ENCYCLOPÆDIA; OR, A DICTIONARY OF ARTS, SCIENCES, AND MISCELLANEOUS LITERATURE; Constructed on a Plan, by which THE DIFFERENT SCIENCES AND ARTS Are digested into the Form of Distinct TREATISES OR SYSTEMS, COMPREHENDING THE HISTORY, THEORY, and PRACTICE, of each, According to the Latest Discoveries 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 most important Topics relative to RELIGION, MORALS, MANNERS, and the OECOeMISTRY 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 most Eminent Persons in every Nation, from the earliest ages down to the present times.

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ILLUSTRATED WITH FIVE HUNDRED AND FORTY-TWO COPPERPLATES.

VOL. XII.  MIE—NEG

PHILADELPHIA: PRINTED BY THOMAS DOBSON, AT THE STONE HOUSE, NO 41, SOUTH SECOND STREET. M.DCC.XCVIII.
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MIEL (Jan), called Giovanni della Vite, a most eminent painter, was born in Flanders in 1599. He was at first a disciple of Gerard Seghers, in whose school he made a distinguished figure; but he quitted that artiff, and went to Italy, to improve himself in design, and to obtain a more extensive knowledge of the several branches of his art. At Rome he particularly studied and copied the works of the Caracci and Corregio; and was admitted into the academy of Andrea Sacchi, where he gave such evident proofs of extraordinary merit and genius, that he was invited by Andrea to assist him in a grand design which he had already begun. But Miel, through some difficulties, rejected those elevated subjects which at first had engaged his attention, refused the friendly proposal of Sacchi, and chose to imitate the style of Bamboccio, as having more of that nature which pleased his own imagination. His general subjects were hunting-scenes, carnivals, gypsies, beggars, pastoral scenes, and conversations; of those he composed his easel-pictures, which are the finest of his performances. But he also painted history in a large size in fresco, and in oil; which, though they seem to want elevation of design, and a greater degree of grace in the heads, yet appear superior to what might be expected from a painter of such low subjects as he generally was fond of representing. His pictures of hunting-scenes are particularly admired: the figures and animals of every species being designed with uncommon spirit, nature, and truth. The transparency of his colouring, and the clear tints of his skies, enliven his compositions; nor are his paintings in any degree inferior to those of Bamboccio either in their force or like. His large works are not so much to be commended for the goodness of the design as for the expression and colouring; but it is in his small pieces that the pencil of Miel appears in its greatest delicacy and beauty. The singular merit of this master recommended him to the favour of Charles Emmanuel duke of Savoy, who invited him to his court, where he appointed Miel his principal painter, and afterwards honoured him with the order of St Mauritius, and made him a present of a crotchet with diamonds of a great value, as a particular mark of his affection. He died in 1664.

Mieris (Francis), the Old, a justly celebrated painter, was born at Leyden in 1635; and was at first placed under the direction of Abraham Toume Vilet, one of the best designers of the Low Countries, and afterwards entered himself as a disciple with Gerard Douw. In a short time he far surpassed all his companions, and was by his master called the prince of his disciples. His manner of painting figures, velvets, stuffs, or carpets, was so singular, that the different kinds and fabric of any of them might easily be distinguished. His pictures are rarely to be seen, and as rarely to be sold; and when they are, the purchase is extremely high, their intrinsic value being so incomparably great. Beside portraits, his general subjects were conversations, persons performing on musical instruments, patients attended by the apothecary or doctor, physicians at work, mechanics and tradesmen, and such like; and the usual valuation he set on his pictures was estimated at the rate of a ducat an hour. The finest portrait of this master's hand is that which he painted for the wife of Cornelius Plaats, which is said to be still preserved in the family, although very great sums have been offered for it. In the possession of the same gentleman was another picture of Mieris, representing a lady painting, and a physician applying the remedies to relieve her. For that performance he was paid (at his usual rate of a ducat an hour) so much money as amounted to fifteen hundred florins when the picture was finished. The grand duke of Tuscany wished to purchase it, and offered three thousand florins for it, but the offer was not accepted. However, that prince procured several of his pictures, and they are at this day an ornament to the Florentine collection. One of the most curious of them is a girl holding a candle in her hand, and it is accounted infallible. This painter died in 1681.

Mieris (John), son of the former, was born at Leyden in 1660, and learned the art of painting from his father. The young artist unhappily was severely afflicted with the gravel and stone, and by those complaints was much hindered in the progress of his studies. But, after the death of his father, he travelled to Germany, and from thence to Florence, where the fame of his father's merit procured him a most honourable reception from the grand duke, who, when he saw some of his paintings, endeavoured to retain him in his service. But Mieris politely declined it, and proceeded to Rome, where his great abilities were well known before his arrival, and his works were exceedingly coveted. In that city his malady increased; yet at the intervals of ease he continued to work with his usual application, till the violence of his distemper ended his days in 1690, when he was only thirty years old. He was allowed to have been as eminent for painting in a large size as his father had been for his works in small.

Mieris (William), called the Young Mieris, was brother to the former, and born at Leyden in 1662. During the life of his father, he made a remarkable progress; but, by being deprived of his director when he was only arrived at the age of nineteen, he had recourse to nature, as the most instructive guide; and by studying with diligence and judgement to imitate her, he approached near to the merit of his father. At
first he took his subjects from private life, in the manner of Francis; such as tradesmen in their shops, or a peasant selling vegetables and fruit, and sometimes a woman looking out at a window; all which he copied minutely after nature, nor did he paint a single object without his model. As Mieris had observed the compositions of Gerrard Lairesse, and other great historical painters, with singular delight, he attempted to design subjects in that style; and began with the story of Rinaldo sleeping on the lap of Armida, surrounded with the loves and graces, the fore-ground being enriched with plants and flowers; a work which added greatly to his fame, and was sold for a very high price. This master also painted landscapes and animals with equal truth and neatness; and modelled in clay and wax, in so sharp and accurate a manner, that he might justly be ranked among the most eminent sculptors. In the delicate finishing of his works, he imitated his father; as he likewise did in the luire, harmony, and truth, of his paintings, which makes them to be almost as highly prized; but they are not equal in respect of design, or of the striking effect, nor is his touch so very exquisite as that of the father. The works of the elder Mieris are better composed, the figures are better grouped, and they have less confusion; yet the younger Mieris is acknowledged to be an artist of extraordinary merit, although inferior to him, who had fearlessly his equal. He died in 1747.

Mieris (Francis), called the Young Francis, was the son of William, and the grandson of the celebrated Francis Mieris; and was born at Leyden in 1689. He learned the art of painting from his father, whose manner and style he always imitated; he chose the same subjects, and endeavoured to render him in his colouring and pencil. But with all his industry he proved far inferior to him; and most of these pictures which at the public sale are said to be of the Young Mieris, and many in private collections ascribed to the elder Francis, or William, are perhaps originally painted by this master, who was far inferior to both; or are only copies after the works of those excellent painters, as he spent abundance of his time in copying their performances.

Mieza, (anc. geog.), a town of Macedonia which was ancietly called Strymonium, situated near Stagira. Here, Plutarch informs us, the flute-stands and shady walks of Arilotie were shown. Of this place was Peuceltes, one of Alexander's generals, and therefore surnamed Miezaux, (Arrian.)

Migdol, or Madoth, (anc. geog.), a place in the Lower Egypt, on this side Pihahiroth, or between it and the Red Sea, towards its extremity. The term denotes a tower or fortress. It is probably the Magdolon of Herodotus, seeing the Septuagint render it by the same name.

Ignard (Nicholas), a very ingenious French painter, born at Troyes in 1628; but, settling at Avignon, is generally distinguished from his brother Peter by the appellation of Mignon of Avignon. He was afterwards employed at court and at Paris, where he became rector of the royal academy of painting. There are a great number of his historical pieces and portraits in the palace of the Tuillery. He died in 1702.

Mignon (Peter), the brother of Nicholas, was born at Troyes in 1610; and acquired so much of the taste of the Italian school, as to be known by the name of the Roman. He was generally allowed to have a superior genius to his brother Nicholas; and had the honour of painting the popes Alexander VII. and Urban VIII. besides many of the nobility at Rome, and several of the Italian princes: His patron, Louis, was ten times to him for his portrait, and respected his talents so much as to enable him, make him his principal painter after the death of Le Brun, and appoint him director of the manufacture. He died in 1695, and many of his pieces are to be seen at St Cloud.

Mignon, or Mignon, (Abraham), a celebrated painter of flowers and still life, was born at Frankfort in 1639; and his father having been deprived of the greatest part of his subsistence by a series of losses in trade, left him in very necessitous circumstances when he was only seven years of age. From that melancholy situation he was rescued by the friendship of James Murel, a flower-painter in that city; who took Mignon into his own house, and instructed him in the art, till he was 17 years old. Murel had often observed an uncommon genius in Mignon: he therefore took him along with him to Holland, where he placed him as a disciple with David de Heem; and while he was under the direction of that master he laboured with incessant application to imitate the manner of de Heem, and ever afterwards adhered to it; only adding daily to his improvement, by studying nature with a most exact and curious observation.—

"When we consider the paintings of Mignon, one is at a loss (Mr Pilkington observes) whether most to admire the freshness and beauty of his colouring, the truth in every part, the bloom on his objects, or the perfect resemblance of nature visible in all his performances. He always shows a beautiful choice in those flowers and fruits from which his subjects are composed; and he groups them with uncommon elegance. His touch is exquisitely neat, though apparently easy and unlaboured; and he was fond of introducing insects among the fruits and flowers, wonderfully finished, so that even the drops of dew appear as round and as translucent as nature itself." He had the good fortune to be highly paid for his works in his lifetime; and he certainly would have been accounted the best in his profession even to this day, if John Van Huylen had not appeared. Weyerman, who had seen many admired pictures of Mignon, mentions one of a most capital kind. The subject of it is a cat, which had thrown down a pot of flowers, and they lie scattered on a marble table. That picture is in every respect so wonderfully natural, that the spectator can scarce persuade himself that the water which is spilled from the vessel is not really running down from the marble. This picture is distinguished by the title of Mignon's Cat. This painter died in 1679, aged only 40.

Migration, the passage or removal of a thing out of one place into another.

Migration of Birds.—It has been generally believed, that many different kinds of birds annually pass from one country to another, and spend the summer or the winter where it is most agreeable to them; and that even the birds of Britain will seek the most distant southern regions of Africa, when directed by a peculiar instinct to leave their own country. It has long
Migration. long been an opinion pretty generally received, that swallows reside during the winter-season in the warm southern regions; and Mr Adamson particularly writes his having seen them at Senegal when they were obliged to leave this country. But besides the swallow, Mr Pennant enumerates many other birds which migrate from Britain at different times of the year, and are then to be found in other countries; after which they again leave these countries, and return to Britain. The reason of these migrations he supposes to be a defect of food at certain seasons of the year, or the want of a secure asylum from the persecution of man during the time of courtship, incubation, and nutrition. The following is his list of the migrating species.

1. Gronis. Of this genus, the hooded crow migrates regularly with the woodcock. It inhabits North Britain the whole year; a few are said annually to breed on Dartmoor, in Devonshire. It breeds also in Sweden and Austria: in some of the Swedish provinces it only shifts its quarters, in others it refides throughout the year. Our author is at a loss for the summer retreat of these which visit us in such numbers in winter, and quit our country in the spring; and for the reason why a bird, whose food is fish, that it may be found at all seasons in this country, should leave us.

2. Cuckoo. Disappears early in autumn; the retreat of this and the following bird is quite unknown to us.

3. Wryneck. Is a bird that leaves us in the winter. If its diet be ants alone, as several affirm, the cause of its migration is very evident. This bird disappears before winter, and revisits us in the spring a little earlier than the cuckoo.

4. Hoopoe. Comes to England but by accident; Mr Pennant once indeed heard of a pair that attempted to make their nest in a meadow at Selborne, Hampshire, but were frightened away by the curiosity of people. It breeds in Germany.

5. Grouse. The whole tribe, except the quail, lives here all the year round: that bird either leaves us, or else retires towards the sea-coasts.

6. Pigeon. Some few of the ring-doves breed here; but the multitude that appears in the winter is so disproportionate to what continue here the whole year, as to make it certain that the greatest part quit the country in the spring. It is most probable they go to Sweden to breed, and return from thence in autumn; as Mr Ekmark informs us: they entirely quit that country before winter. Multitudes of the common wild pigeons also make the northern retreat, and visit us in winter; but not numbers breed in the high cliffs in all parts of this island. The turtle also probably leaves us in the winter, at least changes its place, removing to the southern counties.

7. Star. Breeds here. Possibly several remove to other countries for that purpose, since the produce of those that continue here seems unequal to the clouds of them that appear in winter. It is not unlikely that many migrate into Sweden, where Mr Berger observes they return in spring.

8. Thrushes. The fieldfare and the redwing breed and pass their summers in Norway and other cold countries; their food is berries, which abounding in our kingdoms, tempts them here in the winter. These two and the Roviton crow are the only land-birds that regularly and constantly migrate into England, and do not breed here. The hawkinch and orpithil come here at such uncertain times as not to deserve the name of birds of passage.

9. Chatterer. The chatterer appears annually about Edinburgh in flocks during winter; and feeds on the berries of the mountain-ash. In South Britain it is an accidental visitant.

10. Greybeaks. The greybeak and crofull come here but seldom; they breed in Austria. The pine greybeck probably breeds in the forests of the Highlands of Scotland.

11. Buntings. All the genus inhabits England throughout the year; except the greater Brambling, which is forced here from the north in very severe ffeasons.

12. Finches. All continue in some parts of these kingdoms, except the finch, which is an irregular visitor, said to come from Ruffia. The linnet shifts their quarters, breeding in one part of this island, and remove with their young to others. All finches feed on the seeds of plants.

13. Larks, fly-catchers, swallows, and warblers. All of these feed on insects and worms; yet only part of them quit these kingdoms; though the reason of migration is the same to all. The nightingale, blackcap, fly-catcher, willow-wren, wheat-eater, and white-throat, leave us before winter, while the small and delicate golden-crested wren braves our severest frosts. The migrants of this genus continue longest in Great Britain in the southern counties, the winter in those parts being later than in those of the north; Mr Stillingfleet having observed several wheatshears in the Isle of Purbeck on the 18th of November. As these birds are incapable of very distant flights, Spain, or the south of France, is probably their winter-asylum.

14. Swallows and goat-fishers. Every species disappears at the approach of winter.

Water-Fowl.

Of the vast variety of water-fowl that frequent Great Britain, it is amazing to reflect how few are known to breed here: the cause that principally urges them to leave this country, seems to be not merely the want of food, but the desire of a secure retreat. Our country is too populous for birds so shy and timid as the bulk of these are: when great part of our island was a mere waste, a tract of woods and fen, doubtless many species of birds (which at this time migrate) remained in security throughout the year. Egrets, a species of heron now scarce known in this island, were in former times in prodigious plenty; and the crane, that has totally forsaken this country, bred familiarly in our marshes: their place of incubation, as well as of all other cloven-footed water-fowl (the heron excepted), being on the ground, exposed to every one. As rural economy increased in this country, these animals were more and more disturbed; at length, by a series of alarms, they were necessitated to seek, during the summer, some lonely safe habitation.

On the contrary, those that build or lay in the almost inaccesible rocks that imped over the British seas, breed there still in vast numbers, having little to fear from the approach of mankind; the only disturb-
from the rate attempts of some few to get their eggs.

Cloven-footed Water-Fowl.

15. Heron. The white heron is an uncommon bird, and visits us at uncertain seasons; the common kind and the bittern never leave us.

16. Curlews. The curlew breeds sometimes on our mountains; but, considering the vast flights that appear in winter, it is probable that the greater part retire to other countries; the whimbrel breeds on the Grampian hills, in the neighbourhood of Invercauld.

17. Snipes. The woodcock breeds in the moist woods of Sweden, and other cold countries. Some snipes breed here, but the greatest part retire elsewhere; as do every other species of this genus.

18. Sandpipers. The following continues here the whole year; the ruff breeds here, but retires in winter; the redshank and sandpiper breed in this country, and reside here. All the others abscond themselves during summer.

19. Plovers and oyster-catcher. The long-legged plover and sanderling visit us only in winter; the dotterel appears in spring and in autumn; yet, what is very singular, we do not find it breeds in south Britain. The oyster-catcher lives with us the whole year. The Norfolk plover and sea-lark breed in England. The green plover breeds on the mountains of the north of England, and on the Grampian hills.

We must here remark, that every species of the genera of curlews, woodcocks, sandpipers, and plovers, that forsake us in the spring, retire to Sweden, Poland, Prussia, Norway, and Lapland, to breed: as soon as the young can fly, they return to us again, because the frogs which live in early in those countries totally deprive them of the means of subsisting; as the dryness and hardiness of the ground, in general, during our summer, prevent them from penetrating the earth with their bills, in search of worms, which are the natural food of those birds. Mr Ekmark speaks thus of the retreat of the whole tribe of cloven-footed water fowl out of his country (Sweden) at the approach of winter; and Mr Klein gives much the same account of those of Poland and Prussia.

20. Rails and gallinules. Every species of these two genera continue with us the whole year; the land rail excepted, which is not seen here in winter. It likewise continues in Ireland only during the summer months, when they are very numerous, as Mr Smith tells us in the History of Waterfowl, p. 326. Great numbers appear in Anglesea the latter end of May; it is supposed that they pass over from Ireland, the passage between the two islands being but small. As we have instances of these birds lighting on ships in the channel and the Bay of Biscay, we may conjecture their winter quarters to be in Spain.

Finned-footed Water-Birds.

21. Phalaropes. Visit us but seldom; their breeding place is Lapland, and other arctic regions.

22. Grebes. The great-crested grebe, the black and white grebe, and little grebe, breed with us, and never migrate; the others visit us accidentally, and breed in Lapland.

Web-footed Birds.

23. Avocet. Breed near Fosdike in Lincolnshire; but quit their quarters in winter. They are then not found in different parts of the kingdom, which they visit, not regularly, but accidentally.

24. Auk and guillemots. The great auk or penguin sometimes breeds in St Kilda. The auk, the guillemot, and puffin, inhabit most of the maritime cliffs of Great Britain, in amazing numbers, during summer. The black guillemot breeds in the Bass Isle, and in St Kilda, and sometimes in Llandinno rocks. We are at a loss for the breeding place of the other species; neither can we be very certain of the winter residence of any of them, excepting of the latter guillemot and black-billed auk, which, during winter, visit in vast flocks the Frith of Forth.

25. Divers. These chiefly breed in the lakes of Sweden and Lapland, and in some countries near the pole; but some of the red-throated divers, the northern and the imber, may breed in the north of Scotland and its isles.

26. Terns. Every species breeds here; but leaves us in the winter.

27. Petrels. The fulmar breeds in the Isle of St Kilda, and continues there the whole year except September and part of October; the shearwater visits the Isle of Man in April; breeds there; and, leaving it in August or the beginning of September, disperses over all parts of the Atlantic ocean. The stormfitch is seen at all distances from land on the same vast watery tract; nor is ever found near the shore except by some very rare accident, unless in the breeding season. Mr Pennant found it on some little rocky isles, off the north of Skye. It also breeds in St Kilda. He also supposes that it nests on the Blafquot Isles off Kerry, and that it is the gourder of Mr Smith.

28. Manx shearwaters. This whole genus is mentioned among the birds that fill the Lapland lakes during summer. Mr Pennant has seen the young of the red-breasted in the north of Scotland: a few of these, and perhaps of the goosanders, may breed there.

29. Ducks. Of the numerous species that form this genus, we know of few that breed here: The swan and goose, the shelduck, the eider duck, a few shovellers, garganey, and teal, and a very small portion of the wild ducks.

The rest contribute to form that amazing multitude of water fowl that annually repair from most parts of Europe to the woods and lakes of Lapland and other arctic regions, there to perform the functions of incubation and nutrition in full security. They and their young quit their retreat in September, and disperse themselves over Europe. With us they make their appearance the beginning of October; circulate first round our shores; and, when compelled by severe frost, betake themselves to our lakes and rivers. Of the web-footed fowl there are some of harder constitutions than others: these endure the ordinary winters of the more northern countries; but when the cold reigns there with more than common rigour, they repair for shelter to these kingdoms: this regulates the appearance of some of the diver kind, as also of the wild swans, the swallow-tailed shelduck, and the different sorts of goosanders which then visit our coasts. Barents found the barnacles with their nests in great numbers in Nova Zembla. (Collect. Voy. Dutch East India Company, 8vo. 1703, p. 19.) Clubius, in his Excurs. 368, also
also observes, that the Dutch discovered them on
the rocks of that country and in Waygate Straits. They,
as well as the other species of wild-geese, go very far
north to breed, as appears from the histories of Green-
land and Spitzbergen, by Egede and Cautz. These
birds seem to make Iceland a resting place, as Horre-
bow observes: few continue there to breed, but only
visit that island in the spring, and after a short stay re-
tire full farther north.

30. Corvus. The corvanton and flag breed on
most of our high rocks: the gannet in some of the
Scotch isles, and on the coast of Kerry: the two first
continue on our shores the whole year. The gannet
differs it'self all round the seas of Great Britain, in
pursuit of the herring and pilchard, and even as far as
the Tagus to prey on the fardina.

But of the numerous species of fowl here enumerat-
ed, it may be observed how very few intru'ce them-
selves to us in the breeding season, and what a distant
flight they make to perform the first great dictate of
nature.

There seems to be scarcely any but what we have
traced to Lapland, a country of lakes, rivers, swamps,
and alps, covered with thick and gloomy woods, that
afford shelter during summer to these fowls, which in
winter diffuse over the greatest part of Europe. In
those Arctic regions, by reason of the thickness of
the woods, the ground remains moist and penetrable to
the woodcocks, and other tender-billed fowl: and for the
web-footed birds the waters afford larva innumerable
of the tormenting knot. The days there are long;
and the beautiful meteoric nights indulge them with
every-opportunity of collecting to minute a food: whilst
mankind is very sparingly scattered over that vast nor-
thern waste.

Why then should Linneus, the great explorer of
these rude deserts, be amazed at the myriads of water-
fowl that migrated with him out of Lapland? which
exceeded in multitude the army of Xerxes; covering,
for eight whole days and nights, the surface of the river
Calis! His partial observation as a botanist, would
confine their food to the vegetable kingdom, almost
denied to the Lapland waters; inattentive to a more
plenteous table of insect food, which the all-bountiful
Creator had spread for them in the wilderness. It may
be remarked, that the lakes of mountainous rocky
countries in general are delirir of plants: few or
none are seen on those of Switzerland; and Linneus
makes the same observation in respect to those of Lap-
land; having, during his whole tour, discovered only
a single specimen of a lemma lyrifulta, or 'ivy-leaved
duck's meat,’ Flora Lap. n° 470; a few of the quen
laxiflora, or ‘bullrush,’ n° 18, the alepuchura
geniculata, or ‘fite foxtail grass,’ n° 58; and the
ramunculus aquatilis, n° 234; which are all he enu-
erates in his Prolegomena to that excellent perform-
ance.

Under the article Swallow will be found the prin-
cipal arguments for and against the migration of swal-
lows. Here we shall give a short abstract of the ar-
guments used by the Hon. Daines Barrington against
the migration of birds in general, from a paper pub-
lished by him in the 62d volume of the Philosophical
Transactions. This gentleman denies that any well-
attested instances can be produced of this supposed mi-
gration; which, he thinks, if there were any such perio-
dical flight, could not possibly have escaped the frequent
observation of seamen. It has indeed been asserted
that birds of passage become invisible in their flight,
because they rise too high in the air to be perceived,
and because they choose the night for their passage.
The author, however, expresses his doubts "whether
any bird was ever seen to rise to a greater height
than perhaps twice that of St. Paul's crofs;' and he
further endeavours to show, that the extent of some
of these supposed migrations (from the northern parts
of Europe, for instance, to the line) is too great to be
accounted for, by having recourse to the argument
founded on a nocturnal passage.

The author next recites, in a chronological order,
all the instances that he has been able to collect, of
birds having been actually seen by mariners when they
were crossing a large extent of sea; and he endeavours
to show that no signs can be laid on the few casual
observations of this kind that have been produced in
support of the doctrine of a regular and periodical mi-
gration.

Mr Barrington afterwards proceeds to invalidate
M. Adanson's celebrated observation with respect to
the migration of the swallow in particular, and which
has been considered by many as perfectly decisive of the
present question. He endeavours to show that the
four swallows which that naturalist caught, on their
settling upon his ship, on the 6th of October at about
the distance of 50 leagues from the coast of Senegal,
and which he supposed to have been then proceeding
from Europe to pass the winter in Africa, could not be
true European swallows; or, if they were, could not
have been on their return from Europe to Africa.

His objections are founded principally on some proofs
which he produces of M. Adanson's want of accuracy
on this subject, which has led him in the present in-
stance, to mistake two African species of the swallow-
tribe, described and engraved by Brisson, for Euro-
pean swallows, to which they bear a general resemble-
ance; or granting even that they were European
swallows, he contends, that they were sitting from the
Cape de Verd Islands to the coast of Africa; "to
which short flight, however, they were unequal, and
accordingly fell into the failer's hands." See the ar-
icle Swallow.—We shall here only add, in oppo-
sition to the remarks of Mr Barrington, the following
observations of the Rev. Mr White * in a letter to
Mr Pennant on this subject.

* Natural
History of
Selborne,
Letter iv,
P. 339.
ian Bosporus from Asia to Europe. Besides the abovementioned, he remarks, that the procession is swelled by whole troops of eagles and vultures.

"Now it is no wonder that birds residing in Africa should retreat before the sun as it advances, and retire to milder regions, and especially birds of prey, whose blood being heated with hot animal food, are more impatient of a sultry climate: but then I cannot help wondering why kites and hawks, and such hardy birds as are known to defy all the severity of England, and even of Sweden and all north Europe, should want to migrate from the south of Europe, and be dissatisfied with the winters of Andalucia.

"It does not appear to me that much stress may be laid on the difficulty and hazard that birds must run in their migrations, by reason of vast oceans, cross winds, &c.; because, if we reflect, a bird may travel from England to the equator without launching out and exposing itself to boundless seas, and that by crossing the water at Dover and again at Gibraltar. And I with the more confidence advance this obvious remark, because my brother has always found that some of his birds, and particularly the swallow kind, are very sparing of their pains on crossing the Mediterranean: for when arrived at Gibraltar, they do not

---"rang'd in figure, wedge their way,---" and set forth

"Their airy caravan high over seas
"Flying, and over lands with mutual wing
"Easing their flight;"

Milton.


but scout and hurry along in little detached parties of six or seven in a company; and sweeping low, just over the surface of the land and water, direct their course to the opposite continent at the narrowest passage they can find. They usually slope across the bay to the south-west, and fly over opposite to Tangier, which it seems is the narrowest space.

"In former letters we have considered whether it was probable that woodcocks in moon-light nights cross the German ocean from Scandinavia. As a proof that birds of less speed may pass that sea, considerable as it is, I shall relate the following incident, which, though mentioned to have happened so many years ago, was hardly matter of fact:--As some people were shooting in the parish of Trotton, in the county of Sussex, they killed a cuck in that dreadful winter 1708-9, with a silver collar about its neck (I have read a like anecdote of a swan), on which were engraved the arms of the king of Denmark. This anecdote the rector of Trotton at that time has often told to a near relation of mine; and, to the best of my remembrance, the collar was in the possession of the rector.

"At present I do not know any body near the sea-side that will take the trouble to remark at what time of the moon woodcocks first come. One thing I used to observe when I was a sportsman, that there were times in which woodcocks were so flagrantly and fleetly that they would drop again when flushed just before the fpariels, nay just at the muzzle of a gun that had been fired at them; whether this strange laziness was the effect of a recent fatiguing journey, I shall not presume to say.

"Nightingales not only never reach Northumber-

land and Scotland, but also, as I have been always told, St. Miguel, Devonshire and Cornwall. In those two last counties we cannot attribute the failure of them to the want of warmth: the defect in the west is rather a presumptive argument that these birds come over to us from the continent at the narrowest passage, and do not stroll so far westward."

Migration of Fishes. See Clupea.

St. Miguel, one of the Azore islands, situated in W. Long. 22 45. N. Lat. 38 10. This island appears to be entirely volcanic. The best account we have of it hath been published in the 6th volume of the Philosophical Transactions by Mr Francis Mason. According to him the productions differ greatly from those of Madeira, inasmuch that none of the trees of the latter are found here, except the faya: it has a nearer affinity to Europe than Africa. The mountains are covered with the erica vulgaris, and an elegant ever-green shrub very like a philyrea, which gives them a most beautiful appearance.

"It is one of the principal and most fertile of the Azorian islands, lying nearly east and west. Its length is about 18 or 20 leagues; its breadth unequal, not exceeding five leagues; and in some places not more than two. It contains about 80,000 inhabitants.

Its capital, the city of Ponta del Guda, which contains about 12,000 inhabitants, is situated on the south side of the island, on a fine fertile plain country, pretty regularly built; the streets straight, and of a good breadth. It is supplied with good water, which is brought about the distance of three leagues from the neighbouring mountains. The churches and other religious edifices are elegant and well built for such an island. There is a large convent of Franciscan friars and one of the order of St. Agustin, four convents for professed nuns, and three Recolhimentos for young women and widows who are not professed. The vesels anchor in an open road; but it is not dangerous, as no wind can prevent their going to sea in calm stormy weather.

The country round the city is plain for several miles, well cultivated, and laid out with good tafe into spacious fields, which are fown with wheat, barley, Indian corn, pulse, &c. and commonly produce annually two crops; for as soon as one is taken off, another is immediately sown in its place. The soil is remarkably gentle and easy to work, being for the most part composed of pulverized pumice-flone. There are in the plains a number of pleasant country-feats, with orchards of orange-trees, which are esteemed the best in Europe.

The second town is Ribeira Grande, situated on the north side of the island, containing about as many inhabitants as the city; a large convent of Franciscan friars, and one of nuns. It gives title to a convent, called the Conde Ribeira Grande, who first instituted linen and woolen manufactories in the island.

The third town is Villa Franca, on the south side of the island, about six leagues east of Ponta del Guda. It has a convent of Franciscan friars, and one of nuns, which contains about 300. Here, about half a mile from the shore, lies a small island (Ilhao), which is hollow in the middle, and contains a fine baion with only one entrance into it, fit to hold 50 sail of vessels secure from all weather; at present it wants cleaning out,
The water boils up so hot, that there was no one able to approach it; in a short time it discharged itself into the sea.

This wonderful place had been taken little notice of until very lately: so little curiosity had the gentlemen of the island, that scarcely any of them had seen it, until of late some persons, afflicted with very virulent disorders, were persuaded to try its waters, and found immediate relief from them. Since that time it has become more and more frequented; several persons who had lost the use of their limbs by the dead palpitation, have been cured; and also others who were troubled with eruptions on their bodies.

A clergyman who was greatly afflicted with the gout, tried the said waters, and was in a short time perfectly cured, and has had no return of it since. When Mr Mason was there, several old gentlemen, who were quite worn out with the said disorder, were using the waters, and had received incredible benefit from them; in particular, an old gentleman about 60 years of age, who had been tormented with that disorder more than 20 years, and often confined to his bed for six months together: he had used these waters about three weeks, had quite recovered the use of his limbs, and walked about in the greatest spirits imaginable. A friar also who had been troubled with the said disorder about 12 years, and reduced to a cripple, by using them a short time was quite well, and went about every day.

There are several other hot springs in the island, particularly at Ribeira Grande; but they do not possess the same virtues, at least not in so great a degree.

The east and west part of the island rises into high mountains; but the middle is low, interpenetrated with round conic hills, all of which have very recent marks of fire; all the parts below the surface consisting of melted lava lying very hollow.

Most of the mountains to the westward have their tops hollowed out like a punch-bowl, and contain water. Near the west end is an immense deep valley like the Furnas called the Sete Cidades. This valley is surrounded with very abrupt mountains, about seven or eight leagues round; in the bottom is a deep lake of water, about three leagues in circuit, furnished with great numbers of water-fowls. This water has no mineral quality; neither are there any hot springs in the valley. All these mountains are composed of a white, three bathing-houses, which are most commonly used. St Miguel.
MIL [8] MIL

white crumely pumice-stone, which is so loose, that
if a man thrust a fllick into the banks, whole wag-
gons of it will tumble down. The inhabitants of the island relate a story, that he who first discovered
it Osborne an extraordinary high peak near the well end; but the second time he visited it, no such
peak was to be seen, which he supposed must have
certainly sunk; but, however improbable this story
may be, at some period or another it must have cer-
tainly been the case.

MILAN, or the duchy of the Milanesi, a country
of Italy, bounded on the west by Savoy, Piedmont,
and Montferrat; by Switzerland on the north; by the
territories of Venice, the duchies of Mantua, Parma,
and Placentia, on the east; and by the territories of
Genoa on the south.

Anciently this duchy, containing the north part
of the old Liguria, was called Infabria, from its
inhabitants the Infabres; who were conquered by
the Romans, as there were by the Goths; who in
their turn were subdued by the Lombards. Di-
dier, the last king of the Lombards, was taken prisoner
by Charlemagne, who put an end to the Longobardic
empire, and appointed governors of Milan. These go-
 vernors, being at a distance from their masters, soon
began to assume an independency, which brought a
dreadful calamity on the country; for, in 153, the
capital itself was levelled with the ground by the em-
peror Frederic Barbaroffa, who committed great de-
vastations otherwise throughout the duchy. Under
this emperor lived one Galvian, a nobleman who was
defended from Otho a Milanesi. Galvian, along
with William prince of Montferrat, served in the
crusade, when Godfrey of Boulogne took Jerusalem:
he killed in single combat the Saracen general, whom
he stripped of his helmet, which was adorned with
the image of a serpent swallowing a youth; and this ever
afterwards was the badge of that family. His grand-
fon Galvian, having opposed the emperor, was taken
prisoner, and carried in irons into Germany, from
whence he made his escape and returned to Milan,
died in the service of his country. From him defend-
ed another Otho, at the time that Otho IV. was em-
peror of Germany, and who soon distinguished him-
sely by the accomplishments both of his mind and
body. When he grew up, he was received into the
family of cardinal Ubaldini at Rome. This prelate,
who was himself aspiring at the popedom, was in a short time greatly taken with the address and
accomplishments of young Otho, and predicted his
future greatness. In the mean time, one Torriess, or
Torrian, a Milanesi nobleman of unbounded ambi-
tion, was attempting to make himself master of Mi-
lan. The popular faction had some time before been
caballing against the nobility; and at last, Torrian,
putting himself at their head, expelled the bishop, and
put to death or banished, all the nobility: by which
means the popular government was fully established;
and Torriess, under this pretence, ruled every thing
as he pleased. He was, however, soon opposed by
one Francisco Sepri, who formed a great party, pre-
tending to deliver the city from Torrian's haughti-
ness and cruelty. But while the two parties were
collecting their forces against each other, cardinal
Ubaldini was projecting the destruction of both, by
means of his favourite Otho. This prelate had for
some time borne an implacable hatred to Torriano,
because he had been by him prevented from carrying
out of the treasury of St Ambrose's church at Mil-
an, a carbuncle or jewel of great value, which he
pretended to refer to for adorning the papal tiara; for
which reason he now determined to oppose his ambition.

Ubaldini began with naming Otho archbishop of
Milan; which, as the pope's legate, he had a right to
do. This nomination was confirmed by Pope Ur-
ban IV.; and the party of the nobility having now
got a head from the pope himself, began to gather
strength. Otho in the mean time employed himself in
collecting troops; and had no sooner procured a show
of an army, than, he advanced towards Lago Mag-
gione, and took possession of Arona, a strong poUt
near that lake; but Torriano, marching immediately
against him with all his troops, obliged him to aban-
don the place, and leave his party to make the best
terms they could with the conqueror. This was fol-
low by the destruction of the castles of Arona, An-
ghiari, and Brebbia: soon after which Torriano
died, and was succeeded by his brother Philip, who
had sufficient interest to get himself elected pope,
and prefect of Milan, for ten years. During his lifetime,
his party, however, the party of the nobility increafed conde-
rably under Otho, notwithstanding the check they had
received. Philip died: in 1265, having left ground con-
derably in the affections of the people, though he ob-
tained a great reputation for his courage and con-
duct. His successor Napi rendered himself terrible to
nobility, whom he proscribed, and put to death as of-
ten as he could get them into his power. He pro-
ceeded fuch lengths, and acted with fuch fury against
that unfortunate party, that pope Clement IV. who
had succeeded Urban, at laft interceded Milan, and
excommunicated Napi and all his party. By this
Napi began to lose his popularity, and the public dif-
affection towards him was much heightened by the
natural cruelty of his temper. But in the mean time,
the party of the nobility was in the utmost difter-
se. Otho himself and his friends, having spent all their
fubitance, wandered about from place to place; the
pope not being in a capacity of giving them any af-
fittance. Otho, however, was not discouraged by his
bad successe, but found means still to keep up the spi-
rits of his party, who now chose for their general Squar-
cini Burri, a man of great eminence and courage,
whole daughter was married to Matthew Visconti, af-
terwards called Matthew the great. At the same
time they renewed their confederacy with the marquis
of Montferrat, who was fon-in-law to the king of
Spain. The marquis agreed to this confederacy chiefly
with a view to become master of the Milanesi.

The nobility now again began to make head; and
having collected an army, which was joined by 600
Spanish cavalry and a body of foot, gained some ad-
vaniges. But in the mean time Napi, having gather-
ed together a superior army, suddenly attacked Otho
and Burri, and defeated them. After this disaf-
ter Otho applied to the pope; from whom, however,
he did not obtain the afittance he defired; and in the
mean time Napi invited the emperor Rodolph into
Italy, with the promise of being crowned at Milan.
This invitation was accepted of with great readiness
by
by Rodolph; who constituted Napi his governor and vicar-general in Lombardy, sending to him at the same time a fine body of German horse, the command of which was given to Caftioni, Napi's nephew. On this Otho again applied to the pope (Gregory X.) but he was so far from granting him any assistance, that he is said to have entered into a scheme of aff٬inating him privately; but Otho escaped the danger, and in 1276 began to recover his affairs. The reason of pope Gregory's enmity to him was, that he and his party were thought to be Ghibelines, and were opposed by great numbers of the nobility themselves; but after that pope's death, the Milanesi exiles being united under one head, soon became formidable. They now chose for their general Godfrey count of Langue, a noble Pavan, and an inveterate enemy of the Torriano family. This nobleman being rich and powerful, enlisted many German and other mercenaries, at whom head he marched towards the Laghi Maggiore. All the towns in that country opened their gates to him, through the interest of the Visconti family, who retired in these parts. But this success soon met with a severe check in an unfortunate engagement, wherein Godfrey was defeated and taken prisoner; after which he and 34 nobles had their heads cut off, and sent from the field of battle piled up in a common waggon.

This defeat greatly affected Otho; but having in a short time recovered himself, he again attacked his enemies, and defeated them; but, suffering his troops to grow remiss after their victory, the fugitives rallied, and entirely defeated him. The next year, however, Otho had better success, and totally defeated and took prisoner Napi himself. After this victory Caftioni was obliged to abandon Milan to his competitor, who kept possession of it till his death, which happened in 1295, in the 87th year of his reign.

Otho was succeeded by Matthew Visconti above-mentioned; and Milan continued in subjection to that family without any visible occurrence till the year 1378, when, by the death of Galeazzo II. his brother Barnabo became sovereign of Milan. He was of a brave and active disposition; but excessively partial in his favours, as his brother Galeazzo had also been; and to procure money to supply his extravagancies, was obliged to oppress his subjects. Galeazzo had engaged in an enterprise against Bologna, and the siege of it was continued by Barnabo. It lasted for nine years; and during this time he is said to have cost 300 millions of gold, a prodigious sum in those days, near 40 millions sterling; being in value somewhat more than half-a-crown English. Both the brothers were exceedingly fond of building. Barnabo erected a bridge over the Adda, confining three stories; the lowest for chariots and heavy Carriages, the middle for horses, and the uppermost for foot-passengers. He built also another bridge, which was carried over houses without touching them. To accomplish these, and many other expensive schemes, he became one of the greatest tyrants imaginable, and every day produced fresh instances of his rapacity and cruelty. He instituted a chamber of inquiry, for punishing all those who had for five years before been guilty of killing bears, or even of eating them at the table of another. They who could not redeem themselves by money were hanged, and above 100 wretches perished in that manner. Those who had any thing to lose were obliged of all their substance, and obliged to labour at the fortifications and other public works. He obliged his subjects to maintain a great many hunting-dogs, and each district was taxed a certain number. The owners of his dogs were at the same time the first and last of his capacity. When the dogs were poor and slender, the owners were always fined; but when the dogs were fat, the owners were also fined for suffering them to live without exercise.

The extravagant behaviour of Barnabo soon rendered public affairs ready for a revolution, which was at last accomplished by his nephew John Galeazzo. He affected a solitary life, void of ambition, and even inclining to devotion; but at the same time took care that his nephew John Galeazzo had soldiers advancing from other quarters; so that Barnabo and his sons were immediately seized, and the houses of those who had fined with them given up to be plundered. The booty in plate, money, and all kinds of rich furniture, was immense. The ministers of the late government were dragged from their hiding-places, and put to death; and at last the citadel itself fell into the hands of Galeazzo, who found in it an immense sum of money. Barnabo was carried prisoner to Trissio, a castle of his own building, where he had the happiness to find one person still faithful to him. This was his mistress, named Dominia Pozza; who, when he was abandoned by all the world, shut herself up a voluntary prisoner in his chamber, and remained with him as long as he lived, which was only seven months after his degradation.

John Galeazzo was the first who took upon him the title of the duke of Milan, and was a prince of great policy and no less ambition. He made war with the Florentines, became master of Pisa and Bologna, and entirely defeated the emperor in 1402, so that he entertained hopes of becoming master of all Lombardy, and cutting off all possibility of invading it either from France or Germany; but his designs were frustrated by death, which happened in 1403, in the 55th year of his age. After his decease the Milanesi government fell into the most violent dissensions, so that it ...
could not be supported, even in time of peace, without an army of 20,000 foot and as many horses. In the year 1421, however, Philip duke of Milan became master of Genoa; but though he gained great advantages in all parts of Italy, the different states still found means to counterbalance his successes, and prevent him from enslaving them; so that Milan never became the capital of any extensive empire; and in 1437 Genoa revolted, and was never afterwards reduced.

Philip died in 1448, and by his death the male line of the Visconti family was at an end. The next lawful heir was Valentina his sister, who had married the duke of Orleans son to Charles V. of France. By the contract of that marriage, the lawful progeny of it was to succeed to the duchy of Milan in failure of the heirs-male of the Visconti family; but this succession was disputed by Sforza, who had married Philip's natural daughter. It is certain, however, that the right of succession was vested in the house of Orleans and the kings of France; and therefore though the Sforza family got possession of the duchy for the present, Louis XII. afterwards put in his claim, as being grand-son to John Galeazzo. For some time he was successful, but at length in such an important manner, that they were driven out of the Milanese by the Swis and Maximilian Sforza. The Swis and Milanese were in their turn expelled by Francis I, who obliged the Sforza family to relinquish the government for a pension of 50,000 ducats a-year. Francis Sforza, the son of Maximilian, however, being allied to the emperor and the pope, regained the possession of the Milanese about the year 1521; and, eight years after, the French king, by the treaty of Cambrai, gave up his claim on the duchy.

But, in fact, the emperors of Germany seem to have had the fairest title to the Milanese in right of their being for a long time sovereigns of Italy. On the death of Francis Sforza, therefore, in the year 1536, the emperor Charles V. declared the Milanese to be an imperial fief, and granted the investiture of it to his son Philip II. king of Spain. In his family it continued till the year 1706, when the French and Spaniards were driven out by the Imperialists, and the emperor again took possession of it as a fief. It was confirmed to his house by the treaty of Baden in 1714, by the quadruple alliance in 1718, and by the treaty of Aix-la-Chapelle in 1748.

The duchy of Milan is one of the finest provinces in Italy. It is bounded on the south by the Appenine mountains, and the territory of Genoa; on the north by Switzerland; on the east by the Venetian territories, and the duchies of Mantua, Parma, and Placentia; and on the west by Savoy, Piedmont, and Montferrat; extending from north to south about 100 miles, and from east to west about 70 miles. It is well watered by the Tiffino, the Sile, the Adda, the Po, the Oglio, the Lombr, Serio, &c. and also by several canals and lakes. Of the latter the Lago Maggiore is between 30 and 40 miles in length, and in some places six or seven miles broad. In it lie the Boromenian islands, as they are called, viz. Isola Bella and Isola Madre, the beauty of which almost exceeds imagination; art and nature seem to have vied with one another in embellishing them. In each of them is a palace with delicious gardens, belonging to the Boromean family. The water of the lake is clear and of a greenish colour, and abounds with fish. The hills which it is surrounded presents a most charming landscape, being planted with vines and chestnut-trees, intersected with summer-houses. There is a canal running from it towards Switzerland, with which the city of Milan has a communication. It was anciently called Lacus Verbanus. The Lago de Como, which was called by the Latin poets Lacus Larius, but had its modern name from the city, near which it lies, extends itself about 30 miles northward from Como, but its greatest breadth is not above five miles. From the Lago Maggiore issues the Tessino; and from that of Como the Adda. Of the other lakes, that of Lago and Guarda are the chief; that of Guarda was anciently called Benacus.

The trade and manufactures of this duchy consist principally in silks, stuffs, stockings, gloves, and handkerchiefs, linen and woollen cloth, hardware, curious works of crystal, agate, hyacinths, and other gems; but their exports are usually far short of their imports. As to the revenue of the duchy, it must without doubt be very considerable. It is said to have amounted to 2,000,000 dollars while the duchy was in the hands of Spaniards.

In the year 1767, the Austrian government of Milan published a law, by which all the rights which the pope or the bishops had till then exercised over ecclesiastics, either with regard to their effects or persons, is transferred to a council established for that purpose at Milan. By the same edict, all ecclesiastics were obliged to sell the estates which they had become possessed of since the year 1722; and no subject, whether ecclesiastic or secular, was to go to Rome to solicit any favour, except letters of indulgence, without the consent of the said council.

MILAN, the capital of the duchy of that name, in Latin Mediolanum, is a very large city, and has a wall and rampart round it, with a citadel; yet is thought to be incapable of making any great resistance. The gardens within the city take up a great deal of ground. In the citadel is a foundry for cannon, and an arsenal furnished with arms for 12,000 men. The governor of it is quite independent of the governor-general of the Milanese, who resides in the city, in a large but old and ill-contrived palace. The yearly income of the governor of Milan is said to be 200,000 guilders. The council belonging to the city is composed of a prefrident and 60 doctors of law, who are all nobles, and independent of the governor-general. Milan hath experienced a great variety of fortune, having been subject sometimes to the French, sometimes to the Spaniards, and sometimes to the Germans. A great number of persons of rank and fortune live in it, especially during the winter. The ladies in France are not allowed more liberty than those of this city; even the aulterities of the monastic life are so far mitigated here, that gentlemen have not only the liberty of talking with the nuns, and of railing and laughing at the grate, but of joining with them in concerts of music, and of spending whole afternoons in their company. The place where the bauc monde take the air, either in their coaches or on foot, is the rampart betwixt the Porta Orientale and the Porta Tofa, where it is straight and broad, and extremely pleasant.
Milan, pleasant, being planted between the ramparts and the city. Milan, have been built by the hospitals, and though something has been doing for near 600 years towards the outward or inward ornament thereof, it is not yet finished. Of the great number of statues about it, that of St Bartholomew, just dead alive, with his skin hanging over his shoulders; and of Adam and Eve, over the main portal, are the finest. The pillars supporting the roof of the church are all of marble, and the windows finely painted. This church contains a treasure of great value, particularly a shrine of rock-crystal, in which the body of St Charles Borromeo is deposited. The other churches most worthy of a stranger's notice are those of St Alexander, St Jerome, St Giovanni de Cafarotti della Paffione, that of the Jesuits, and of St Ambrose, in which lie the bodies of the saints and of the kings Pepin and Bernard. In the Ambroian college, founded by Frederic Borromeo, 16 professors teach gratis. In the same college is also an academy of painting, with a museum, and a library containing a vast number of printed books and manuscripts; among the last of which is a translation of Josephus's History of the Jews, done by Rufinus about 1250 years ago, and written on the bark of a tree. St Ambrose's works on vellum, finely illuminated; the orations of Gregory Nazianzen, and the works of Virgil, in folio, with Petrarch's notes. In the museum are Leonardo da Vinci's mathematical and mechanical drawings, in 12 large volumes. The seminary for sciences, the college of the nobles, the Helvetian college, and the mathematical academy, are noble foundations and stately buildings. Of the hospitals, the most remarkable are the Lazaretto, and that called the great hospitals, the latter of which receives sick persons, foundlings, and lunatics, and has six smaller hospitals depending on it, with a revenue of 100,000 rixdollars.

The number of the inhabitants of this city is said to be about 200,000. It has been 40 times besieged, taken 20 times, and four times almost entirely demolished; yet it has always recovered itself. It is said that gunpowder is sold here only by one person, and in one place. The court of inquisition is held in the Dominican convent, near the church of Madonna della Grazia. The houses of entertainment, and the ordinaries here, are represented as very indifferent. Mr. Keyfer says, it is not usual for young travellers, when they go to any of the taverns in Milan, to be asked, “whether they choose a letto fornito, or female bed-fellow,” who continues maid till the enters the bed-chamber. Milan is described as inferior to Turin both in beauty and conveniency: many of the streets being crooked and narrow, and paper-windows much more frequent than in that city; even in grand palaces, the windows are often composed promiscuously of glass and paper. Two large canals extend from hence, the one to the Telfino, and the other to the Adda; the Telfino having a communication with the Lago Maggiore, and, by a canal, with the S. S., and the Adda rising from the Lago di Como, and having a communication by canal with the Lambro and S. Siro. In a void space in one of the fronts of Milan, where stood the house of a barber who had confpired with the comminity of health to poison his fellow-citizens, is ered a pillar called Colonna Infausta, with an inscription to perpetuate the memory of the execrable design. The environs of this city are very pleasant, being adorned with beautiful fountains, gardens, orchards, &c. About two Italian miles from it, at the seat of the Simonetti family, is a building, that would have been a masterpiece of its kind had the architect designed it for an artificial echo. It will return or repeat the report of a pistol above 60 times; and any tingle musical instrument, well touched, will have the same effect as a great number of instruments, and produce a most surprising and delightful concourse.

According to Dr Moore, “there is no place in Italy, perhaps in Europe, where strangers are received in such an easy hospitable manner as at Milan. Formerly the Milanese nobility displayed a degree of splendor and magnificence, not only in their entertainments, but in their usual style of living, unknown in any other country in Europe. They are under a necessity at present of living at less expense, but they still show the same obliging and hospitable disposition. This country having, not very long since, been possessed by the French, from whom it devolved to the Spaniards, and from them to the Germans, the troops of those nations have, at different periods, had their residence here, and, in the course of these vicissitudes, produced a style of manners, and stamped a character on the inhabitants of this duchy, different from what prevails in any other part of Italy; and nice observers imagine they perceive in Milanese manners the politeness, formality, and honesty imputed to those three nations, blended with the ingenuity natural to Italians. The great theatre having been burnt to the ground last year, there are no dramatic entertainments, except at a small temporary play-house, which is little frequented; but the company assemble every evening in their carriages on the ramparts, and drive about, in the same manner as at Naples, till it is pretty late. In Italy, the ladies have no notion of quitting their carriages at the public walks, and using their own legs, as in England and France. On seeing the number of servants, and the splendor of the equipages which appear every evening at the Corso on the ramparts, one would not suspect that degree of depopulation, and diminution of wealth, which we are assured has taken place within these few years all over the Milanese; and which proceeds from the burdensome nature of some late taxes, and the inolent and oppressive manner in which they are gathered.” E. Long. 15. 35. N. Lat. 38. 32.

MILBORN-roxt, a town of Somersetshire in England, seated on a branch of the river Parret, 115 miles from London. Though it is represented in parliament, it is no market-town nor corporation; but it appears in Domesday-book to have had a market once, and 56 burgesses. It is in a manner surrounded by Dorsetshire. Here are nine capital burgesses, who
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Milbrook yearly choose two bailiffs, that have the government of the borough under them, and jointly return the members of parliament with the two stewards, who are chosen yearly out of nine commonalty stewards, and have the custody of the corporation-seal. These two stewards also distribute the profits of the lands given to the poor here, of which the said commonalty stewards are trustees. The inhabitants are about 1,100, the houses not much above 200. There are two fairs, June 6th and October 28th.

Milbrook, a town of Cornwall, on the west side of Plymouth-Haven. It has a good fishing-trade, and has formerly furnished the British fleet with many able hands.

Mildenhall, a town of Suffolk, seven miles from Newmarket, 12 from Bury, and 70 from London. It is a large populous town on the river Lark, a branch of the Ouse, with a harbour for boats. It has a well-frequented market on Friday, especially for fish. "It has been recommended to send two men into the drawing this along the field through the ears, the disorder attacks the milletus. It was founded by a Cretan colony under Miletus, the companion of Bacchus; or (according to others) by Neleus the son of Codrus; or by Sarpedon, Minos's brother, (Ephorus, quoted by Strabo). Milos, the people, (Ovid).

Miletus (anc. geog.), a celebrated town of Asia Minor, on the confines of Ionia and Caria. It was the capital city of all Ionia, and famous both for the arts of war and peace. It was situated about 10 miles south of the mouth of the river Meander, near the sea-coast. It was founded by a Cretan colony under Miletus, the companion of Bacchus; or (according to others) by Neleus the son of Codrus; or by Sarpedon, a son of Jupiter. It has successively been called Leipues, Pityius, and Anadone. The inhabitants, called Milici, were very powerful, and long maintained an obstinate war against the kings of Lydia. They early applied themselves to navigation; and planted no less than 80 colonies, or (according to Seneca) 380, in different parts of the world. It was the only town that made head against Alexander, and was with much difficulty taken. It gave birth to Thales, one of the seven wise men, and the first who applied himself to the study of nature. It was also the country of Anaximander, the scholar and successor of Thales, the inventor of sun-dials and the gnomon, and the first that published a geographical map; of Anaximenes, scholar and successor to the foregoing; and of other great men. It was noted for its excellent wool, according to Virgil; and was also celebrated for a temple and oracle of Apollo Dylmenus. This famous people, from being powerful,
MILFORD, of Sulis-County in the Delaware flate, is situated at the source of a small river, 15 miles from Delaware bay, and 150 southward of Philadelphia. This town, which contains about 100 houses, has been built, except one house, since the revolution. It is laid out with much taste, and is by present it is called by the Turks becoming afterwards opulent and abandoned to pleasures, lost both their riches and their power.—At present it is called by the Turks Melas, and not far distant from it runs the river Meander. St. Paul going from Corinth to Jerusalem passed by Miletus, and as he went by sea, and could not take Ephesus in his way, he caused the bisho.p and priests of the church of Ephesus to come to Miletus (Acts xx. 15, &c.), which was about 12 leagues from them.

MILFOIL, or Yarrow. See Achillea.

MILFORD, a town of Sussex-county in the Delaware flate, is situated at the source of a small river, 15 miles from Delaware bay, and 150 southward of Philadelphia. The inhabitants are Episcopalians, Quakers, and Methodists.

MILFORD-Haven, one of the finest harbours in Europe, and indispensably the best in Britain, is situated in Pembroke-shire in South-Wales, and lies on the north side of the Bristol Channel. It is very large,large, and deep; there is no danger of going in or out with the tide, or almost with any wind. If a ship comes in without a cable or anchor, she may run ashore on the ooze, and there lie safe till she is rehitched; and in an hour's time she may get out of the harbour into the open sea. It lies extremely convenient for ships bound from the English or Bristol Channels to Ireland, or farther west, and from thence to the Channel. It is said, that 1000 fall of any ship may ride secure in this haven. It has 16 deep and safe creeks, five bays, and 13 roads, all distinguished by their several names. The spring tide rises 36 feet; so that ships may at any time be laid ashore. Dale harbour is a ready outlet for small vessels, where they may ride in two or three fathoms at low-water.—In the reign of Queen Elizabeth, before the Spanish invasion, two forts were begun at the entrance of Milford-Haven; one on each side, called Nangle and Dale blockhouses; but they were not then finished.—The Stuck-rock rises here above water, lying near the middle of the entrance between Nangle and Dale. Penrithmouth is the opening of that branch of the haven on which the town of Pembroke is seated, and where the custom-house of Milford is kept. The breadth of the entrance between rock and rock is but 200 yards at high-water, and 112 at low-water. There is a ridge of rocky ground that has the name of Carrs, which runs almost across Milford-Haven, from Peter church towards Llanladwell, where it renders the landing place difficult to strangers, from its not appearing at low-water. The great convenience of this harbour is, that in an hour's time a ship may be in or out of it, and in the way between the land's end and Ireland. As it lies near the mouth of the Severn, a ship in eight or ten hours may be over on the coast of Ireland, or off the Land's-End in the English Channel; and a vessel may get out hence to the west much sooner than from either Plymouth or Falmouth. This harbour has been greatly improved by new works, at the expense of the government. The parliament, on April 14, 1759, granted 10,000l. for fortifying the harbour of Milford, all of which was expended on the fort at Neyland, which, however, still remains unshaken.

MILIARY, in general, something resembling millet-feed.

MILITARY-FARM. See MEDICINE, n° 229.

MILITANT, or CHURCH-MILITANT, denotes the body of Christians while here on earth.

MILITARY, something belonging to the soldiery or militia.

MILITARY-Discipline, the training of soldiers, and the due enforcement of the laws and regulations instituted by authority for their conduct.

Next to the forming of troops, military discipline is the first object that presents itself to our notice: it is the soul of all armies; and unless it is established amongst them with great prudence, and supported with unshaken resolution, they are no better than so many contemptible heaps of rabble, which are more dangerous to the very state that maintains them than even its declared enemies.

MILITARY-Execution, the ravaging or destroying of a country or town that refuses to pay the contribution inflicted upon them.

MILITARY-Exercife. See EXERCISE and WORDS of Command.

MILITARY-State, in British polity, one of the three divisions of the laity. See LEIT.

This state includes the whole of the soldiery, or such persons as are peculiarly appointed among the rest of the people for the safeguard and defence of the realm.

In a land of liberty, it is extremely dangerous to make a distinct order of the profession of arms. In absolute monarchies, this is necessary for the safety of the prince; and arises from the main principle of their constitution, which is that of governing by fear: but, in free states, the profession of a soldier taken singly and merely as a profession, is justly an object of jealousy. In these no man should take up arms but with a view to defend his country and its laws: he puts not off the citizen when he enters the camp; but it is because he is a citizen, and would with to continue so, that he makes himself for a while a soldier. The laws, therefore, and constitution of these kingdoms, know no such state as that of a perpetual standing soldier, bred up to no other profession than that of war; and it was not till the reign of Henry VII. that the kings of England had so much a guard about their persons.

In the time of the Anglo-Saxons, as appears from Edward the Conqueror's laws, the military force of England was in the hands of the dukes or earls, who were constituted through every province and county in the kingdom; being taken out of the principal nobility, and such as were most remarkable for being sapientes, fidels, et animos. Their duty was to lead and regulate the English armies, with a very unlimited power; prout eis vidum fuerit, ad honorem corone et militem regni. And because of this great power they were elected by the people in their full assembly, or folk-mote, in the same manner as sheriffs were elected: following still that old fundamental maxim of the Saxon constitution, that where any officer was entrusted with such power, as if abused, might tend...
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to the oppression of the people, that power was delegated to him by the vote of the people themselves. So too, among the ancient Germans, the ancestors of our Saxon forefathers, they had their dukes, as well as kings, with an independent power over the military, as the kings had over the civil state. The dukes were elective, the kings hereditary: for so only can be sufficiently understood that passage of Tacitus, Reges ex nobilitate, duces ex virtute fumunt. In constituting their kings, the family or blood-royal was regarded: in choosing their dukes or leaders, warlike merit: just as Cæsar relates of their ancestors in his time, that whenever they went to war, by way either of attack or defence, they elected leaders to command them. This large share of power, thus conferred by the people, though intended to preserve the liberty of the subject, was perhaps unreasonably detrimental to the prerogative of the crown: and accordingly we find a very ill use made of it by Edric duke of Mercia, in the reign of king Edmond Ironside; who, by his office of duke or herethoch, was intituled to a large command in the king’s army, and by his repeated treacheries at last transferred the crown to Canute the Dane.

It seems universally agreed by all historians, that king Alfred first settled a national militia in this kingdom, and by his prudent discipline made all the subjects of his dominions soldiers: but we are unfortunately left in the dark as to the particulars of this his celebrated regulation; though, from what was last observed, the dukes seem to have been left in possession of too large and independent a power: which enabled duke Harold, on the death of Edward the Confessor, though a stranger to the royal blood, to mount for a short space the throne of this kingdom, in prejudice of Edgar Etheling the rightful heir.

Upon the Norman conquest, the feudal law was introduced here in all its rigour, the whole of which is built on a military plan. In consequence thereof, all the lands in the kingdom were divided into what were called knight’s fees, in number above 60,000; and for every knight’s fee a knight or follower, miles, was bound to attend the king in his wars, for 40 days in a year; in which space of time, before war was reduced to a science, the campaign was generally finished, and the king either conquered or victorious. By this means the king had, without any expense, an army of 60,000 men always ready at his command. And accordingly we find one, among the laws of William the conqueror, which in the king’s name commands and firmly enjoins the personal attendance of all knights and others; qual habebant et teneant se semper in armis et equis, ut decet et opportet: et quod jiperum fuit promptum et forati ad servitium fuum integrum nobis eisdem mandubi, cum opus adfererit, facendum quod dentent de foedibus et to-nementis suis de jure nobis facere. This personal service in process of time degenerated into pecuniary commutations or aids; and at last the military part of the feudal system was abolished at the Restoration, by statute 12 Car. II. c. 24. See Feodat-Sytem.

In the meantime, we are not to imagine that the kingdom was left wholly without defence in case of domestic insurrections, or the prospect of foreign invasions. Besides those who by their military tenures, were bound to perform 40 days service in the field, first the office of arms, enacted 27 Hen. II. and afterwards the statute of Winchester, under Edward I. obliged every man, according to his estate and degree, to provide a determinate quantity of such arms as were then in use, in order to keep the peace; and confibles were appointed in all hundreds by the latter statute, to see that such arms were provided. These weapons were changed, by the statute 4 & 5 Ph. & M. c. 2. into others of more modern service; but both this and the former provisions were repealed in the reign of James I. While these continued in force, it was usual from time to time for our princes to issue commissions of array, and send into every county officers in whom they could confide, to muster and array (or in military order) the inhabitants of every district; and the form of the commission of array was settled in parliament in the 5 Hen. IV. But at the same time it was provided, that no man should be compelled to go out of the kingdom at any rate, nor out of his shire, but in cases of urgent necessity; nor should provide soldiers unless by consent of parliament. About the reign of king Henry VIII. and his children, lord-lieutenants began to be introduced, as flanding representatives of the crown, to keep the counties in military order; for we find them mentioned as known officers in the statute 4 & 5 Ph. & M. c. 3, though they had not been then long in use; for Camden speaks of them in the time of Queen Elizabeth as extraordinary magistrates, constituted only in times of difficulty and danger.

In this statute things continued till the repeal of the statutes of armour in the reign of king James 1.; after which, when king Charles I. had, during his northern expeditions, lifted commissions of lieutenancy, and exerted some military powers which, having been long exercised, were thought to belong to the crown, it became a question in the long-parliament, how far the power of the militia did inherently reside in the king; being now unsupported by any statute, and founded only upon immemorial usage. This question, long agitated with great heat and resentment on both sides, became at length the immediate cause of the fatal rupture between the king and his parliament: the two houses not only denying this prerogative of the crown, the legality of which claim perhaps might be some what doubtful; but also feizing into their hands the entire power of the militia, the illegality of which step could never be any doubt at all.

Soon after the restoration of king Charles II. when the military tenures were abolished, it was thought proper to ascertain the powers of the militia, to recognize the sole right of the crown to govern and command them, and to put the whole into a more regular method of military subordination: and the order in which the militia now stands by law, is principally built upon the statutes which were then enacted. It is true, the two last of them are apparently repealed; but many of their provisions are re-enacted, with the addition of some new regulations, by the present militia-laws; the general scheme of which is to discipline a certain number of the inhabitants of every county, chosen by lot for three years, and officered by the lord-lieutenant, the deputy lieutenants, and other principal landholders, under a commission from the crown. They are not compellable to march out of their counties, unless
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forces should be kept on foot in Ireland, though paid at the charge of that kingdom: which permission is extended by flat. 8. Geo. III. c. 13. to 16,235 men in time of peace.

To prevent the executive power from being able to oppress, says baron Montesquieu, it is requisite that the armies with which it is intrusted should confit of the people, and have the same spirit with the people; as was the case at Rome, till Marius new-modelled the legions by enlisting the rabble of Italy, and laid the foundation of all the military tyranny that ensued.

Nothing then, according to these principles, ought to be more guarded against in a free state, than making the military power, when such a one is necessary to be kept on foot, a body too distinct from the people. Like this, therefore, it should wholly be composed of natural subjects; it ought only to be enlisted for a short and limited time; the soldiers also should live intermixed with the people; no separate camp, no barracks, no inland fortresses, should be allowed. And it perhaps might be still better, if, by enlisting a flated number, and enlisting others at every renewal of their term, a circulation could be kept up between the army and the people, and the citizen and the soldier be more intimately connected together.

To keep this body of troops in order, an annual act of parliament likewise passed, "to punish mutiny and desertion, and for the better payment of the army and their quarters." This regulates the manner in which they are to be differeed among the several inn-keepers and victuallers throughout the kingdom; and establishes a law-martial for their government. By this, among other things, it is enacted, that if any officer or soldier shall excite, or join any mutiny, or, knowing of it, shall not give notice to the commanding officer, or shall desert, or lie in any other regiment, or leap upon his post, or leave it before he is relieved, or hold correspondence with a rebel or enemy, or strike or use violence to his superior officer, or shall disobey his lawful commands; such officer shall suffer such punishment as a court-martial shall inflict, though it extend to death itself.

However expedient the most strict regulations may be in time of actual war, yet in times of profound peace, a little relaxation of military rigour would not, one should hope, be productive of much inconvenience. And, upon this principle, though by the standing laws (still remaining in force, though not attended to) desertion in time of war is made felony without benefit of clergy, and the offence is triable by a jury, and before the judges of the common law; yet, by the militia laws beforementioned, a much lighter punishment is inflicted for desertion in time of peace. So, by the Roman law also, desertion in time of war was punished with death, but more mildly in time of tranquility. But the mutiny-act makes no such distinction: for any of the faults abovementioned are, equally at all times, punishable with death itself, if a court-martial shall think proper. This discretionary power of the court-martial is indeed to be guided by the direction of the crown; which, with regard to military offences, has almost an absolute legislative power. "His Majesty (says the act) may form articles of war, and constitute courts-martial, with power to try any crime by such articles, and inflict such penalties as the articles direct."
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Military. direct.” A vast and most important truth! an unlimited power to create crimes, and annex to them any punishments not extending to life or limb! These are indeed forbidden to be inflicted, except for crimes declared to be so punishable by this act; which crimes we have just enumerated, and among which, we may observe, that any disobedience to lawful commands is one. Perhaps in some future revision of this act, which is in many respects hastily penned, it may be thought worthy the wisdom of parliament to ascertain the limits of military subjection, and to enact express articles of war for the government of the army, as is done for the government of the navy; especially as, by the present constitution, the nobility and gentry of the kingdom, who serve their country as militia officers, are annually subjected to the same arbitrary rule during their time of exercise.

One of the greatest advantages of the law is, that not only the crimes themselves which it punishes, but also the penalties which it inflicts, are ascertained and notorious: nothing is left to arbitrary discretion; the king by his judges infenches what the law has previously ordained, but is not himself the legislator. How much, therefore, is it to be regretted, that a set of men, whose bravery has so often preferred the liberties of their country, should be reduced to a state of servitude in the midst of a nation of freemen; for Sir Edward Coke will inform us, that it is one of the genuine marks of servitude, to have the law, which is our rule of action, either concealed or precarious; ubi jus, ubi remedium. Nor is this state of servitude quite conformable with the maxims of sound policy observed by other free nations. For the greater the general liberty is which any state enjoys, the more cautious has it usually been in introducing slavery in any particular order or profession. These men, as baron Montesquieu observes, seeing the liberty which others possess, and which they themselves are excluded from, are apt (like enuchs in the eastern seraglions) to live in a state of perpetual envy and hatred towards the rest of the community, and indulge a malignant pleasure in contributing to destroy those privileges to which they can never be admitted. Hence have many free states, by departing from this rule, been endangered by the revolt of their slaves; while, in absolute and despotic governments, where no real liberty exists, and consequently no invidious comparisons can be formed, such incidents are extremely rare.

Two precautions are therefore advised to be observed in all prudent and free governments: 1. To prevent the introduction of slavery at all; or, 2. If it be already introduced, not to intrust those slaves with arms, who will then find themselves an overmatch for the freemen. Much less ought the soldiery to be an exception to the people in general, and the only state of servitude in the nation.

But as soldiery, by this annual a5, are thus put in a worse condition than any other subjects; so, by the humanity of the founding laws, they are in some cases put in a much better. By statute 43 Eliz. c. 3, a weekly allowance is to be raised in every county for the relief of soldiery that are sick, hurt, and maimed: not forgetting the royal hospital of Chelsea for such as are worn out in their duty. Officers and soldiery, that have been in the king’s service, are by several statutes, enabled at the close of several wars, at liberty to use any trade or occupation they are fit for, in any town in the kingdom (except the two universities), notwithstanding any statute, custom, or charter to the contrary. And soldiery in actual military service may make uncaptive wills, and dispose of their goods, wages, and other personal chattels, without these forms, solemnities, and expenses, which the law requires in other cases. Our law does not indeed extend this privilege so far as the civil law; which carried it to an extreme that borders upon the ridiculous; for if a soldier, in the article of death, wrote any thing in bloody letters on his shield, or in the dust of the field with his sword, it was a very good military testament.

Military Court. See Chivalry (Court of).


Military Ways (see military), are the large Roman roads which Agrippa procured to be made through the empire, in the time of Augustus, for the more convenient marching of troops and conveyance of carriages. N. Bergier has written the history of the origin, progress, and amazing extent, of these military roads, which were paved from the gates of Rome to the extreme parts of the empire. See Way.

Militia, in general, denotes the body of soldiery, or those who make profession of arms.

In a more refined sense, militia denotes the trained bands of a town or country, who arm themselves, upon a short warning, for their own defence. So that, in this sense, militia is opposed to regular or flated troops. See Military State, and Feudal System.

Miliun, millet, in botany; a genus of the diagnosta order, belonging to the triandria clafs of plants; and in the natural method ranking under the 4th order, Gramina. The calyx is bivalved, and uniflorous; the corolla is very short: the stigmata pencil like.—There are five species; of which the most remarkable is the panicum, or common millet. This is a native of India, but is now commonly cultivated in many parts of Europe as an eculent grain. It rises, with a reed-like stalk, three or four feet high, and channelled: at every joint there is one reed-like leaf, which is joined on the top of the sheath, and embraces and covers that joint of the stalk below the leaf; this sheath is closely covered with soft hairs, but the leaf which is expanded has none. The top of the stalk is terminated by a large loose panicel, which hangs on one side, having a chaffy flower, which is succeeded by a small round feed. There are two varieties; one with white, and the other with black seeds; but they do not differ in any other particular. This plant is greatly cultivated in the oriental countries, and from whence we are annually furnished with it. It is seldom cultivated in Britain but in small gardens, for feeding of poultry, where the seeds generally ripen very well. It is used as an ingredient in puddings, and is by some people greatly esteemed. The seeds must be sown in the beginning of April, upon a warm dry soil, but not too thick because the plants divide into several branches, and should have much room. When they come up they should be cleaned from weeds; after which they
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Milk. will in a short time get the better of them, and prevent the future growth. In August the seeds will ripen, when the plant must be cut down, and the seeds beaten out, as is practised for other grain; but if it is not protected from birds, they will devour it as soon as it begins to ripen.

MILK, a well-known fluid, prepared by nature in the breasts of women, and the udders of other animals, for the nourishment of their young.—According to Dr Cullen, milk is a connecting and intermediate substance between animals and vegetables. It seems immediately to be secreted from the chyle, both being a white liquor of the same fluid. Such a fluid nature has perfectly assimilatory food, as the albumen of the oviparous, and in the viviparous animals, and somewhat of the same kind, as it was necessary the vessels should be filled with such a fluid as would make way for an after-assimilation. When the infant has attained a considerable degree of firmness, as when it is separated from the mother, yet such a degree of weakness still remains as makes somewhat of the same indication necessary, it believes the infant to have an alkalescent food ready prepared, and at the same time its noxious tendency to be avoided. Milk then is given, which is alkalescent, and at the same time, has a sufficient quantity of acidity to correct that alkalescence. As the body advances in growth, and the alkalescent tendency is greater, the animal, to obviate that tendency, is led to take vegetable food, as more suited to its strength of assimilation.

Dr Cullen observes, that milk is almost suited to all temperaments; and it is even so to stomachs disposed to acidity, more than those substances which have undergone the vinous fermentation; nay, it even cures the heart-burn, checks vinous fermentation, and precipitates the lees, when, by renewal of fermentation, the wine happens to be fouled. It, therefore very properly accompanies a great deal of vegetable aliment; although sometimes its acidity is troublesome, either from a large proportion taken in, or from the degree of it; for, according to certain unaccountable circumstances, different acids are formed in the stomach in different states of the body; in a healthy body, e.g. a mild one; in the hypochondriac diseased, one sometimes as corrosive as the foallic acid. When the acidity of milk is carried to a great degree, it may prove remarkably refrigerant, and occasion cold crudities, and the recurrence of intermittent fevers. To take the common notion of its passing unchanged into the blood, it can suffer no solution. But if we admit its coagulum in the stomach, then it may be reckoned among soluble or insoluble foods, according as that coagulum is more or less tenacious. Formerly rennet, which is employed to coagulate milk, was thought an acid; but, from late observations, it appears, that, if it be an acid it is very different from other acids, and that its coagulum is stronger than that produced by acids. It has been imagined, than a rennet is to be found in the stomachs of all animals, which causes coagulation of milk; but to Dr Cullen the coagulation of milk seems to be owing to a weak acid in the stomach, the relics of our vegetable food, inducing, in healthy persons, a weak and soluble coagulum: but in different stomachs this may be very different, in those becoming heavy and less soluble food, and sometimes even evaporated in a coagulated undisolved state both by stomach and food.

As milk is acidulent, it may be rendered sometimes purgative by mixing with the bile; and some examples...
Milk. of this I have been remarked. More commonly, however, it is reckoned among those foods which occasion colicivenes.

Hoffman, in his experiments on milk, found that all kinds of it contained much water; and when this was diluted, found the residue very different in their solubility. But we must not thence conclude, that the same insolubility takes place in the stomach; for extracts made from vegetables with water are often very insoluble substances, and hardly diffusible through water itself: therefore, in Hoffman's extracts, if we may so call them, of milk, somewhat of the same kind might have appeared; and these substances, which in their natural state were not so, might appear very insoluble. However, we may allow that milk is always somehow insoluble in the intestines, as it is of a drying nature, and as chest, &c. is very colitive. And this effect shows that milk is always coagulated in the stomach: for if it remained fluid, no cases would be produced, whereas sometimes very hard ones are observed. In the blood-vessels, from its animal nature, it may be considered as nutritious; but when we consider its vegetable contents, and acceitancy in the prime size, we find that, like animal-food, it does not excite that degree of fever in the time of digestion, and that from its acceitancy it will resist putrefaction. Hence its use in hectic fevers, which, whatever be their cause, appear only to be exacerbations of natural febrile paroxysms, which occur twice every day, commonly after meals, and at night. To obviate these, therefore, we give such an aliment as produces the least exacerbation of these fevers: and of this nature is milk, on account of its acecent vegetable nature.

There appears all somewhat peculiar to milk, which requires only a small exertion of the animal-powers in order to its assimilation; and besides, in hemic complaints there is wanted an oily, bland food, approaching to the animal-nature; so that on all these accounts milk is a diet peculiarly adopted to them, and, in general, to most convalescents, and to those of inflammatory temperaments. So far of milk in general. We shall now speak of the particular kinds which are in common use.

The milk of women, mares, and asses, agree very much in their qualities, being very dilute, having little solid contents, and, when evaporated to dryness, having these very soluble, containing much saccharine matter, of a very ready acceitancy, and, when coagulated, their coagulum being tender and easily broke down. From this view they have left oil, and seem to have left coagulable matter than the rest.

The milk of cows, sheep, and goats, agree in opposite qualities to the three just mentioned; but here there is somewhat more of gradation. Cows' milk comes nearest to the former kind: goats' milk is less fluid, left sweot, less flatulent, has the largest proportion of insoluble part after coagulation, and indeed the largest proportion of coagulable part; its oily and coagulable parts are not spontaneously separable, never throwing out a cream, or allowing butter to be readily extracted from it. Hence the virtues of these milks are obvious, being more nourishing, though at the same time left easily soluble in weak stomachs, than the three first, lefts acceitant than these, and so more rarely laxative, and peculiarly fitted for the diet of convalescents without fever. The three first again are left nourishing, more soluble, more laxative, as more acceitant, and adapted to the convalescents with fever.

These qualities, in particular milks, are considerably diversified by different circumstances. First, different animals, living on the same diet, give a considerably different milk; for there seems to be something in the constitution, abstracting from the aliment, which constitutes a considerable diversity of milk, not only in the same species of animals, but also in the same animal, at different ages, and at different distances after delivery: this applies to the choice of nurses. Secondly, Milk follows the nature of the aliment more than any other juice in the human body, being more or less fluid and dilute, more or less solid and nourishing, in proportion as these qualities are more or less in the aliment. The nature of the aliment differs according to its time of growth, e.g. old griefs being always found more nourishing than young. Aliment, too, is always varied according to the season, as that is warm or dry, moist or cloudy.

The milk of each particular kind of animal is fitter for particular purposes, when fed on proper food—Thus the cow delights in the succulent herbage of the vale: if the sheep be fed there he certainly rots, but on the higher and more dry side of the mountain he feeds pleasantly and healthily; while the goat never stops near the bottom, but ascends to the craggly summit: and certainly the milks of these animals are always best on their proper soil, and that of goats is best on a mountainous country. From a dissertation of Linnaeus, we have many observations concerning the variety of plants on which each animal chooses to feed. All the Swedish plants which could be collected together, were preferred alternately to domestic animals, and then it appeared that the goat lived on the greatest variety, and even on many which were poisonous to the rest; that the cow chose the first succulent shoots of the plant, and neglected the frutification; which last was preferred by the goat. Hence may be deduced rules, concerning the sustenance of different animals; e.g. Farmers find, that in a pasture which was only fit to feed a certain number of sheep, an equal number of goats may be introduced, while the sheep are no less nourished than before.

It is not easy to assign the difference between milk fresh-drawn and that contained in the open air for some time: but certainly there is some material one, otherwise nature universally would not have directed infants to sucking; and indeed it seems, better than the other, fitted for digestion and nourishment. Physicians have supposed that this depended on the evaporation of some of the milk, which, just after, returns, but our author cannot conceive any such, except common water here; and besides, the volatile parts can hardly be nutritious. A more plausible account seems deducible from mixture: milk newly-drawn has been but lately mixed, and is exposed to spontaneous separation, a circumstance hurtful to digestion, none of the parts being, by themselves, so easily assimilated as when they are all taken together. Hence, then, milk new drawn is more intimately blended, and therefore then is more proper to the weakly and infants.

Another difference in the use of milk exposed for some time to the air, is taking it boiled or unboiled. Physicians...
Physicians have generally recommended the former; but the reason is not easily assigned. Perhaps it is this: Milk kept for some time exposed to the air has gone so far to a spontaneous separation; whereas the heat thoroughly blends the whole, and hence its resolution is not so easy in the stomach; and thus boiled milk is more agreeable than raw, and gives more ease.

Again, when milk is boiled, a considerable quantity of air is detached, as appears from the froth on the surface; and air is the chief instrument of fermentation in bodies; so that after this process it is not liable to aecency: for these reasons it is proper for the robust and vigorous.

Another difference of milk is, according as it is fluid or coagulated. The coagulated is of two kinds, as induced by rennet, or the natural aecency of the milk. The former preparation makes the firmer and less easily soluble coagulum; though, when taken with the whey unseparated, it is less difficult of solution, though more so than any other coagulum in the same cafe. Many nations use the latter form, which is easier soluble, but very much aecent, and therefore, in point of solution, should be confined to the vigorous, in point of aecency, to those who live on alkali salts food; and in the last cafe, the Laplanders use it as their chief aecent condiment. From the same considerations it is more cooling, and in its other effects like all other aecent vegetables.

Milk by evaporation yields a sweet saline matter, of which Dr Lewis gives the following proportions:

<table>
<thead>
<tr>
<th>Twelve ounces of</th>
<th>Left of dry matter</th>
<th>From which water extracted a sweet saline substance amounting to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows milk</td>
<td>13 drams.</td>
<td>1½ drams.</td>
</tr>
<tr>
<td>Goats milk</td>
<td>12½</td>
<td>1½</td>
</tr>
<tr>
<td>Human milk</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Aifes milk</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

The saline substance extracted from aifes milk was white, and sweet as sugar; those of the others brown or yellow, and considerably less sweet; that from cows milk had the least sweetness of any.

On distilling 12 quarts of milk in balneo maris, at least nine quarts of pure phlegm were obtained: the liquor which afterwards arose was acridulous, and by degrees grew sensibly more and more acid as the distillation was continued. After this came over a little spirit, and at last an empyreumatic oil. The remaining solid matter adhered to the bottom of the retort, in the form of elegant shining black flowers, which being calcined and elixated yielded a portion of fixed alkaline salt.

Milk, set in a warm place, throws up to the surface an unctuous cream, from which, by agitation, the butter is easily separated. The addition of alkaline salts prevents this separation, not (as some have supposed) by absorbing an acid from the milk, but by virtue of their property of intimately uniting oily bodies with watery liquors. Sugar, another grand intermediate between oils and water, has this effect in a greater degree, though that concrete is by no means alkaline, or an absorbent of acids.

The sweet saccharine part of the milk remains dissolved in the whey after the separation of the curd or cheesy matter, and may be collected from it in a white crystalline form, by boiling the whey till all remains of the curdled substance have fallen to the bottom; then filtering, evaporating it to a due consistence, festing it to shoot, and purifying the crystals by solution in water and a second crystallization. Much has been said of the medicinal virtues of this sugar of milk, but it does not seem to have any considerable ones: it is from cows milk that it has been generally prepared; and the crystals obtained from this kind of milk have but little sweetness.

When milk is suffered to coagulate spontaneously, the whey proveth acid, and on standing grows more and more so until the putrefactive state commences. Sour whey is used as an acid, preferably to the directly vegetable or the mineral acids, in some of the chemical arts; as for dissolving iron in order to the bluing of linen and leather. This acid was commonly made use of in the bleaching of linen, for dissolving and extracting the earthy particles left in the cloth by the alkaline salts and lime employed for cleaning and whitening it. Butter-milk is preferred to plain four-milk or four whey: this last is supposed to give the cloth a yellow colour. Dr Home, in his ingenious treatise on this subject, recommends water acidulated with spirit of vitriol (in the proportion of about half an ounce, or at most three quarters of an ounce, to a gallon), as preferable in many respects to the acid of milk, or of the more directly vegetable substances. He observes, that the latter are often difficultly procurable, abound with oleaginous particles, and hsten to corruption; whilst the vitriolic acid is cheap, and pure, and indispensible for putrefying: That milk takes five days to perform its office, whilst the vitriolic acid does it in as many hours, perhaps in as many minutes: That this acid contributes also to whiten the cloth, and does not make it weaker though the cloth be kept in it for months. He finds, that acids as well as alkalis, extract an oily matter from the cloth, and lose their acidity and alkaliity. Since this treatise appeared, the use of four-milk is very generally superseded by oil of vitriol.

It is observable, that aifes milk is greatly disposed, on standing for a little time, to become thick and ropy. In the Breulau collection for the year 1720, there is a remarkable account of milk (which probably was that of the aifes) grown so thick and tenacious as to be drawn out into long strings, which, when dried, were quite brittle.

New cows milk, suffered to stand for some days on the leaves of butterwort or sun-devil, becomes uniformly thick, slippery, and coherent, and of an agreeable sweet taste, without any separation of its parts. Fresh milk, added to this, is thickened in the same manner, and this successively. In some parts of Sweden, as we are informed in the Swedish Memoirs, milk is thus prepared for food.

New milk has a degree of glutinous quality, so as to be used for joining broken stone ware. There is a far greater tenacity in cheese properly prepared.

Milk, when examined by a microscope, appears composed of numerous globules swimming in a transparent fluid. It boils in nearly the same degree of heat with common water; some forts rather sooner, and some a little later: after boiling, it is less diff
Milk.

posed to grow four than in its natural state. It is coagulated by acids both mineral and vegetable, and by alkalies both fixed and volatile. The coagulum made by acids falls to the bottom of the serum; that made by alkalies swins on the surface, commonly forming (especially with volatile alkalies) a thick corkaceous skin. The serum, with alkalies, proves green or dirty; with acids, it differs little in appearance from the whey that separates spontaneously. The coagulum formed by acids is dissolved by alkalies, and that formed by alkalies is redissolved by acids; but the milk does not in either case resume its original properties. It is coagulated by most of the middle salts, whose basis is an earth or a metallic body; as solution of alum, fixed salt ammonia, sugar of lead, green and blue vitriol; but not by the chalybeate or purging mineral waters, nor by the bitter salt extracted from the purging waters. Among the neutral salts that have been tried, there is not one that produces any coagulation. They all dilute the milk, and make it less disposed to coagulate with acids or alkalies: Nitre seems to have this effect in a greater degree than the other neutral salts. It is instantly coagulated by highly-rectified spirit of wine, but scarcely by a phlegmatic spirit. It does not mingle with expressed oils. All the coagula are dissolved by gall.

It has generally been supposed by medical authors, that the milk of animals is of the same nature with mineral waters, nor by the bitter salt vomited by infants of a few days old are yellow, of the cream thrown by the stomach, or labours under any disease. We may presume, that the cream of woman's milk, by its inferior specific gravity, will swim on the surface of the contents of the stomach; and being of an oily nature, that it will be of more difficult digestion than any other constituent part of milk. When an infant then frets very plentifully, fo as to over-dilute the stomach, or labours under any weakness in the powers of digestion, it cannot appear unreasonable to suppose, that the cream shall be first rejected by vomiting. Analogous to this, we know that adults affected with dysepsia often bring up greasy fluids from the stomach by eructation, and this especially after eating fat meat. We have, in some instances, known this to blaze when thrown into the fire like spirit of wine or oil.” Our author derives a confirmation of his opinion from the following observation, viz. that curds vomited by infants of a few days old are yellow, while they become white in a fortnight or three weeks. This he accounts for from the yellow colour of the cream thrown up by the milk of women during the first four or five days after delivery.

Mr Clarke likewise controverts that common opinion of the human milk being so prone to acidity; that a great number of the diseasfs of children are to be accounted for from that principle. “Whoever (says he) takes the trouble of attentively comparing human milk with that of ruminant animals, will soon find it to be much less prone to run into the acid or acid procfs. I have very often exposed equal quantities of human and cows milk in degrees of temperature, varying from the common summer heat, or 65° to 100°; and
and I haveconfantly found that cows' milk acquires a greater degree of acidity in 36 hours than the human milk did in many days: cows' milk becomes offensively putrid in four or five days; a change which healthy human milk, exposed in the same manner, will not undergo in many weeks, nay sometimes in many months. I once kept a few ounces of a nurse's milk, delivered about six or seven days, for more than two years in a bottle moderately corked. It stood on the chimney-piece, and was frequently opened to be examined. At the end of this period it showed evident marks of moderate acidity, whether examined by the taste, smell, or paper stained by vegetable blues or purples; the latter it changed to a florid red colour, whereas cows' milk kept a few days changed the colour of the same paper to a green, thereby clearly showing its putrefient tendency.

Our author next goes on to consider of the probability there is of milk becoming so frequently and strongly acid as to occasion most of the diseasés of infants. He begins with an attempt to show, that the phenomena commonly looked upon to be indications of acidity are by no means certain. Curdled milk has already been shown to be no sign of acidity; and the other appearance, which has commonly been thought to be fo certain, viz. green faces, is, in the opinion of Mr Clarke, equally fallacious. In support of this he quotes a letter from Dr Sydenham to Dr Cole; in which he says that the green matter vomited by hysterical women is not any proof of acid humors being the cause of that disease, for sea-fleec people do the same. The opinion of green faces being an effect of acidity, proceeds on the supposition that a mixture of bile with an acid produces a green colour; but it is found, that the vegetable acid, which only can exist in the human body, is unable to produce this change of colour, though it can be effected by the strong mineral acids. As nothing equivalent to any of these acids can be supposèd to exist in the bowels of infants, we must therefore take some other method of accounting for the green faces frequently evacuated by them. "Why should four milk, granting its existence, give rise to them in infants and not in adults? Have butter milk, summer-fruits of the most acceefcent kind, leemon or orange juice, always this effect in adults by their admixture with bile? This is a question which, I believe, cannot be anwsered in the affirmative."

On the whole, Dr Clarke considers the disease of acidity in the bowels, though so frequently mentioned, to be by no means common. He owns, indeed, that it may sometimes occur in infancy as well as in adults, from weakness of the stomach, colic, or improper food; and an indubitable evidence is affordèd by faces which stain the blue or purple colour of vegetables to a red, though nothing can be inferred with certainty from the colour or smell.

The Doctor next proceeds to state several reasons for his opinion, that the greater number of infantile diseases are not owing to acidity: 1. Woman's milk in an healthy state contains little or no coagulable matter or curd. 2. It shows a less tendency out of the body to become accefeent than many other kinds of milk. 3. The appearances which have been generally supposèd to characterize its acidity do not afford satisfactory evidence of such a morbid cause. 4. Granting this to be the case, we have plenty of mild absorbents, capable of destroying all the acid which can be supposèd to be generated in the bowels of an infant; yet many children are observed to die in consequence of these diseasés supposèd to arise from acidity. 5. The milk of all ruminant animals is of a much more accefeent nature than that of the human species, yet the young of these animals never suffer anything like the disèasés attributed to acidity in infants. 6. History informs us, that whole nations live four curdled milk as a considerable part of their food without feeling any inconvenience; which, however, must have been the case, if acidity in the stomach was productive of such deleterious effects as has been supposèd.

The reasoning of Dr Clarke seems here to be very plausible, and nothing has as yet been offered to contradict it. The reviewers in taking notice of the treatise only observe, that the Doctor's posìtions are supported by great probability; yet "they have seen them, or think they have seen them, contradicted by the appearance of diseases and the effects of medicines" so that they must leave the subject to farther examination.

In a memoir by Miss Parmentier and Deyeux, members of the royal college of pharmacy, &c. in Paris, we have a great number of experiments on the milk of asses, cows, goats, sheep, and mares, as well as women. The experiments on cows milk were made with a view to determine whether any change was made in the milk by the different kinds of food eaten by the animal. For this purpose some were fed with the leaves of "mais" or Turkey wheat; some with cabbage; others with small potatoes; and others with common grasses. The milk of those fed with the "mais" or Turkey wheat was extremely sweet; that from the potatoes and common grasses much more acrimonious and in¬fipid; and that from the cabbages the most disagreeable of all. By distillation only eight ounces of a colourless fluid were obtained from as many pounds of each of these milks; which from those who fed upon grass had an aromatic flavour; a disagreeable one from cabbage; and none at all from the potatoes and Turkey wheat. This liquid became fetid in the space of a month whatever the animal had been fed with, acquiring at the same time a viscidity and becoming turbid; that from cabbage generally, but not always, becoming first putrid. All of them separated a filamentous matter, and became clear on being exposed to the heat of 25° of Reaumur's thermometer. In the residua of the distillations no difference whatever could be perceived. As the only difference therefore existing in cow's milk lies in the volatile part, our authors conclude, that it is improper to boil milk either for common or medicinal purposes. They observed also, that any sudden change of food, even from a worse to a better kind, was attended by a very remarkable diminution in the quantity of milk. All the residuums of the distillations yielded, in a strong fire, a yellow oil, an acid, a thick and black empyreumatic oil, a volatile alkali, and towards the end a quantity of inflammable air, and at last a coal remained containing some fixed alkali with muriatic acid.

On agitating, in long bottles, the creams from the milk of cows fed with different substances, all of them
were formed into a kind of half-made butter; of which that formed from the milk from mais was white, firm, and infpid; that from potatoes was softer and more pinguedinous; but that from common grafs was the best of all. Cabbage, as in other cafes, gave a strong taint.

In the course of their experiments, it was endeavoured to determine whether butter is actually contained in the cream, or whether it be a chemical production of the operation of churning. They could not find any reafon absolutely satisfactory on either side, but incline to the latter opinion; because when cream is allowed to remain among the milk, and the whole curdled promiscuously, only fat cheef, without any butter, is produced. The oily parts cannot be separated into butter either by acids or any other means than churning: even the artificial mixture of oil with the cream is insufficient for the purpose.

The ferum of milk was reduced by filtration to a clear and pellucid liquor; and, by mixture with fixed acid, was confirmed by experiments made upon the milk of 20 nurfees. Its coagulability was not increafed by heat. The cream, by agitation, formed a vilcid unctuous matter, but could not be changed into perfect butter: but they found that it was extremely difficult to determine the proportions of the various component parts in human milk, as it differs remarkably, not only in different subjéfts, but in the fame subjéct at different times. In a nurfe aged about 32 years, who was extremely subjéct to nervous affections, the milk was one day found almost quite colourles and transparent. In two hours after, a second quantity drawn from the breafh was vilcid like the white of an egg. It became whiter in a short time, but did not recover its natural colour before the evening. It was afterwards found that these changes were occasioned by her having some violent hystericfits in the mean time.

Sugar of Milk. Under the article Chemistry an account has been given of the fugar of milk, with fome of the different methods of making it: but of late we have an account of a method used by fome of the Tartar nations of preferring their milk by means of froft; in which operation great quantities of the fugar of milk are accidentally formed. The account was given by Mr Fahrig of Peterburgh, who undertook a journey, by order of the academy of Peterburgh, among the Mogul tribes who inhabit the country beyond the lake Baikal, on the Banks of the river Salenga. These people allow their milk to freeze in large quantity in iron kettles; and, when it is perfectly congealed, they place them over a gentle fire to soften the edges of the cake, after which it may be taken out with a wooden spatula. They commence these operations at the beginning of the cold, when they have milk in the greatest abundance; after which it may be preferred with great celerity throughout the whole winter. Mr Fahrig having frequent opportunities of seeing these cakes, soon observed, that the surface of them was covered to a confiderable depth with a farinaceous powder; and having eftablifhed a daily upon the fame plan with thofe of the Moguls, he found the fame thing take place with himself. This powder was extremely sweet, and he received platefuls of it from the natives, who used it in their food, and sweetened their other viuals with it. Having caufed a number of cakes of frozen milk to be conveyed to the top of his house, where they were directly exposed to the violent cold, he found that the separation of the farinaceous powder was greatly promoted by this means. He scraped the cakes every week to the depth...
is given to substances very different from milk, properly so called, and which resemble milk only in colour. Such is water in which quicklime has been flaked, which acquires a whiteness from the small particles of the lime being suspended in it, and has hence been called the milk of lime. Such also is the solution of liver of sulphur, when an acid is mixed with it, by which white particles of sulphur are made to float in the liquor.

Mix of Vegetables. For the same reason that milk of animals may be considered as a true animal emulsion, the emulifiable liquors of vegetables may be called vegetable milks. Accordingly emulsions made with almonds are commonly called milk of almonds. But besides this vegetable milk, which is in some measure artificial, many plants and trees contain naturally a large quantity of emulifiable or milky juices. Such are lettuce, spurge, fig-tree, and the tree which furnishes the classic American resin. The milky juices obtained from all these vegetables derive their whiteness from an oily matter, mixed and undissolved in a watery or mucilaginous liquor. Most resinous gums were originally such milky juices, which afterwards become solid by the evaporation of their moist fluid and volatile parts.

These natural milky juices have not been examined by any chemist. Such an examination would, however, procure much essential knowledge concerning vegetable economy. We should probably find examples of all kinds of oils reduced into milky juices; and this knowledge cannot fail of throwing much light on the nature of refined and gum-refins.

Mix of Pear, See Mowifery, p. 806.

Mix of Hedges, the English name of a shrub growing on the coast of Coromandel, where it is used for hedging. The whole shrub grows very bushy with numerous erect branches, which are composed of cylindrical joints as thick as a tobacco-pipe, of a green colour, and from three to six inches long; the joints are thicker than the other parts, but always give way at the thinnest place of the plant. When broken it yields a milk of an exceedingly caustic quality, which blistered any part of the skin it touched. When the joints are broken off at each end, the tube then contains but very little milk. In this state Mr. Ives ventured to touch it with his tongue, and found it a little sweet. In the hedges it is seldom very woody; but when the wood is pretty solid, and the bark grey and cracked. This plant, he informs us, has acquired a great reputation in curing the venereal disease, on the following account. A poor Portuguese woman, the eldest female of her family, had wrought surprising cures in the most intractable venereal disorders, even such as the European physicians had pronounced incurable. These facts became so notorious, that the servants of the company, and especially their surgeons, were induced to offer her a very considerable premium for a discovery of the medicine; but she always refused to comply, giving for a reason, that while it remained a secret, it was certain provision for the maintenance of the family in the present as well as in future generations. On account of this denial the English surgeons were sometimes at the pains to have her motions without doors carefully watched; and as they were not able to discover that she ever gathered of any other plant or tree but this, they conjecture...
Mr. Ives inquired at the black druggist concerning the virtues of this plant; who all agreed, that it would cure the lues venera, but differed as to the manner of administering it; some saying that a joint of it should be eaten every morning; others that the milk only should be dropped upon sugar; and then put into milk, oil, &c. and given daily to the patient.

**MILK-WAY.** See Astronomy-Index.

**MILL,** a machine for grinding corn, &c. of which there are various kinds, according to the different methods of applying the moving power; as water-mills, wind-mills, mills worked by horses, &c. See *Mechanics,* Sept. V.

The first obvious method of reducing corn into flour for bread would be, by the simple expedient of pounding. And that was for ages the only one which was practised by the various descendants of Adam, and actually continued in use among the Romans below the reign of Valpallian. But the process was very early improved by the application of a grinding power, and the introduction of mill-stones. This, like most of the common refinements in domestic life, was probably the invention of the antediluvian world, and certainly practised in some of the earliest ages after it. And, like most of them, it was equally known in the east and west. Hence the Gauls and Britons appear familiarly acquainted with the use of hand-mills before the time of their submission to the Romans; the Britons particularly distinguing them, as the Highlanders and we distinguis/h them at present, by the simple appellations of *querns,* *carnes,* or *flones.* And to the Romans the added the very useful invention of water-mills. For this discovery the world is pretty certainly indebted to the genius of Italy; and the machine was not uncommon in the country at the conquest of Lancashire. This, therefore, the Romans would necessarily introduce with their many other refinements among us. And that they actually did, the British appellation of a *water-mill* fully suggests of itself; the *menas* of the Welsh and Cornish, the *mull,* *mesil,* and *menial* of the Armoricans, and the Irish *mills* and *moldon,* being all evidently derived from the Roman *molae* and *molendinum.* The subject Britons universally adopted the Roman name, but applied it, as we and our successors do, only to the Roman *mill,* and one of these was probably erected at every stationary city in the kingdom. One plainly was at Manchesten, serving equally the purposes of the town and the accommodation of the garrison. And one alone would be sufficient, as the use of handmills remained very common in both, many having been found about the site of the station particularly; and the general practice having continued among us nearly to the present period. Such it would be peculiarly necessary to have in the camp, that the garrison might be provided against a siege. And the water-mill at Manchester was fixed immediately below the Cattlefield and the town, and on the channel of the Medlock. There, a little above the ancient ford, the sluice of it was accidentally discovered about 30 years ago. On the margin of Dyer's-croft, and opposite to some new constructions, the current of the river, accidentally swelled with the rains, and, obstructed by a dam, broke down the northern bank, swept away a largeock upon the edge of it, and disclosed a long tunnel in the rock below. This has been since laid open in part with a spade. It appeared entirely uncovered at the top, was about a yard in width, and another in depth, but gradually narrowed to the bottom. The sides showed everywhere the marks of the tool on the rock, and the course of it was parallel with the channel. It was bared by the flood about 25 yards only in length, but was evidently continued for several further; having originally begun, as the nature of the ground evinces, just above the large curve in the channel of the Medlock.

For the first five or six centuries of the Roman state, there were no public bread-bakers in the city of Rome. They were first introduced into it from the east, at the conclusion of the war with Perseus, and about the year 167 before Christ. And, towards the close of the first century, the Roman families were supplied by them every morning with fresh loaves for breakfast. But the same custom, which prevailed originally among the Romans and many other nations, has continued nearly to the present time among the Mancunians. The providing of bread for every family was left entirely to the attention of the women in it. And it was baked upon loaves, which the Welsh denominate *gri-dials* and we *gredds.* It appears, however, from the kiln-burnt pottery which has been discovered in the British sepulchres, and from the British appellation of an *odyn* or *oven* remaining among us at present, that furnaces for baking were generally known among the original Britons. An *odyn* would, therefore, be erected at the mansion of each British baron, for the use of himself and his retainers. And, when he and they removed into the vicinity of a Roman station, the oven would be rebuilt with the mansion, and the public bakehouses of our towns commence at the first foundation of them. One bakehouse would be constructed, as we have previously shown, one mill to have been set up, for the public service of all the Mancunian families. One oven and one mill appear to have been equally established in the town. And the inhabitants of it appear immemorially accustomed to bake at the one and grind at the other. But the therefore, were in all probability constructed at the first introduction of water-mills and ovens into the country. The great similarity of the appointments refers the consideration directly to one and the same origin for them. And the general nature of all such institutions points immediately to the first and actual introduction of both. And, as the same establishments prevailed equally in other parts of the north, and pretty certainly obtained over all the extent of Roman Britain, the same creeds were as certainly made at every stationary town in the kingdom.

**MILL (John),** a very learned divine, was born at Shap in Westmoreland, about the year 1645; and became a servitor of Queen's college Oxford. On his entering into orders he became an eminent preacher, and was made prebendary of Exeter. In 1681, he was created doctor of divinity; about the same time he was made chaplain in ordinary to King Charles II. and in 1685 he was elected principal of St Edmund's Hall in Oxford. His edition of the Greek Testament, which will ever render his name memorable, was published about a fortnight before his death, which happened...
Before Littleton’s time, however, a somewhat nicer characteristic than seems compatible with his notion appears to have belonged to them; for Shakespeare, in his Henry IV, makes Hotspur, when complaining of the daintiness of a courtier, say, “I was perfumed like a millener.”

The fact seems to be, that there were milleners of several kinds: as barke-milleners, (for so those persons were called who made ornaments of coloured wood for horses); haberdashers of small wares, the milleners of Littleton; and milleners such as these now peculiarly known by that name, whether male or female, and to whom Shakspeare’s allusion seems most appropriate.

Laflly, Dr Johnson, in his Dictionary, derives the word from milner, an inhabitant of Milan, from whence people of this profession first came, as a Lombard is a banker.

MILLE PASSUS, or Milia Paffium; a very common expression among the ancient Romans for a measure of distance, commonly called a mile. Millarium, rarely used. Which Hefychius made to consist of seven stadia; Plutarch, little short of eight; but many others, as Strabo and Polybius, make it just eight stadia. The reason of this difference seems to be, that the former had a regard to the Grecian foot, which is greater than the Roman or Italic. This distance is oftentimes called lapsis, which fce. Each paffus consisted of five feet, (Collumella).”

MILLENIUM, “a thousand years” generally employed to denote the thousand years, during which, according to an ancient tradition in the church, grounded on fome texts in the Apocalypse and other scriptures, our bleffed Saviour fhall reign with the faithful upon earth after the firft refurrection, before the final completion of beatitude.

Though there has been no age of the church in which the millennium was not admitted by individual divines of the firft eminence, it is yet evident from the writings of Eufebius, Irenreus, Origen, and others, among the ancients, as well as from the histories of Dupin, Motheim, and all the moderns, that it was never adopted by the whole church, or made an article of the established creed in any nation.

About the middle of the fourth century the millenians held the following tenets: 1. That the city of Jerufalem fhould be rebuilt; and that the land of Judea fhould be the habitation of thofe who were to reign on earth 1000 years. 2. That the firft refurrection was not to be confined to the martyrs; but that after the fall of Antichrift all the just were to rife, and all that were on the earth were to continue for that space of time. 3. That Christ fhall then come down from heaven, and be fecn on earth, and reign there with his fervants. 4. That the fants during this period fhall enjoy all the delights of a te rrificial paradise.

These opinions were founded upon several passages of scripture, which the millenarians among the fathers understood in no other than a literal fense, but which the moderns, who hold that opinion, confider as partly literal and partly metaphorical. Of these passages, that upon which the greateft stress has been laid, we believe to be the following:—“And I faw an angel come down from heaven, having the key..."
MILL

by the reign of Christ and the saints. For a thousand years upon earth, nothing more is meant, than that before the general judgment the Jews shall be converted, genuine Christianity be diffused through all nations, and mankind enjoy that peace and happiness which the faith and precepts of the gospel are calculated to confer on all by whom they are sincerely embraced.

Our Saviour's own account of his religion, that from a small beginning it will increase to the full harvest. The millennium therefore is to be considered as the full effect of the Christian principles in the hearts of men, and over the whole world; and the divines who have treated of this subject endeavour to prove, that this is to be expected from the facts which have already existed, and from the importance of the Christian doctrine.

1. The gradual progress of Christianity is no objection to this fact. This is similar to the progress and advancement from left to greater perfection in every thing which possesses vegetable or animal life. The same thing is observed in the arts, in civilization, in societies, and in individuals—and why should it not be admitted to have place in religion? There is indeed a general principle on which a gradual progression, both in the natural and moral world, is founded. The Almighty never employs supernatural means where the thing can be accomplished by those which are natural. This idea is of the most general extent through the whole of the present system of nature. The possibility of another plan could easily be admitted; but in this case there would be a total alteration of every part of the works of God or of man that we are acquainted with. In the same manner, if the religion of Christ had been irresistible, it would have totally altered its natural consequences. It was necessary, therefore, from the present condition of man as an active, intelligent, and accountable being, that means should be employed; and wherever means are employed, the effects produced must be gradual, and not instantaneous.

2. Though the progress of a divine revelation be gradual yet it is to be expected, from the wisdom and compation of God, that it will still be advancing in the hearts of men, and over the world. In the first age of the church, the word of God, supported by miracles, and by the animated zeal of men, who spake what they saw and heard, grew and prevailed. In this case supernatural means were necessary, because the prejudices of the world could not be subdued without them. It was the first watering of a plant which you afterwards leave to the dew of heaven. Miracles at the same time were employed only as the means of conviction; and they were not continued, because in this case they would have become a constant and irresistible principle, incompatible with the condition of man as a responsible agent. After this power was withdrawn, there were many ages of ignorance and superstition in the Christian church. But what is necessary to be established on this subject is, not that the progress of Christianity has never been interrupted, but that on the whole it has been advancing. The effects of this religion on mankind, in proportion as it was received, were immediate and visible.
to the accumulation of this world's property, if they
lawed from bread to bread, and operated with equal
force on all men, would be productive of equal good
and happiness to all. We are scarcely able to
perceive the force of this at first view, because the deceit
and imposition which yet exist in the world, prevent
the operation of the beet principles even in the beet hearts.
But in proportion to the improvement of mankind,
what is their real interest, and what are the real ob-
jects of happiness, will gradually unfold. The con-
tempt of vice will be greater in proportion to the fear-
city of it: for one villain gives countenance and sup-
port to another, just as iron sharpeneth iron. This
opens to our view another fact connected with the
practice of Christianity, namely, that the nearer it
arrives to its perfect state, it will be the more rapid
in its progress. The beauty of holiness will be more
visible; and, in the strong language of the prophet,
"the earth shall bring forth in one day, and a nation
shall be born at once." This fact is perfectly
true, for the gospel is consistent with its nature and importance.—8.

We can scarcely believe that means so admirably adapt-
ted to the reformation of mankind should be without
their effect; and if the most difficult part be already
accomplished, we have no reason to apprehend that
the scheme will not be completed. This fact is also clear-
ly the subject of ancient prophecy. For "thus faith
the Lord," I will extend peace to her like a river,+ Ver. 12,
and the glory of the Gentiles like a flowing stream. 23.
And it shall come to pass, from one sabbath to an-
other, and from one new moon to another, shall all
flesh come to worship before me, faith the Lord."—
"Violence shall be no more heard in thy land, waiting
nor defraction within thy border; but thou shalt call
thy walls salvation, and thy gates praise." (If. lx. 18.)

Without entering more minutely on the prophecy
already quoted from chap. xx. of the book of the Rele-
vation, it is sufficient to observe, that Dr Whitby, in
his treatise on the millennium at the end of his com-
mentary endeavours to prove, from the spirit of the
passage and the similarity of the expressions with
those of other prophets, that it refers to a state of
the church for a thousand years, which shall be like life
from the dead. The commencement of this period
is connected with two events; the fall of antichrift,
and the conversion of the Jews. The latter of these
events he considers as a key to all the prophecies
concerning the millennium. As the Jews were the
ancient people of God, and as their conversion is to
be the previous step to the general knowledge of Chris-
tianity, the prophecies of the millennium have a chief
relation to this important event. We have already ob-
erved, that God never interposes with miraculous
power to produce what can be effected by natural
means; and from what we know of human nature, we
cannot but perceive that the conversion of the Jews
will powerfully operate to the general conversion of
mankind. Freed from those prejudices which now
make them the objects of hatred in all nations, and
fired with that zeal by which new converts are always
actuated, they will preach the gospel with a fervour
of which we, who have long been blessed with its rays,
can hardly form a conception; and, by their present
dispersion over the whole earth, they will be enabled
to adapt their instructions to every individual of the
human
MILLEPS, or WOOD-LOUSE, in zoology; a species of Oniscus. These insects are found in cellars, under fences, and in cold moist places; in the warmer countries they are rarely met with. Millepedes have a faint disagreeable smell, and a somewhat pungent, sweetish, nauseous taste. They have been highly celebrated in suppers of urine, in all kinds of obstructions of the bowels, in the jaundice, weakness of sight, and variety of disorders. Whether they have any just title to these virtues is greatly to be doubted; thus much is certain, that their real effects come far short of the character usually given them.

MILLEPORA, in natural history, a name by which Linnaeus distinguishes that genus of lithophytes, of a hard structure and full of holes, which are not flat or radiated, and whose animal is the hydra, in which it differs from the madrepore, and comprehending 14 different species.

In the millepora, the animal which forms and inhabits it occupies the substance; and it is observed that the millepora grow upon one another; their little animals produce their spawn; which attaching itself either to the extremity of the body already formed, or underneath it, gives a different form to this production. Hence the various shapes of the millepora, which is composed of an infinite number of the cells of those little insects, which all together exhibit different figures, though each particular cellula has its essential form, and the same dimensions, according to its own species.

MILLET, in botany. See MILLIUM.

MILLIARE, or MILLIARIUM, a Roman mile, which consisted of 1000 paces, mille passus, whence the name.

MILLIARIUM Aureum, was a gilded pillar in the forum of Rome, at which all the highways of Italy met, as one common centre. From this pillar the miles were counted, and at the end of every mile a stone was put down. The military column was erected by Augustus Cæsar, and, as we are informed by travellers, it still be seen.

MILLING of CLOTH. See FULLING.

MILLION, in arithmetic, the sum of ten hundred thousand, or a thousand times a thousand. See ARITHMETIC.

MILLO, a part of mount Zion at its extremity; and therefore called Millo of the city of David (2 Chron. xxxii.), taken in with the wall that encompassed mount Zion. Uncertain whether Beth-Millo, (Judges ix. 20.) denotes a place; if it did, it lay near Sechem.

MILLOT (Claude Francis Xavier), of the French academy, was born at Besançon March 1726, and was for some time Jesuit. He was consecrated for the pulpit, and continued to preach after he left the society: But the weakness of his voice, his timidity, and the awkwardness of his manner, not permitting him to continue in this profession, he relinquished it, although he had preached Advent sermons at Verfailles, and Lent sermons at Luneville. The Marquis de Felino, minister of Parma, instituted an historical clas for the benefit of the young nobility; and, at the desire of M. le Duc de Nivernois, he gave the charge of it to the Abbé Millot. The minister having occasioned a kind of rebellion among the people by some innovations which he had made in the flate, the Abbé continued attached to the interest of his patron, and would not desert him till the storm was blown over.

When he was told that he would lose his place by this conduct, he replied, "My place is with a virtuous perfected man who has been my benefactor; and that I shall never lose." At length, having filled the historical chair with great approbation, he returned to France, and was appointed preceptor to M. le Duc d'Enghien. In this situation he died, A. D. 1785, aged 59. The Abbé Millot did not shine in company; he was cold and reserved in his manner; but every thing he said was judicious, and exactly in point.

D'Alembert said, that of all his acquaintance the Abbé Millet had the fewest prejudices and the least pretension. He composed several works, which are digested with great care, and written in a pure, simple, and natural style. The principal are, 1. Éléments de l'Histoire de France, depuis Clovis jusqu'à Louis XIV. 3 vols. In 12mo. The author, feeling the most curious and important facts, has suppressed every thing foreign to the subject; and has not only arranged the materials in their proper order, but chosen them with the greatest judgment. Querlon thought this the best abridgment which we have of the history of France, and preferred it to that of the President Renaut. 2. Éléments de l'Histoire d'Angleterre, depuis son origine jusque à Louis X. 3 vols. In 12mo. In this valuable abridgment, the author satisfies, without tiring, his readers. It is all that is necessary for those who wish to gain a general knowledge of the English history, without entering minutely into its particular parts.

A certain critic maintains, that this work is merely a counterfeit of Voltaire's general history. But this censure is altogether unjust. The ancient history in this work is wholly composed by the Abbé Millet; and, no less than the modern part, discovers his abilities in the choice of facts, in divesting them of useless circumstances, in relating them without prejudice, and in adorning them with judicious reflections.
attended by his wife and a numerous retinue of gladiators and servants, he met on the Appian road his enemy Clodius, who was returning to Rome with three of his friends and some domestics completely armed.— A quarrel arose between the servants. Milo supported his attendants, and the dispute became general. Clodius received many severe wounds, and was obliged to retire to a neighbouring cottage. Milo pursued his enemy in his retreat, and ordered his servants to dispatch him. The body of the murdered tribune was carried to Rome, and exposed to public view. The enemies of Milo inveighed bitterly against the violence and barbarity with which the faced peron of a tribune had been treated. Cicero undertook the defence of Milo; but the continual clamours of the friends of Clodius, and the flight of an armed soldiery, which surrounded the seat of judgment, so terrified the orator, that he forgot the greatest part of his arguments, and the defence he made was weak and indiscriminate.— Milo was condemned, and banished to Mafilia. Cicero soon after sent his exiled friend a copy of the oration which he had prepared for his defence, in the form in which we have it now; and Milo, after he had read it, exclaimed, O Cicero, how I wish spoken before my accusers in these terms, Milo could not be now eating figs at Marsilles. The friendship and cordiality of Cicero and Milo were the fruits of long intimacy and familiar intercourse. It was to the successful labours of Milo that the orator was recalled from banishment, and restored to his friends.

MILIO, (anciently Melos), an island in the Archipelago, about 50 miles in circumference, with a harbour, which is one of the largest in the Mediterranean. The principal town is of the same name as the island, and was prettily built, but abominably nasty: the houses are two stories high, with flat roofs; and are built with a fort of pumic-Rome, which is hard, blackish, and yet very light.

This island was formerly rich and populous. From the earliest times of antiquity it enjoyed pure liberty. The Athenians, not being able to purchase the Melians to declare in their favour in the Peloponnesian war, made a descent upon the island, and attacked them vigorously. In two different expeditions they failed of their purpose; but returning with more numerous forces, they laid siege to Melos; and, obliging the besieged to surrender at discretion, put to the sword all the men who were able to bear arms. They spared only the women and children, and these they carried into captivity. This act of cruelty put humanity to the blush, and disgraced the Athenian name. But war was then carried on with a degree of wild rage, unexampled in the present times. That republic knew not how to pardon, and always carried its vengeance to an extravagant height. When Lyander, the Lacedemonian general, came to give law to the Athenians, he expelled the colony which they had lent to Melos, and re-established the unfortunate remains of its original inhabitants.

This island left its liberty when Rome, aspiring to the empire of the world, conquered all the isles of the Archipelago. In the partition of the empire, it fell to the share of the eastern emperors, was governed by particular dukes, and was at last conquered by Solomon II. Since that period, it has groaned under the
yoke of Turkish depotisim, and has left its opulence and splendor. At the commencement of the present century, it boasted of 17 churches, and 11 chapels, and contained more than 20,000 inhabitants. It was very fertile in corn, wine and fruits; and the whole space from the town to the harbour, which is nearly two miles, was laid out in beautiful gardens. M. Tournafort, who visited it in the year 1700, gives a fine description of it. The earth, being constantly warmed by subterraneous fires, produced almost without interruption plenteous crops of corn, barley, cotton, exquisite wines, and delicious melons. St Elias, the finest monastery in the island, and situated on the most elevated spot, is encircled with orange, citron, cedar, and fig trees. Its gardens are watered by a copious spring. Olive trees, of which there are but few in the other parts of the island, grow in great numbers around this monastery. The adjacent vineyards afford excellent wine. In a word, all the productions of the island are the very best of their kinds; its patridges, quails, kids, and lambs, are highly valued, and may yet be bought at a very cheap price.”

Were M. Tournefort to return to Milo, M. Savary assures us, he would no longer see the fine island which he has described. “He might still see alum, in the form of feathers, and fringed with silver thread, hanging from the arches of the caverns; pieces of pure sulphur filling the cliffs of the rocks; a variety of mineral springs; hot baths, (though these are now only a few of small dirty caves); the same subterraneous fires which in his days warmed the bottom of the earth, and were the cause of its extraordinary fertility: but instead of 5000 Greeks, all paying the capitation tax (5), he would now find no more than about 700 inhabitants on an island 18 leagues in circumference. He would fight to behold the finest lands lying uncultivated, and the most fertile valleys converted into morasses; of the gardens scarcely a vestige left; three-fourths of the town in ruins, and the inhabitants daily decreasing. In short, during the last 50 years, Milos has assumed a quite different appearance. The plague, which the Turks propagate everywhere, has cut off one part of its inhabitants; the injudicious administration of the Porte, and the oppressive extortions of the Captain Pacha, have destroyed the rest. At present, for want of hands, they cannot cut out a free channel for their waters, which flagrate in the valleys, corrupt, and infect the air with their putrid exhalations. The salt marishes, of which there are numbers in the island, being equally neglected, produce the same effect. Add to these inconveniences, those sulphurous exhalations which abound all over the island, and by which the inhabitants of Milos are afflicted with dangerous fevers during three-fourths of the year. Perhaps they may be obliged to forsake their country. Every countenance is yellow, paler, and livid; and none bears any mark of good health. The prudent traveller will be careful to spend but a very short time in this unwholesome country, unless he chooses to expose himself to the danger of catching a fever.

To sleep over-night, or to spend but one day in the island, is often enough to occasion his being attacked with that distemper.

“Yet (continues our author) a judicious and enlightened government might expel those evils which ravage Milos. Its first care would be to establish a lazaretto, and to prohibit vessels whose crews or cargoes are infected with the plague from landing. Canals might next be cut, to drain the marishes, whose exhalations are so pernicious. The island would then be re-peopled. The sulphurous vapours are not the most noxious. These prevailed equally in ancient times, yet the island was then very populous. M. Tournafort, who travelled through it at a time less distant from the period when it was conquered by the Turks, and when they had not yet had time to lay it waste, reckons the number of its inhabitants (as we have said) at about 20,000. The depopulation of Milos is therefore to be ascribed to the depopulation of the Porte, and its detestable police.”

The women of Milo once so celebrated for their beauty, are now fallow, unhealthful, and disgracefully ugly; and render themselves still more hideous by their drees, which is a kind of loose jacket, with a white coat and petticoat, that scarcely covers two-thirds of their thighs, barely meeting the stocking above the knee. Their hind hair hangs down the back in a number of plaits; that on the fore part of the head is combed down each side of the face, and terminated by a small stuff curl, which is even with the lower part of the cheek. All the inhabitants are Greeks, for the Turks are not fond of trusting themselves in the small islands; but every summer the captain bahaw goes round with a squadron to keep them in subjection, and to collect the revenue. When the Russians made themselves masters of the Archipelago during the late war, many of the islands declared in their favour; but being abandoned by the peace, they were so fearfully mulcted by the Grand Signior, that they have professed a determination to remain perfectly quiet in future. As the Turks, however do not think them worth a garrison, and will not trust them with arms and ammunition, all those which the Russians may choose to invade will be obliged to submit. The two points which form the entrance of the harbour, crouching each other, render it imperceptible until you are close to it. Thus, while you are perfectly secure within it, you find great difficulty in getting out, particularly in a northerly wind; and as no trade is carried on except a little in corn and salt, Milos would fearfully ever be visited, were it not that, being the first island which one makes in the Archipelago, the pilots have chosen it for their residence. They live in a little town on the top of a high rock, which, from its situation and appearance, is called the castle. Patridges still abound in this island; and are so cheap, that you may buy one for a charge of powder only. The peasants get them by standing behind a portable screen, with a small aperture in the centre, in which they place the muzzle of their piece, and then draw the

(a) Grown up men are the only persons who pay the capitation tax. Therefore, by adding to the number of 5000 who paid the tax, the women, boys, and girls, we find that Milos, in the days of Tournefort, contained at least 20,000 souls.
the partridges by a call. When a sufficient number are collected, they fire among them, and generally kill from four to seven at a shot: but even this method of getting them is so expensive, from the scarcity of ammunition, that the people can never afford to shoot them, except when they are gentlemen in the island, from whom they can beg a little powder and shot.

Milo is 60 miles north of Candia; and the town is situated in E. Long. 25. 15. N. Lat. 36. 27.

MILSTONE. See MILL-STONE.

MILT; in anatomy, a popular name for the SPLEEN.

Milt, or Mel, in natural history, the soft ree in fishes; thus called from its yielding, by expression, a whitish juice resembling milk. See Roe.

The milt is properly the seed or spermatic part of the male fish. The milt of a carp is reckoned a choice bit. It consists of two long whitish irregular bodies, each included in a very thin fine membrane. M. Petit considers them as the testicles of the fish wherein the seed is preserved; the lower part, next the anus, he takes for the vesicula seminalis.

MILTHORPE, a port-town of Westmoreland, at the mouth of the Can, five miles from Kendal. It is the only sea-port in the county; and goods are brought thither in small vessels from Grange in Lancashire. Here are two paper-mills. It has a market on Friday, and a fair on Old May-day; and there is a good stone-bridge over the river Betha, which runs through the town.

MILTIADES, an Athenian captain, son of Cypselus. He obtained a victory in a chariot race at the Olympic games. He led a colony of Athenians to the Cheroneus. The causes of this appointment are striking and singular. The Thracian Dolonci, harassed by a long war with the Abshynians, were directed by the oracle of Delphi to take for their king the first man they met in their return home, who invited them to come under his roof and partake his entertainments. This was Miltiades, whom the appearance of the Dolonci, with their strange arms and garments, had struck. He invited them to his house, and was made acquainted with the commands of the oracle. He obeyed; and when the oracle of Delphi had approved a second time the choice of the Dolonci, he departed for the Cheroneus, and was invited by the inhabitants with sovereign power. The first measures he took was to stop the further incursions of the Abshynians, by building a strong wall across the Ithmus. When he had established himself at home, and fortified his dominions against foreign invasion, he turned his arms against Lamppacus. His expedition was unsuccessful; he was taken in an ambush, and made prisoner. His Friend Cretus king of Lydia was informed of his captivity, and procured his release. He lived few years after he had recovered his liberty. As he had no issue, he left his kingdom and possessions to Stefagoras the son of Cimon, who was his brother by the same mother. The memory of Miltiades was greatly honoured by the Dolonci, and they regularly celebrated festivities and exhibited shows in commemoration of a man to whom they owed their greatness and preservation.

MILTIADES, the son of Cimon, and brother of Stefagoras mentioned in the preceding article, was some time after the death of the latter, who died without issue, sent by the Athenians with one ship to take possession of the Cheroneus. At his arrival Miltiades appeared mournful, as if lamenting the recent death of his brother. The principal inhabitants of the country visited the new governor to console with him; but their confidence in his sincerity proved fatal to them. Miltiades seized their persons, and made himself absolute in Cheroneus. To strengthen himself, he married Hgegypyla, the daughter of Olorus the king of the Thracians. His triumph was short. In the third year of his government, his dominions were threatened by an invasion of the Scythian Nomades, whom Darius had some time before irritated by entering their country. He fled before them; but as their hostilities were of short duration, he was soon restored to his kingdom. Three years after, he left Cheroneus; and set sail for Athens, where he was received with great applause. He was present at the celebrated battle of MARATHON; in which all the chief officers ceded their power to him, and left the event of the battle to depend upon his superior abilities. He obtained an important victory over the more numerous forces of his adversaries. Some time after, Miltiades was intrusted with a fleet of 70 ships, and ordered to punish those islands which had revolted to the Persians. He was successful at first; but a sudden report that the Persian fleet was coming to attack him, changed his operations as he was besieging Paros. He raised the siege, and returned to Athens.

He was accused of treason, and particularly of holding correspondence with the enemy. The falsity of these accusations might have appeared, if Miltiades had been able to come into the assembly. But a wound which he had received before Paros detained him at home, and his enemies, taking advantage of his absence, became more eager in their accusations, and louder in their clamours. He was condemned to death; but the rigor of his sentence was softened on the recollection of his great services to the Athenians, and he was put into prison till he had paid a fine of 50 talents to the state. His inability to discharge so great a sum detained him in confinement; and his wounds becoming incurable, he died a prisoner about 489 years before the Christian era. His body was interred by his son Cimon, who was obliged to borrow and pay the 50 talents, to give his father a decent burial.—The accusations against Miltiades were probably the more readily believed by his countrymen, when they remembered how he made himself absolute in Cheroneus; and in condemning the barbarity of the Athenians towards a general, who was the source of their military prosperity, we must remember the jealousy which ever reigns among a free and independent people, and how watchful they are in defence of the natural rights which they fear wrested from others by violence. Cornelius Nepos has written the life of Miltiades the son of Cimon; but his history is incongruous and unintelligible, from his confounding the actions of the son of Cimon with those of the son of Cypselus. Greater reliance is to be placed on the narration of Herodotus, whose veracity is confirmed, and who was indisputably better informed and more capable of giving an account of
Milton.

THE LIFE AND EXPLOITS OF MEN WHO FLOURISHED IN THEIR AGE, AND OF WHICH THEY LEFT THE LIVING MONUMENTS.

Hegesippus was born about six years after the famous battle of Marathon; and C. Nepos, as a writer of the Augustan age, flourished about 450 years after the age of the father of history.

MILTON (John,) the most illustrious of the English poets, was descended of a genteel family, seated at a place of their own name, viz. Milton, in Oxfordshire. He was born December 9, 1608, and received his first rudiments of education under the care of his parents, assisted by a private tutor. He afterwards professed some time at St Paul's School, London; in which city his father had settled, being engaged in the business of a scrivener. At the age of 17, he was sent to Chirill's college, Cambridge, where he made a great progress in all parts of academical learning; but his chief delight was in poetry. In 1628, he proceeded to St. John's College, Cambridge, both of which performances spread his fame over all Europe. He now dwelt in a pleasant house, with a garden, in Petty France, Westminster, opening into St James's Park. In 1632, he buried his wife, who died not long after the delivery of her fourth child; and about the same time he also lost his eye-sight, by a gouty fever, which had been growing upon him many years.

Cromwell took the reins of government into his own hands in the year 1653; but Milton still held his office. His leisure-hours he employed in prosecuting his studies; whereof he was so far from being discouraged by the loss of his sight, that he even conceived hopes this misfortune would add new vigour to his genius; which, in fact, seems to have been the case. Thus animated, he again ventured upon matrimony; his second lady was the daughter of Captain Woodlock of Hackney; she died in childbirth about a year after. On the deposition of the protector, Richard Cromwell, and on the return of the long parliament, Milton being still continued secretary, he appeared again in print; pleading for a further reformation of the laws relating to religion; and, during the anarchy that ensued, he drew up several schemes for re-estabishing the commonwealth, exerting all his faculties to prevent the return of Charles II. England's destiny, however, and Charles's good fortune, prevailing, our author chose to consult his safety, and retired to a friend's house in Bartholomew-Closet. A particular prosecution was intended against him; but the just clemency to which his admirable genius and extraordinary accomplishments entitled him, had raised him to so many friends, even among those of the opposite party, that he was included in the general amnesty.

This form over, he married a third wife, Elizabeth, daughter of Mr. Minshull, a Cheshire gentleman; and was now established in the house of a gentleman, who did not wish for his removal, and who lived in the same house. He was now taken into the service of the commonwealth, and made Latin secretary to the council of state, which resolved neither to write to others abroad, nor to receive any answer, except in the Latin tongue, which was common to them all. The famous Bona Dei, coming out about the same time, our author, by command, wrote and published his Les Moeurs de la Fille de France. "A Defence of the People of England, in answer to Salmantius's Defence of the King," which performance spread his fame over all Europe. He now dwelt in a pleasant house, with a garden, in Petty France, Westminster, opening into St James's Park. In 1652, he buried his wife, who died not long after the delivery of her fourth child; and about the same time he also lost his eye-sight, by a gouty fever, which had been growing upon him many years.
MILTON, or Milton, in Dorsetshire, south-west of Blandford, near the road to Dorchester, 114 miles from London. It is chiefly noted for its abbey, built by king Athelstan. The church stands near the south side of the abbey. It is a large and magnificent pile of Gothic architecture, and contains several ancient monuments. Here is an alms-house for six people, who have 12s. a week, and three yards of cloth for a gown, one pair of shoes and stockings, and 10s. each on St Thomas’s day yearly. Here is a free-school, and a market on Tuesdays.

MILTON, in Kent, near Sington and the Isle of Sheppey, 6 miles north-west of Feverham, and 40 from London. It is also called Middle ton from its situation near the middle of the county, i.e. from Deptford to the Downs. The kings of Kent had a palace here, which was cattellated, and stood below the church; but was burnt down in Edward the Confessor’s time by Earl Godwin, &c. Its church stands near a mile off. On approaching the town up the Thames, by the East-Swale, it seems hid among the creeks; yet it is a large town; and has a considerable market on Saturdays, and a fair on July 24. The oyster taken hereabouts are the most famous of any in Kent. This town is governed by a portreeve, chosen yearly on St James’s-day, who supervises the weights and measures all over the hundred of Milton.

MILTON, in Kent, a mile on the east side of Grave ford, was incorporated with it in the reign of Queen Elizabeth by the name of the portreeve, jurats, and Habitants of the towns of Graveford and Milton. King Henry VIII. raised a platform or block-house here, for the defence both of this town and Grave ford, and the command of the river. It has a fair Jan. 25.

MILVIUS MOLVIUS, or MULVIUS, Pont; a bridge on the Tiber, built by Emilius Scaurus the censor, in the time of Sylla, at two miles distance from the city, on the Via Flaminia, and repaired by Augustus. From this bridge the ambassadors of the Allobroges were brought back to Rome, by Cicero’s management, and made a discovery of Catilina’s conspiracy (Sallust). Near it Maxentius was defeated by Constantine (Eutropius). Now called Ponte Molli.

MILVIUS, in ornithology, a species of Falco. MIMES, in the ancient comedy, were buffoons or mimics, who entertained the people by taking off certain characters, using such gestures as suited the persons or subjects they represented. There were on the Roman stage female performers of this kind called mimina. The word is derived from mimes, I imitate. Some of the mimia added their parts to the found of the share they called mimina. MIMES were also a kind of farces or ludicrous comedies, generally performed by one person. They had no acts, nor any exordium. The mimia were introduced upon the Roman stage long after comedy and tragedy had arrived at their full perfection. The actor wore no mask, but smeared his face with foot, was drest in lambkin, wore garlands of ivy, and carried a basket of flowers and herbs, in honour of Bacchus, and diverted the audience with apith tricks and ridiculous dances. This was the flute of the mimia soon after their first introduction; but they underwent many alterations, which it would take up too much room to relate, and which are not of sufficient importance to justify a detailed account. See Pantomimes.

MIMESIS, in rhetoric, the imitating the voice and gestures of another person.

MIMNERMUS, an ancient poet and musician, flourished about the beginning of the 6th century B.C. He was of Smyrna, and contemporary with Solon. Athenaeus gives him the invention of pentameter verse. His elegies, of which only a few fragments are preserved, were so much admired in antiquity, that Horace preferred them to those of Callimachus. He composed a poem of this kind, as we learn from Pausanias, upon the battle fought between the people of Smyrna, and the Lydians, under Gyges. He likewise was author of a poem in elegiac verse, quoted by Strabo, which he entitled Nannus, and in which we may suppose he chiefly celebrated a young and beautiful girl of that name, who, according to Athenaeus, was a player on the flute, with whom he was enamoured in his old age. With respect to love matters, according to Propertius, his verses were more valuable than all the writings of Homer.

Plus in amore vult Mimmermi veris Homero.

Lib. i. Eleg. 9. v. 11.

And Horace bears testimony to his abilities, in describing that seducing passion:

Si Mimmermi uti cenfet, sine amore jouctque

Nil est juicandum, vivas in amore joyctque.

Ep. VI. Lib. i. v. 63.
It, as with Mimnermus said,
Life unbless'd with love and joy
Ranks us with the senseless dead,
Let these gifts each hour employ.

Alluding to some much admired lines of this Greek poet, which have been preferred by Stobæus.

Mimosa, the sensitive plant: A genus of the polygamy order, belonging to the monoecea class of plants; and in the natural method ranking under the 33d order, Leguminosae. The hermaphrodite calyx is quinquedentate; the corolla quinquefid; there are five stamens; the ovary is sessile; the fructification is a pinnate legume, with various kinds of seeds; the leaves are of the shrub and tree kind, and are of warm climates.

The very rapidly affected, and in some sorts the footstalks and all are affected, so as instantly to fall downward as if fastened by hinges, which last are called humble sentitives. They have all winged leaves, each wing consisting of many small pinnae.

In the System Vegetabilium, this genus, including the mimosa properly so called, and the acacias, is divided into several sections, distinguished by the figure, situation, and arrangement, of the leaves; as simple, pinnated, bigeminous and tergeminous, conjugate and pinnated, double pinnated. The following are the most remarkable species, with their properties. 1. The Senfitive, or common sensitive humble plant, rises with an underhairy, declinated, prickly stem; branching two or three feet around, armed with hairy spines; pinnated, digitated leaves, each leaf being of five or more long foliages, attached by their base to a long footstalk, and spread out above like the fingers of a hand; and at the sides and ends of the branches roundish heads of greenish white flowers, succeeded by small jointed prickly pods.—This is truly of the humble sensitive kind: for by the leaf touch the leaves instantly recede, contract, close, and together with the footstalk quickly decline downward, as if ashamed at the approach of the hand.

3. The Pernambucanæ, or Pernambuca fputful mimosa, has unshrubby, procumbent, unarmed stems, branching two or three feet around; bipinnated leaves, of three or four pair of short, winged foliages; and at the axillas drooping spikes of pentandrous flowers, the lower ones calbruated.—This species recedes very slowly from the touch, only contracting its pinna a little when smartly touched; hence the name filoful mimosa.

4. The Ageratæ, or Panama sensitive plant. Of this curious species, which has been well described by Dr Browne (but not figured), there is a good figure in the Raritæ Floræ Americæ published by Sir Joseph Banks. It grows in moist places, and by the sides of rivulets, in the parishes of St. James and Hanover, Jamaica. It seldom rises above three feet in height; but its slender branches extend considerably on the neighbouring bushes. It is armed with crooked, sharp, spines, so thickly set on the trunk, branches, and leaves, that there is no touching it with futility. But the plant has a beautiful appearance; the flowers are yellow and globular, growing at the extremity of the branches. The pods are hairy, brown, and jointed; each containing a small, flat, and brown seed. The leaves are numerous, small, and winged: next to those of the mimosa pudica, they are the most irritable; contracting with the leaf touch, and remaining so for several minutes after. This species would form a good hedge or fence around a garden, and by being trimmed now and then by a gardener's pruners, may be easily kept from spreading.

5. The Punctata, or punctated sensitive mimosa, rises with a shrubby, upright, taper, spotted, unarmed stem, branching erectly five or six feet high; bipinnated leaves, of four or five pair of long winged foliages, having each about 20 pair of pinnae; and at the axillas and termination of the branches oblong spikes of yellowish deciduous flowers, the inferior ones calbruated; succeeded above by oblong feed-pods. This sort, though naturally shrubby and perennial in its native soil, yet in this country it sometimes decays in winter. It is only sensitive in the foliola, but quick in the motion.

6. The Visa, lively mimosa, or small leaf sensitive weed, has many creeping roots, and spreads itself to cover large spots of ground. It rises at most to two inches, has winged leaves, with numerous small pinnae. The flower is globular, of a bluish colour, and grows in clusters from the axilla: these are followed by little short, hairy, pods, containing smooth shining seeds. This is the most sensible of all the mimofas, the pudica not excepted. By running a stick over the plant, a person may write his name, and it will remain visible for ten minutes.

7. The Quadrivalvæ, perennial, or quadrivalve humble mimosa.
11. The *Arborea*, or wild tamarind tree, is common in all the woodlands, and especially near where settlements have been made, in Jamaica. It rises to a considerable height, and is proportionally thick. The timber is excellent, and serves many purposes in rural economy: it is of the colour of cedar, pretty hard and takes a good polish. The leaves are numerous; the flowers globular and white. The pods are about a foot in length, of a fine scarlet colour: when they are ripe they open and become twived. The seeds then appear; they are oblong, smooth, of a shining black, and quite soft. On the whole, from the leaves, flowers, and pods, this tree exhibits a singular and beautiful contrast. With us this plant is raised in hot-houses; but it appears, that with a little pains it may be made to grow in the open air. A good, small tree of this sort grew in the garden of the late Dr William Pictairn, at Hilfington, near London.

12. The *Laifolia*, shag-bark, or white wild tamarind. This excellent timber tree is very common in Jamaica, and rises to a moderate height and good thickness. The trunk is rough and scaly: the leaves are numerous, of a rhomboid figure, and yellowish and green colour. The flower-spikes are from the axille; their colour is yellow. The seed-vessels are flat, jointed, and twived. The seeds are of the bigness of a vetch, white, and finely streaked with blue.

13. The *Lebœus* or ebony tree. This is a native of the East Indies but raised from seeds in Jamaica and St Vincent's. It is figured, though not accurately, by Plukenet, Tab. 331. fig. 1. To what height this tree grows, we cannot yet say: but it must be of a considerable thickness if it be the ebony we have in ufe here. Time will soon determine this, as the few plants in the islands are reared with great care by Dr Dancer in Jamaica and Mr Alexander Anderson in St Vincent's.

14. 15. The *Cinerea a*; & *Pinnata* Caliaw bushes. These species are common about Kingston and Spa-fig. 4, in both Jamaica and rife by blender trunks to about 20 feet. Dr Roxburgh of Madras, amongst a number of useful discoveries, has found the lac in Torn on this subject. 

16. The *Scardens*, caconos, or maroooyh witch (Gigalosium fandens, Brown's Jam. p. 362. Paphosus maximus perennis, Sloane's Cat. 68. Perin Kaku-valli, H. M. vii. 3. & see 3. 4.) This species of mimosa is frequent in all the upland valleys and woodlands on the north side of Jamaica. It climbs up the tallest trees, and spreeds itself in every direction by means of its cirris or claspers, so as to form a complete arbour, and to cover the space of an English acre from one root. This circumstance has a bad effect on the trees or bushes to shed. Light, air, and rain (so necessary for all plants), being shut out, the leaves drop off, the tree gradually rots, and the limbs fall down by the weight of this parasite.

Several authors have mentioned the cacon; but their descriptions of the plant, and particularly the figures, are erroneous. On that account we have given a figure from the herbarium of a gentleman long resident in Jamaica: and the following are the characters, fig. 3, transcribed from his field notes.

The roots of this plant run superficially under the ground or herbage. The trunk is seldom thicker than a man's thumb, and sends off many branches, with numerous shining green leaves, each of which terminates in a tendril or clawer, that serves to fasten it to trees or bushes. The flower-spikes are from the axil: they are slender, and the florets on them small and numerous. The pod is perhaps the largest and longest of any other in the world; being sometimes eight or nine feet in length, five inches broad, jointed, and containing 10 or 15 seeds. These seeds are brown, shining, flattened, and very hard, and called cardoon. They are the same mentioned in the Philosophical Transactions, No. 222, page 296, by Sir Hans Sloane, as being thrown ashore on the Hebrides and Orkneys. This happens in the following manner: The seeds or beans fall into the eastward till they fall into the gulf stream, which forces them northward along the coast of America and the Bahama islands. As the winds blow frequent and strong from America, these seeds are driven to the eastward, till at length they are thrown ashore and left with the tide as aforesaid.

This bean, after being long soaked in water, is boiled and eaten by some negroes; but, in general, there seems to be no other use made of it than as a sort of snuff-box.


17. The Catechu, according to Mr Ker, grows only to 12 feet in height, and to one foot in diameter; it is covered with a thick rough brown bark, and towards the top divides into many close branches: the leaves are bipinnated, or doubly winged, and are placed alternately upon the younger branches: the partial pinnae are nearly two inches long, and are commonly from 15 to 30 pairs; having small glands inserted between the pinnae: each wing is usually furnished with about 40 pairs of pinnule or linear lobes, beft with short hairs: the spines are short, recurved, and placed in pairs at the bases of each leaf: the flowers are hermaphrodite and male, and stand in clove spikes, which arise from the axil of the leaves, and are about four or five inches long: the calyx is tubular, hairy, and divides at the limb into five ovate pointed segments: the corolla is monopetalous, white, and of the same form as the calyx, but twice its length: the filaments are numerous, capillary, double the length of the corolla, adhering at the base of the germ, and crowned with roundish anthers: the germ is ovate, and supports a slender style, which is of the length of the filaments, and terminated by a simple stigma: the fruit, or pod, is lance-shaped, brown, smooth, compressed, with an undulated thin margin; it contains six or eight roundish flattened seeds which produce a nauseous odour when chewed. From this tree, which grows plentifully on the mountains in India, where it flowers in June, is produced the official drug long known in Europe by the name of terra japonica; for the history and preparation of which, see the article Terra japonica.

18. The Niloticus, or true Egyptian acacia, rises to a greater height than the preceding: the bark of the trunk is smooth, and of a grey colour; that of the branches has commonly a purplish tinge: the leaves are bipinnated, and placed alternately: the partial pinnae are opposite, furnished with a small gland between the outermost pair, and beft with numerous pairs of narrow elliptical pinnule, or leaflets: the spines are long, white, spreading, and proceed from each side of the base of the leaves: the flowers are hermaphrodite and male: they assume a globular shape, and stand four or five together upon slender peduncles, which arise from the axil of the leaves: the calyx is small, bell-shaped, and divided at the mouth into five minute teeth: the corolla consists of five narrow yellowish segments: the filaments are numerous, capillary, and furnished with roundish yellow antherae: the germ is conical, and supports a slender style, crowned with a simple stigma: the fruit is a long pod, resembling that of the lupin, and contains many flatish, brown seeds. It is a native of Arabia and Egypt, and flowers in the rivers, and by the sea.

Although the mimosa nilotica grows in great abundance over the vast extent of Africa, yet gum arabic is produced chiefly by those trees, which are situated near the equatorial regions; and we are told, that in Lower Egypt the solar heat is never sufficiently intense for this purpose. The gum exudes in a liquid from the bark of the trunk and branches of the tree, in a similar manner to the gum which is often produced upon the cherry-trees &c. in this country; and by exposure to the air it soon acquires solidity and hardness. In Senegal the gum begins to flow when the tree first opens its flowers; and continues during the rainy season till the month of December, when it is collected for the first time. Another collection of the gum is made in the month of March, from incisions in the bark, which the extreme dryness of the air at that time is said to render necessary. Gum arabic is now usually imported into England from Barbary; not packed up in skins, which was the practice in Egypt and Arabia, but in large casks or hogheads. The common appearance of this gum is well known; and the various figures which it assumes seem to depend upon a variety of accidental circumstances attending its transudation and concretion. Gum Arabic of a pale yellowish colour is most esteemed; on the contrary, those pieces which are large, rough, of a roundish figure, and of a brownish or reddish hue, are found to be less pure, and are said to be produced from a different species of mimosa (M. Senegal); but the Arabian and Egyptian gum is commonly intermixed with pieces of this kind, similar to that which comes from the coast of Africa near the river Senegal.

Gum-arabic does not admit of solution by spirit or oil, but in twice its quantity of water it dissolves into a mucilaginous fluid, of the complexion of a thick syrup; and in this state answers many useful pharmaceutical purposes; by rendering oily, refractive, and pungent substances, miscible with water. The glutinous quality of gum-arabic is preferred to most other gums and mucilaginous substances; as a demulcent in coughs, hoarseness, and other catarrhal affections, in order to obtund irritating acrimonious humours, and to supply the loss of abraded mucus. It has been very generally employed in decoctions of ardent urine and stranguary;
Mimosa nilotica

Mimosa Quadra

Plate CCCXL.
Mimosa (non-descript)

Plate CCCXII

Copied from Capt. Paterson's Travels

R. Scott & S. Wardice
MINAGNHINIM, a pulifilable instrument of music, among the Hebrews, which was a square table of wood, fitted with a handle; over this table was stretched an iron chain, or hempen cord, passing thro’ balls of wood or brass, which struck against the table when the instrument was struck, and occasioned a clear sound, which might be heard at a great distance. See Kircher’s figure of it in Plate CCCXIV.

MINCHA, in the Jewish customs, offerings of meal, cakes, or biscuits, made in the temple of the Lord. The Seventy have sometimes preferred this word in their translation; but instead of mincha they read mana, which doublets was the received pronunciation in their time. We find mana in the same sense, in Baruch i. 10. Levit. ii. 3. &c. See the Greek of Jerem. xvii. 26. Dan. ii. 46. 2 Kings viii. 5, 9, xvii. 2. xx. 12. 2 Chron. vii. 7. Nehem. xiii. 5, 9, &c.

MINCHING-HAMPTON, a town of Gloucestershire, 20 miles from Bath and Bristol, and near 90 from London, with a market on Tuesdays, and two fairs. The parifh is pretty large, being bounded or hempen, cord, passing thro’ balls of wood or brass, which struck against the table when the instrument was struck, and occasioned a clear sound, which might be heard at a great distance. See Kircher’s figure of it in Plate CCCXIV.

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MINDELHEIM, a district of Germany, in Suabia, lying between the bishopric of Augsburg and the abbey of Kempten, which is 20 miles in length and 16 in breadth.

MINDELHEIM, a town of Germany, in the circle of Weftphalia, lies in the circle of Weftphalia, to the north of the circle of Ravenberg, and along each side of the river Wefer. It is about 22 miles square, and Minden and Peterfagen are the principal places. It was formerly a biphopic, but is now secularized; and was ceded to the elector of Brandenburg by the treaty of Weftphalia.

MINDORA, an island of Asia, in the East Indies, and one of the Philippines, 50 miles in circumference, and separated from Luconia by a narrow channel. It is full of mountains, which abound in palm-trees and all sorts of fruits. The inhabitants are idolaters, and pay tribute to the Spaniards to whom this island belongs.

MINE, in natural history, a deep pit under ground, from whence various kinds of minerals are dug out; but the term is more particularly applied to those which yield metals. Where flones only are procured, the appellation of quarries is universally bestowed upon the places from which they are dug out, however deep they may be.

The internal parts of the earth, as far as they have been yet investigated, do not consist of one uniform substance, but of various strata or beds of substances, extremely different in their appearances, specific gravities, and chemical qualities, from one another. Neither are these strata similar to one another either in their nature or appearance in different countries; so that even in the short extent of half a mile, the strata will be found quite different from what they are in another place. As little are they the same either in depth or solidity. Innumerable cracks and fissures, by the miners called lodges, are found in every one of them; but these are so entirely different in size and shape, that it is impossible to form any inferences from their size in one place to that in another. In these, lodges or fissures the metallic ore is met with; and considering the great uncertainty of the dimensions of the lodes, it is evident that the business of mining, which depends on that size, must in like manner be quite uncertain and precarious. Mr Price, in his treatise on the Cornish mines, observes, that "the comparative smallness of the largest fissures to the bulk of the whole earth is really wonderful. In the finest pottery we can make, by a microscopic view, we may discover numerous cracks and fissures, so small as to be imperceptible by any fluid, and impervious to the naked eye."
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necessary and useful as the strata through which they pass. They are the drains that carry off the redundant moisture from the earth; which, but for them, would be too full of fens and bogs for animals to live or plants to thrive on. In these fissures, the several ingredients which form lodes, by the continual pilling of waters, and the menstrua of metals, are brought out of the adjacent strata, collected and conver- 
"nently located in a narrow channel, much to the advantage of those who search for and pursue them; for if metals and minerals were more dispersed, and scattered thinly in the body of the strata, the trouble of finding and getting at them would be endless, and the expense of procuring them exceed the value of the acquisition.

The insides of the fissures are commonly coated over with a hard, crystalline, earthy substance or rind, which very often, in the breaking of hard ore, comes off along with it, and is commonly called the capes or rails of the lode: but Mr Price is of opinion, that the proper walls of the lode are the sides of the fissure itself, and not the coat just mentioned, which is the natural plaster upon those walls, furnished perhaps by the contents of the fissures, or from oozings of the surrounding strata.

The breadth of a lode is easily known by the distance betwixt the two incrusted sides of the stones of ore; and if a lode yields any kind of ore, it is a better sign that the walls be regular and smooth, or at least that one of them be so, than otherwise; but there are not many of these fissures which have regular walls until they have been sunk down some fathoms.

Thus the inner part of the fissure in which the ore lies, is all the way bounded by two walls of stone, which are generally parallel to one another, and include the breadth of the vein or lode. Whatever angle of inclination some fissures make in the solid strata at their beginning, they generally continue to do the same all along. Some are very uncertain in their breadth, as they may be small at their upper part and wide underneath, and vice versa. Their regular breadth, as well as their depth, is subject to great variation; for though a fissure may be many fathoms wide in one particular place, yet a little further would it not perhaps be one inch wide. This excessive variation happens generally in very compact strata, when the vein or fissure is squeezed, as it were, through hard rocks which seem to compress and straiten it. A true vein or fissure, however, is never entirely obliterated, but always shews a string of metallic ore or of a veiny substance; which often serves as a leader for the miners to follow until it sometimes leads them to a large and richly impregnated part. Their length is in a great measure unlimited, though not the space bett fit for yielding metal. The richest flate for copper, according to Mr Price, is from 4o to 8o fathoms deep; for tin, from 2o to 6o; and though a great quantity of either may be raised at 8o or 10o fathoms, yet "the quality (says our author) is often too much decayed and dry for metal."

Mr Price informs us, that the fissures or veins of the Cornish mines extend from east to west; or, more properly, one end of the fissure points west and by north, or east and by south; while the other tends west and by north; thus they frequently pass through a considerable tract of country with very few variations in their directions, unless they are interrupted by some intervening cause.

But, besides this east and west direction, we are to consider what the miners call the underlyng or base- line of the vein or lode; viz. the deflection or deviation of the fissure from its perpendicular line, as it is followed in depth like the slope of the roof of a house, or the descent of the steep side of a hill. This fissure is generally to the north or south; but varies much in different veins, or sometimes in the same vein: for it will frequently slope or underlie a small space in different ways, as it may appear to be forced by hard strata on either side.—Some of the fissures do, not vary much from a perpendicular, while some deviate more than a fathom; that is, for every fathom they descend in perpendicular height, they deviate likewise as much to the south or north. Others differ so much from the perpendicular, that they assume a position almost horizontal; whence they are also called horizontal or flat lodes, and sometimes lode plots. Another kind of these has an irregular position with respect to the rest; widening horizontally for a little way, and then descending perpendicularly almost like flairs, with only a small string or leader to follow after; and thus they alternately vary and yield ore in several flat or horizontal fissures. This, by the Cornish tanners, is called (but in Mr Price's opinion erroneously) a floor or floor; which, properly speaking, is a hole or cavity impregnated with metal, making no continued line of direction or regular walls. Neither does a floor of ore descend to any considerable depth; for underneath it there appears no sign of a vein or fissure, either leading directly down or any other way. This kind of vein is very rare in Britain. The fissures most common in Britain are the perpendicular and inclined, whether their direction be north or south, east or west.

The perpendicular and horizontal fissures (according to our author) probably remain little altered from their first position, when they were formed, at the inundation of the strata immediately after the waters left the land. The perpendicular fissures are found more commonly situated in level ground, at a distance from hills, and from the sea-coast; but, with regard to the latter, we find that the upper and under masses of strata differ in their solidity and other properties.

"Hence, (says our author) it is very plain, that inclined fissures owe their deflection or underlie to some secondary cause, violence, or subduction, of the earth; for though perpendicular fissures are seldom to be seen, yet such as are inclined at very considerable depths, become more and more perpendicular as the more central strata, by reason of the vaft superincumbent weight, do not seem so likely to be driven out of their position as thefe which lie nearer the surface."

The fissures are often met with fractured as well as inclined; the reason of which, in Mr Price's opinion, has been a subduction of the earth from some extraordinary cause. "The original position (says he) must have been horizontal, or parallel to the surface of the earth: but we often find these strata very sensibly declined from that first position; now, some-
times quite reversed, and changed into perpendicular. When we see a wall lean, we immediately conclude that the foundation has given way, according to the angles which the wall makes with the horizon; and when we find the like declination in strata, we may conclude, by parity of reason, that there has been a like failure of what supported them, in proportion to that declination; or that whatever made the strata to fall so much awry, must also cause every thing included in those strata to fall proportionally. Wherever the greatest subsidence is to the north, the top of the strata will point to the north, and of consequence underlie to the south, and wherever the sequence underlie to the south, and in general, where a vein has a bad appearance at first, it will be imprudent to be at much expense with it.

Veins of metal, as has been already observed, are frequently, as it were, so comprised betwixt hard strata, that they are not an inch wide; nevertheless, if they have a string of good ore, it will generally be worth while to pursue them; and they frequently turn out well at last, after they have come into softer ground. In like manner, it is an encouragement to go on, if the branches or leaders of ore enlarge either in width or depth as they are worked; but it is a bad sign if they continue horizontal without inclining downwards; though it is not proper always to discontinue the working of a vein which has an unfavourable aspect at first. Veins of tin are worth working when only three inches wide, provided the ore be good; and copper ores when six inches wide will pay very well for the working. Some of the great mines, however, have very large veins, with a number of other small ones very near each other. There are also veins creffing one another sometimes met with, which are called contras, vulgarly cantours. Sometimes two veins run down into the ground in such a manner that they meet in the direction of their depth; in which case, the same observations apply to them which are applicable to those that meet in a horizontal direction. Sometimes a vein will suddenly disappear without giving any warning, by becoming narrower, or of worse quality; which by the miners is called a flint or leap, and is very common in the mines of Cornwall. In one day’s time they may thus be disappointed in the working of a rich vein of tin, and have no further sign of any thing to work upon: at the fractured extremity of their vein they perceive a body of clay or other matter; and the method of recovering their vein is to drive on their work in the direction of the former part, so that their new work shall make the same angle with the clay that the other part of the vein does. Sometimes they sink a shaft down from the surface; but it is generally a matter of difficulty to recover a vein when thus lost.

The method of discovering mines is a matter of so much difficulty, that it seems surprizing how those who were totally unacquainted with the nature of metals first came to think of digging them out of the earth. According to Lucretius, the discovery was made by the conflagration of certain woods, which melted the veins of metal in the earth beneath them; but this seems to be rather improbable. Aristotle, however, is of the same opinion with Lucretius, and tells us, that some shepherds in Spain, having set fire to the woods, the earth was thus heated to such a degree, that the silver near the surface of it melted and flowed into a mass; and that in a short time the metallic mass was discovered by the rending of the earth in the time of an earthquake: and the same story is told by Strabo, who ascribes the discovery of the mines of Andalusia to this accident. Cadmus is said by some to have been the first who discovered gold; while others ascribe this to Thoas the Thracian, to Mercury the son of Jupiter, or to Piuis king of
of Egypt; where he having left his own country, went into
Egypt, where he was elected king after the death of
Mizraim the son of Ham: and, on account of his dis-
covery, was called the Golden God. Others say, that
Ecalis or Eactus the son of Jupiter, or Sol the son of
Oceanus, was the first discoverer; but Ephesides attri-
butes the discovery not only of gold, but of all other
metals, to Prometheus. The bronzes and copper mines
mines of
Cyprus were first discovered by Cinara the son of
Agryopa; and Hesiod ascribes the discovery of the iron
mines of Crete to the Cretan Daedylus Ideri. The ex-
traction of lead or tin from its ore in the island of
Caffite, according to several ancient authors, was
discovered by Midacritus.—The scripture, however,
avcribes the invention of bronzes and iron, or at least
of the methods of working them, to Tubal Cain before
the flood.

In more modern times, we know that mines have
been frequently discovered by accident; as in sea-cliffs,
among broken craggy rocks, by the washing of the
tides or floods, also by irrigations and torrents of wa-
ter issuing out of hills and mountains, and sometimes
by the wearing of high roads. Mr Price mentions
another way by which mines have been discovered, ea-
by fiery corruptions; which he says, he has heard
from persons whose veracity he is unwilling to
question. "The timbers (says he) generally compare
these effluvia to blazing stars or other whimsical like-
nesses, as their fears or hopes suggest; and search with
uncommon eagerness the ground over which these
jack-a-lanterns have appeared and pointed out. We
have heard but little of these phenomena for many
years; whether it be, that the present age is credu-
lous than the foregoing, or that the ground being
more perforated by innumerable new pits funk every
year, some of which, by the flannary laws, are pre-
vented from being filled up, has given these vapours a
more gradual vent, it is not necessary to enquire as to
the fact itself is not generally believed."

Mines, however, are now most commonly discovered
by investigating the nature of such veins, ores, and
stones, as may seem most likely to turn to account;
but there is a particular sagacity, or habit of judging
from particular signs, which can be acquired only by
long practice. Mines, especially those of copper, may
also be discovered by the harsh and disagreeable taste
of the waters which issue from them; though it is pro-
able that this only happens when the ore lies above
the level of the water which breaks out; for it does
not seem likely that the taste of the ore could afcour,
unless we were to suppose a pond or lake of water
standing above it. The presence of copper in any wa-
ter is easily discovered by immersing in it a bit of po-
Iified iron, which will thus instantly be turned of a
copper colour, by reason of the precipitation of the
metal upon it. A candle, or piece of tallow put into
water of this kind, will in a short time be tinged of a
green colour.

Another and still more remarkable method of dis-
covering mines is said to be by the virgula divinatoria,
or "divining rod;" which, however incredible the flo-
ries related concerning it may be, is still relied on
by some, and among others by Mr Price. It is not
known who was the inventor of this method; but A-
gricola supposes that it took its rise from the magi-
cians, who pretended to discover mines by enchantment.

It is mentioned of it, however, before the 11th
century, since which time it has been frequently used;
and the Copricular Philosophy has even been called
in to account for it. But before we pretend to ac-
count for phenomena so very extraordinary as those
reported of the virgula divinatoria, it is necessary, in
the first place, to determine whether or not they exist.
Mr Price has been already hinted, believes in it,
though he owns that by reason of his constitution of
mind and body he is almost incapable of co-operating
with its influence. The following account, however,
gives from Mr William Cookworthy of Plymouth,
a gentleman of known veracity and great chemical
abilities.

He had the first information concerning this rod
from one Captain Ribeira, who deferted from the
Spanish service in Queen Anne's reign, and became
captain-commandant in the garrison of Plymouth; in
which town he satisfied several intelligent persons of
the virtues of the rod, by many experiments on pieces
of metal hid in the earth, and by an actual discovery
of a copper mine near Oakhampton, which was wrought
for some years. This captain very readily showed the
method of using the rod in general, but would not by
any means discover the secret of distinguishing the dif-
ferent metals by it; though, by a constant attention
to his practice, Mr Cookworthy discovered it. Cap-
tain Ribeira was of opinion, that the only proper rods
for this purpose were those cut from the nut or fruit-
trees; and that the virtue was confined to certain per-
sons, and those comparatively speaking but few:
but Mr Price says that the virtue resides in all per-
sons and in all rods under certain circumstances.
"The rod (says he) is attracted by all the metals, by
coals, limetones, and springs of water, in the follow-
5. Tin; 6. Lead; 7. Coals; 8. Limetone and springs
of water. One method of determining the different
attractions of the rod is this: Stand, holding the rod
with one foot advanced; put a guinea under that
foot, and an halfpenny under the other, and the rod will
be drawn down; shift the pieces of money, and the
rod will be drawn towards the face, or backwards to
the gold, which proves the gold to have the stronger
attraction.

"The rods formerly used were shoots of one year's
growth that grew forked; but it is found, that two
separate shoots tied together with packthread or other
vegetable substance answer rather better than such as
are naturally forked, as the shoots of the latter are
defiled of an equal frize. They are to be tied together
by the greater ends, the small ones being held in the
hands. Hazle rods cut in the winter, such as are ufed
for fishing rods, and kept till they are dry, do bef-
though, where these are not at hand, apple-tree fik-
cers, rods from peach trees, currants, or the oak, though
green, will answer tolerably well."

Our author next proceeds to describe the manner of
holding the rod; of which he gives a figure, as he says
it is difficult to be described. The small ends being
crooked, are to be held in the hands in a position flat
or parallel to the horizon, and the upper part in an
elevation not perpendicular to it, but at an angle of
about 70 degrees. "The rod (says he) being per-

The toe of the right foot is within the femidiameter of the piece of metal or other subj ect of the rod, it will be repelled towards the face, and continue to be so while the foot is kept from touching or being directly over the subj ect; in which case it will be fe n s iti bly and strongly attracted, and be drawn quite down. The rod should be firmly and steadily grasped; for if, when it has begun to be attracted, there be the least imaginable jerk or opposition to its attraction, it will not move any more till the hands are opened, and a fresh grasp taken. The stronger the grasp the livelier the rod moves, provided the grasp be steady and of an equal strength. This observation is very necessary; as the operation of the rod in many hands is defeated purely by a jerk or counteraction: and it is from thence concluded, that there is no real efficacy in the rod, or that the person who holds it wants the virtue: whereas, by a proper attention to this circumstance in using it, five persons in fix have the virtue, as it is called; that is, the nut or fruit-bearing rod will an s wer in their hands. If a rod, or the least piece of one of the nut-bearing or fruit kind, be put under the arm, it will totally destroyed the operation of the virgula divinatoria, in regard to all the subj ects of it, except water, in th ose hands in which the rod naturally operates. If the least animal thread, as filk, or worsted, or hair, be tied round or fixed on the top of the rod, the same subst ances tied round or fixed on the top of the rod, will make it work in those hands, in which without these additions it is not attracted."

Such are the accounts of this extraordinary rod, to which it is probable that few will attent; and we believe the instances of mines having been discovered by it to be but very rare. Another and very ancient mode of discovering mines, less certain than the divining rod, but extremely difficult and precarious, is that called floating; that is, tracing them by loose stones, fragments, or fleot, which may have been separated and carried off to a considerable distance from the ve in, and are found by chance in running waters, on the superficies of the ground, or under the skirts of the mountains, and there found many times both middling fort of stones and small ones also of metal. Then they consider the situation of that place, and whence these stones can tumble, which of necessity must be from higher ground, and follow the track of them up the hill as long as they can find any of them," &c.

"Another way (says Mr Price) of discovering lodes is by working drifts across the country, as we call it, that is, from north to south, and vice versa. I tried the experiment in an adventure under my management, where I drove all open at grafs about two feet in the field, very much like a level to convey water upon a mill wheel: by so doing I was sure of cutting all lodes in my way; and did accordingly discover five cour ses, one of which has produced above 180 tons of copper ore, but the others were never wrought upon. This method of discovering lodes is equally cheap and certain; for 100 fathoms in shallow ground may be driven at 50 s. expense.

In that kind of ground called by our author favible, and which he explains by the phra se tender flanding, he tells us, that "a very effectual, proving, and confquential way is, by driving an adit from the lowest ground, either north or south; whereby there is a certainty to cut all lodes at 50, 30, or 40 fathoms deep, if the level admits of it. In driving adits or levels across, north or south, to unwater mines already found, there are many fresh veins discovered, which frequently prove better than those they were driving to."

After the mine is found, the next thing to be con sidered is, whether it may be dug to advantage. In order to determine this, we are duly to weigh the nature of the place, and its situation, as to wood, water, carriage, healthiness, and the like; and compare the result with the richness of the ore, the charge of digging, stamping, washing, and smelting.

Particularly the form and situation of the spot should be well considered. A mine must either happen, 1. In a mountain; 2. In a hill; 3. In a valley; or, 4. In a flat. But mountains and hills are dug with much greater ease and convenience, chiefly because the drains and burrows, that is, the adits or avenues, may be here readily cut, both to drain the water and to form gang-ways for bringing out the lead, &c. In all the four cases, we are to look out for the veins which the rains or other accidental thing may have hid bare; and if such a vein be found, it may be proper to open the mine at that place, especially if the vein prove tolerably large and rich: otherwise the most commodious place for situation is to be chosen for the purpose, viz. neither on a flat, nor on the tops of mountains, but on the sides. The best situation for a mine, is a mountaneous, woody, wholesome spot; of a face easy ascent, and bordering on a navigable river.
The places abounding with mines are generally healthy, as standing high, and every where exposed to the air; yet some places where mines are found prove poisonous, and can upon no account be dug, though ever so rich; the way of examining a suspected place of this kind, is to make experiments upon brutes, by exposing them to the effluvia or exhalations to find the effects.

Devonshire and Cornwall, where there are a great many mines of copper and tin, is a very mountainous country, which gives an opportunity in many places to make adits or subterraneous drains to some valley at a distance, by which to carry off the water from the mine, which otherwise would drown them out from getting the ore. These adits are sometimes carried a mile or two, and dug at a vast expense, as from 2000 l. to 4000 l. especially where the ground is rocky; and yet they find this cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty and the mine is deep. Sometimes, indeed, they cannot find a level near enough to which an adit may be carried from the very bottom of the mine; yet they find it worth while to make an adit at half the height to which the water is to be raised, thereby saving half the expense.

The late Mr. Collar, considering that sometimes from small streams, and sometimes from little springs or collections of rain-water, one might have a good deal of water above ground, thought not a sufficient quantity to turn an overhot-wheel, thought that if a sufficient fall might be had, this collection of water might be made useful in raising the water in a mine to the adit, where it may be carried off.

But now the most general method of draining mines is by the steam-engine. See Steam-Engine.

Mine, in the military art, denotes a subterraneous canal or passage, dug under the wall or rampart of a fortification, intended to be blown up by gunpowder.

The alley or passage of a mine is commonly about four feet square; at the end of this is the chamber of the mine, which is a cavity of about five feet in width and in length, and about six feet in height; and here the gunpowder is flowed. The passage of the mine is the trail, for which there is always a little aperture left.

Two ounces of powder have been found, by experiment, capable of raising two cubic feet of earth; consequently 200 ounces, that is, 12 pound 8 ounces, will raise 200 cubic feet, which is only 16 feet short of a cubic toise, because 200 ounces joined together have proportionally a greater force than 2 ounces, as being an united force.

All the turnings a miner uses to carry on his mines, and through which he conducts the sucs, should be well filled with earth and dung; and the masonry in proportion to the earth to be blown up, as 3 to 2. The entrance of the chamber of the mine ought to be firmly shut with thick planks, in the form of a St. Andrew's cross, so that the inclosure be secure, and the void spaces shut up with dung or tempered earth. If a gallery be made below or on the side of the chamber, it must absolutely be filled up with the strongest masonry, half as long again as the height of the earth; for this gallery will not only burst, but likewise obstruct the effect of the mine. The powder should always be kept in sacks, which are opened when the mine is charged, and some of the powder fired about: the greater the quantity of earth to be raised is, the greater is the effect of the mine, supposing it to have the due proportion of powder. Powder has the same effect upon masonry as upon earth, that is, it will proportionably raise either with the same velocity.

The branches which are carried into the solidity of walls do not exceed three feet in depth, and two feet six inches in width nearly; this fort of mine is most excellent to blow up the strongest walls.

The weight of a cubic foot of powder should be 80 lb. 1 foot 1 inch cube will weigh 100 lb. and 1 foot 2 inches and 1/4, 150 lb. and 20 lb. of powder will be 1 foot 5 inches cube; however, there is a diversity in this, according to the quantity of saltpetre in the gunpowder.

If, when the mines are made, water be found at the bottom of the chamber, planks are laid thereon, upon which the powder is placed either in sacks or barrels of 100 lb. each. The fausilfes must have a clear passage to the powder, and be laid in an auger or wooden trough, through all the branches. When the powder is placed in the chamber, the planks are laid to cover it, and others again across these; then one is placed over the top of the chamber, which is shaped for that purpose: between that and those which cover the powder, props are placed, which shore it up; some inclining towards the outside, others to the inside of the wall; all the void spaces being filled with earth, dung, brick, and rough stones. Afterwards planks are placed at the entrance of the chamber, with one across the top, whereon they buttress three strong props, whose other ends are likewise propped against another plank situated on the side of the earth in the branch; which props being well fixed between the planks with wedges, the branch should then be filled up to its entrance with the aforesaid materials. The fausilfes which pass through the sides of the branches which pass through the sides of the branches must be exactly the same length with that in the middle, to which they join; the part which reaches beyond the entrance of the mine is that which conveys the fire to the other three; the fausilfes being of equal length, will spring together.

From a great number of experiments, it appears, 1. That the force of a mine is always towards the weakest side; so that the disposition of the chamber of a mine does not at all contribute to determine this effect. 2. That the quantity of powder must be greater of less, in proportion to the greater or less weight of the bodies to be raised, and to their greater or less cohesion; so that you are to allow for each cubicathom

| Of loose earth, | - | 9 or 10 lb. |
| Firm earth and strong sand, | 11 or 12 |
| Flat clayey earth, | 15 or 16 |
| New masonry, not strongly bound, | 15 or 20 |
| Old masonry, well, | 25 or 30 |

3. That the aperture, or entonnoir of a mine, if rightly changed, is a cone, the diameter of whose base is double the height taken from the centre of the mine.

4. That when the mine has been overcharged, its entonnoir is nearly cylindrical, the diameter of the upper
Mineral waters, properly so called, are those in which gas, or sulphureous, saline, or metallic substances, are discovered by chemical trials. As many of these waters are employed successfully in medicine, they are also called medicinal waters.

Mineral waters receive their peculiar principles by passing through earths containing salts, or pyritous substan­ces that are in a state of decomposition. Some of these waters are valuable from the quantity of useful salts which they contain, particularly of common salt, great quantities of which are obtained from these waters; and others are chiefly valued for their medicinal qualities. The former kind of mineral waters is an object of manufacture, and from them is chiefly extracted that salt only which is most valuable in commerce. See Salt.

Many of those waters have been accurately analyzed by able chemists and physicians. But notwithstanding these attempts, we are far from having all the certainty and knowledge that might be defined on this important subject; for this kind of analyses is perhaps the most difficult of any in chemistry.—Almost all mineral waters contain several different substan­ces, which being united with water may form with each other numberless compounds. Frequently some of the principles of mineral waters are in so small a quantity, that they can scarcely be perceived; although they may have some influence on the virtues of the water, and also on the other principles contained in the water.—

The chemical operations used in the analyses of mineral waters, may sometimes occasion essential changes in the substances that are to be discovered. And also, these waters are capable of suffering very-considerable changes by motion, by heat, and by exposure to air.

Probably also the variations of the atmosphere, subterranean changes, some secret junction of a new spring of mineral or of pure water, lastly the exhaustion of the minerals whence waters receive their peculiar principles, are causes which may occasionally change the quality of mineral waters.

We need not therefore wonder that the results of analyses of the same mineral waters made by different chemists, whose skill and accuracy are not questioned, should be very different.

The consequences of what we have said on this subject are, That the examination of mineral waters is a very difficult task; that it ought not to be attempted but by profound and experienced chemists; that it requires frequent repetitions, and at different times; and lastly, that no fixed general rules can be given concerning these analyses.

As this matter cannot be thoroughly explained without entering into details connected with all the parts of chemistry, we shall here mention only the principal results, and the most essential rules, that have been indicated by the attempts hitherto made on this subject.

We may admit the division or arrangement of mineral waters into certain clastics, proposed by some of the best chemists and naturalists.

Some of these waters are called cold, because they are not naturally hotter than the atmosphere. Some of them are even colder, especially in summer. Those are called hot mineral waters, which in all seasons are hotter than the air. These are of various degrees of heat, and some of them are almost as hot
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Mineral. as boiling water. In some mineral waters certain volatile, spirituous, and elatic principles may be perceived, by a very sensible piquant taste: this principle is called the gas or spirit of the waters.

The waters which contain this principle are generally lighter than pure water. They sparkle and emit bubhles, at their spring, but especially when they are shaken, and poured from one vessel into another. They sometimes break the bottles containing them, when these are well corked, as fermenting wines sometimes do. When mixed with ordinary wine, they give to it the piquancy and sparkling quality of Champaigne wine.

This volatile principle, and all the properties of the water dependent upon it, are lost merely by exposure to air, or by agitation. The waters containing this principle are distinguished by the name of spirituous mineral waters, or acidulous waters.

Other divisions of mineral waters may be made relatively to some of their predominant principles. Hence some waters are called acidulous, alkaline, martial, neutral, &c.

When a mineral water is to be examined, we may observe the following rules:

Experiments ought to be made near the spring, if possible.

The situation of the spring, the nature of the soil, and the neighbouring rising grounds, ought to be examined.

Its sensible qualities, as its smell, taste, colour, are to be observed.

Its specific gravity and heat are to be ascertained by the hydrostatical balance and the thermometer.

From the properties abovementioned of spirituous mineral waters, we may discover whether it be one of this class. For greater certainty we may make the following trial. Let the neck of a wet bladder be tied to the neck of a bottle containing some of this water. By shaking the water, any gas that it may contain will be disengaged, and will swell the bladder. If the neck of the bladder be then tied with a string above the bottle, and be cut below this string, so as to separate the bladder from the bottle, the quantity and nature of the contained gas may be further examined.

Lastly, we must observe the changes that are spontaneously produced upon the water in close and open vessels, and with different degrees of heat. If by these means any matter be crystallized or deposited, it must be set apart for further examination.

These preliminary experiments and observations will almost certainly indicate, more or less definitely, something concerning the nature of the water, and will point out the method to be followed in our further inquiry.

We must then proceed to the decomposition of the water, either without addition, and merely by evaporation and distillation, or with the addition of other substances, by means of which the matters contained in the water may be precipitated and discovered. It is not material which of these two methods be first practiced, but it is quite necessary that the one should succeed the other. If we begin by evaporating and distilling, these operations must be sometimes interrupted, that the several principles which rise at different times of the distillation may be obtained and examined separately, and also to allow the several faults that may be contained to crystallize by the evaporation and by cold.

The substances which have hitherto been met with in mineral waters are,

1. Vitriolic Acid. This acid is sometimes found pure and unmixed with any other substance, though more frequently joined with iron or copper. In its pure state, it is most frequently found in the neighbourhood of volcanoes, where, in the opinion of Dr Donald Monro, it is most probably “distilled from mines of vitriol or of pyrites-stone, decomposed by subterranean fire.” It seems, however, more probably to proceed from the decomposition of sulphur; for neither vitriol nor pyrites will at all give a pure acid. This only can be obtained from the fumes of sulphur, which we know abound in all such places. Dr Vandellius, in a book intitled De Thermis Agri Patavini, published in 1761, mentions a cave near to the town of Latera, about 30 miles from Viterbo, in Italy, where a clear acid water drops from the crevices of the rocks, and is collected by the country people in glazed earthen vessels. This has a mild agreeable taste, and is found to be a pure vitriolic acid much diluted. The cavern, however, is so filled with noxious vapours, that it cannot be entered without danger of suffocation, except in winter, or when it blows a north wind. A similar native vitriolic water is mentioned by Theophilus Griflionius, near the town of Salvena. Varenius also mentions a spring in the province of Nota in Sicily, the waters of which are so pure, that the neighbouring people use it instead of vinegar. In some waste coal pits, the water takes four, and effervesces with alkalis; but in all these the acid is mixed with much vitriol, or other matter. Dr Monro mentions acid dews collected in the East Indies: this acid he supposes to be the vitriolic, and that it probably imparts some acidey to waters upon which the dews fall.

2. Nitrous and marine acids are never found in waters pure, though the former is frequently found combined with calcareous earth, and the latter with fojuble alkali, calcareous earth, or magnesia.

3. Fixed air enters into the composition of all waters; but abounds particularly in those of the mineral kind, at least such as are cold. It imparts an agreeable acidulous taste to fuch water as it is mixed with, and is found by undoubted experiments to be that which gives the power and efficacy to the cold kind. It is known to be a solvent of iron, and that by its means this metal is very often dissolved in waters; and Dr Dejean of Leyden, in a letter to Dr Monro in the year 1777, supposes it to be the medium by which sulphur also is dissolved. “Having been lately at Aix-La-Chapelle (says he), I mixed a solution of arzenic in the marine acid with some of the water of the emperor’s bath, and immediately a true and genuine sulphur was precipitated to the bottom of the vessel in which the water was contained: which convinced me that the sulphur was dissolved by means of fixed air, though Sir Torbern Bergman thinks otherwise, and that the sulphur is suspended by means of phlogiston, and the matter of heat united in the waters; and he says, that if the concentrated nitrous acid be added to these waters, it feizes the phlogiston, precipitates the sulphur, and takes away the hepaticinal.” If sulphur is by this medium suspended in
indeed, grains, that duum be alkali. Think that it is a native frequently found along with it in the same water. These are very much impregnated with this acid, and are thought to be native of. Dr Nichola Andrea speaks of a water at Selliata, in Calabria, which is so strongly impregnated with this kind of salt, that he thinks it would be worth while to prepare it from thence in the way of trade. It is very probable that such waters are frequently to be met with in countries where the soil is impregnated with mineral alkali.

7. Glauber's salt. Many mineral waters contain a portion of this salt, though the quantity is commonly very small. However, M. Boulloc, in the memoirs of the academy of sciences at Paris for 1724, makes mention of the waters of a spring in the neighbourhood of a village about three leagues from Madrid, which, by evaporation, yields a true Glauber's salt. This salt, he says, is found in a concrete state about the fides of the spring, resembling the icicles which in winter hang from the roofs of houses. From this circumstance, it would seem that the water of the spring was very richly impregnated with the salt; and Dr Nichola Andrea speaks of a water at Selitaria, in Calabria, which is so strongly impregnated with this kind of salt, that he thinks it would be worth while to prepare it from thence in the way of trade. It is very probable that such waters are frequently to be met with in countries where the soil is impregnated with mineral alkali.

8. Common nitre. In some of the barren provinces of Bengal, the earth is so strongly impregnated with this salt, that the surface is covered with a nitrous crust resembling hoar-frost; and in such places the waters are strongly impregnated with it, as may naturally be supposed. In colder countries, however, this impregnation is more rare, though infinches of perfect nitre being found in springs are not wanting in Europe; but no natural combination of nitric acid with foffil alkali, or cubic nitre, has yet been met with in any part of the world.

9. Sea salt. This abound not only in the waters of the ocean, but in great numbers of salt springs; and there are but few waters so pure as not to contain a small portion of it.

10. Aerated foffil alkali. This is found in Seltzer, and other waters of that kind, but combined with such a quantity of fixed air, that the acid taste of the alkali is entirely covered, and the water has a brisk acidulous one. By evaporating the water, however, this superfluous quantity of air is dissipated, and the alkali then appears in its more acid state.

11. Gypsum, or felenites. This composition of the vitriolic acid and lime is extremely common in mineral waters. For a long time it was supposed to be a simple earth or stone, on account of its difficult solubility in water, requiring 700 or 800 times its own weight of water to dissolve it artificially, though Dr Rutty informs us, that the water in which it is originally dissolved will contain four or five times that proportion. There are to appearance several kinds of this substance; but whether they arise from foreign mixture, or from any difference in the calcarious earths among themselves, we know not. It is not, however, considered as a medicinal ingredient, nor indeed is the internal use of it thought to be very safe.

12. Epiton salt. Bergman and some other chemists have reduced all the calcarious purging salts in which the vitriolic acid is concerned; but Dr Monro observes, that these salts not only crystallize in various modes, but have different degrees of solubility in water. Thus the Epiton salt, properly so called, dissolves in an equal quantity of water, while the calcarious nitres, or purging salts from mineral waters, require from 10 to 50 times their weight to dissolve them. This matter would require the analysis of a great number of water samples to decide, but it is certain that the quantity of water required is very considerable.
the iron dissolved in its stead. Sometimes the quantity of copper is so great, that it is found advantageous to extract it in this way, as is the case in a certain stream in Ireland.

16. Vitriolated iron is found in considerable quantity in several waters both of England, Scotland and Ireland, as well as in many countries on the continent. Some authors have imagined, that there is a kind of volatile vitriol with which waters are sometimes impregnated. An anonymous author, in a work intitled *delle Terme Portense*, published at Rome in 1768, informs us, that having fixed a glass receiver to a hole through which the vapour of the water rises from the aqueduct below, he found in it a month afterwards, as well as in the mouth of the hole, a concrete and incrusted sub stance, like flatalcrite, which by experiment proved to be a true salt of iron, with a superabundant quantity of acid. Hence he concludes that this water, as it rises from the spring, is impregnated with a fine volatile martial vitriol, in such small proportion that it cannot be discovered in any quantity that may be analysed in retorts or stills, though it may be discovered by confining for a long time the vapour, which is naturally and constantly sublimed from the whole body of the thermal water discharged from the spring, as it passes through the aqueducts. The water of this spring is strongly sulphureous, and its heat 92 degrees of Fahrenheit.

Another kind of supposed volatile vitriol is that composed of iron, dissolved by fixed air. The notion of this being a volatile substance arose from observing that there are some waters which taste strongly chalybeate at the fountain, but, after running for a little way, los es it entirely. This, however, is founded on a mistake: for it is only one of the ingredients, viz. the fixed air, which flies off when it is combined with earth: after which the iron precipitates in a similar manner.

20. Vitriolated zinc. This has been found native in the bowels of the earth; and thence has been supposed, not without reason, to be an ingredient in mineral waters: but none have yet brought any decisive experiments on this subject, except Dr Rutty and Dr Gmelin, who both say that they have obtained a white vitriol from mineral waters which were at the same time impregnated with iron and some other ingredients.

21. Muriated magnesia. Waters impregnated with this salt are mentioned both by Bergman and Scheele; but the particular properties of them are not known.

22. Arsenic has been supposed sometimes to be an ingredient in mineral waters: though no certain proofs of its existence have been brought. Poisonous springs, supposed to be impregnated with it, are mentioned by Varenius; and Dr Baldafelli tells us of a small spring (near to the Aqua Sante, in the country of Sicily), the waters of which kill any animal that drinks them. He supposes this to be owing to arsenic, but was afraid to analyse the water.

23. Poffel oils. Almost all waters, even those which are accounted the most pure, contain some portion of an oily matter though generally so small that it cannot be perceived without evaporating a large quantity of the liquid. Some contain it in great quantity; inasmuch that, besides impregnating the water as strongly as possible, a great quantity falls to the bottom. 

18. Vitriolated copper. This salt is seldom found, except in waters which flow from copper mines. The water impregnated with it is emetic and purgative, and may justly be accounted poisonous rather than medicinal. On dipping clean iron into such water, the copper is instantly precipitated in its metallic state, and
MIN [ 48 ] MIN

Sulphur. This is a common ingredient in mineral waters; and its presence is known by the strong hepatic smell they emit, as well as by their blackening silver. &c. Sulphureous waters are frequently very clear and transparent when taken up at the fountain; but when kept in open vessels, or bottles not well stoppered, they soon deposit the sulphur they contain in the form of a dirty white powder, and lose their sulphureous smell. The bottom of the wells containing such waters, or of the channels in which they run, assume a black colour, and a raggy kind of matter is deposited on such substances as they run over for some time; and when these are taken up and dried, they appear covered with a true sulphur. Some waters contain this ingredient in very considerable quantity. From that of Harrowgate it may be separated by filtration; and Father de Térére, in the second part of his Histoire Naturelle des Aulnins, tells us, that when he was in the island of Guadaloupe, and amusing himself one day with evaporating in a tin plate some sulphureous water which he found near the burning mountain, there remained on the plate a layer of sulphur about the thickness of a leaf of paper. Dr Monro mentions his having obtained a true sulphur, by evaporation, from a mineral water at Caille-Leod, in the county of Ross, in Scotland. Dr Brown, in his Travels, informs us, that having cauèd some of the pipes which carry off the water from the duke's bath at Baden, in Austria, to be opened, he took from thence a quantity of fine sulphur in powder, something like flower of brimstone, which had been sublimed from the waters. A similar kind of sulphur is obtained from the upper part of the pipes and conduits which convey the waters of Aix-la-Chapelle from their sources.

From these and other facts of a similar nature, Dr Monro concludes, that sulphur is dissolved by some means or other in the water. Great differences however have taken place among chemists concerning the mode in which sulphur is thus dissolved. Sulphur, we know, may be dissolved by means of an alkali, as well as by calcareous earth; and there are some instances of alkaline waters containing sulphur, though we are not absolutely certain that the alkaline fyll is the bond of union between the sulphur and them. Dr Vandelli, in his treatise de Thermae agri Paullini, already quoted, mentions a substance found in the conduits of the waters of the baths at Aponum, which he calls crystallized sulphur; and says that it dissolves in the waters by boiling, recovering afterwards its solid form. This substance has not been examined; but we know of no other mineral with which sulphur readily assumes a crystalline form than terra pendorosa.—This compound is easily dissolved in water, and communicates to it a most powerful taste and smell of hepatic sulphur. Great part of the terra pendorosa, though not the whole, may be separated by fixed air, so that it is probably this permanent compound which Vandelli observed. Dr Lucas supposed that the sulphureous waters contain both an acid and phlogiston; and Sir Torbern Bergman, that they are impregnated only with the hepatic gas; and that this gas conficts of sulphur united with phlogiston, from which the sulphur may be precipitated by the nitrous acid.

For an account of the cause of heat in mineral waters, see the article SPRINGS.

Having now mentioned the principal substances that form almost all these waters, we shall next show the proofs by means of which they may be discovered in water, without decomposing the water by evaporation or by distillation.

If any portion of disengaged acid or alkali be contained in water, it may be known by the taste, by changing the colour of violets or of turnip, and by adding the precise quantity of acid or of alkali that is necessary for the separation of the contained disengaged saline matter.

Sulphur, and liver of sulphur, may be discovered in waters by their singular smell, and by the black colour which these substances give to white metals or to their precipitates, but especially to silver.

Vitriolic salts with earthy bases may be discovered in water by two processes: 1. By adding some fixed alkali, which decomposes all their fols, and precipitates their earthy bases; and, 2. By adding a solution of mercury in nitrous acid, which also decomposes these fols, and forms a turbid mineral with their acid. But for this purpose the solution of mercury ought to have a superabundant quantity of acid; for this solution when perfectly saturated, forms a precipitate with any kind of water, as M. Rouelle has very justly remarked: and indeed, all metallic solutions in any acids are strictly capable of decomposition by water alone, and so much more easily as the acid is more perfectly saturated with the metal.

Martial vitriol or iron combined with any acid, or even with gas, shows itself in waters by blackening an infusion of galls, or by forming a Prussian blue with the phlogisticated alkaline lixivium.

The vitriol of copper, or copper dissolved by any acid, may be discovered by adding some of the volatile spirit of sal ammoniac, which produces a fine blue colour; or by the addition of clean iron, upon the surface of which the copper is precipitated in its natural or metallic state.

Glauber's salt is discovered by adding a solution of mercury in nitrous acid, and forming with it a turbid mineral: or by crystallization.

Common salt contained in waters forms with a solution
The process of silver in nitrous acid a white precipitate, or luna cornes. It may also be known by its crystallization.

Marine salt with earthy bases produces the same effect upon solution of silver. It also forms a precipitate when fixed alkali is added. The acrimony, bitterness, and deliqueency of this salt, serve to distinguish it.

The proofs related for the examination of mineral waters, are only those which are most essential. Many others may be made to confirm the former proofs: but waters is the chief cause of their lightness, piquancy, general, anG waters, are only effect of substance what ever, dissolved in solution of vitriolic acid by the sulphur, or salts: if this matter contained a fhell in exposed to a red heat. If this matter contained but a fels in this matter, ferve to.

This proof related in nitric acid, which are which are added. The acrimony, ferfey,ottie acid, and the other is fixed air. See ALTERLOGY, FIXED Air, and Gas, piufim. Air united superabundantly with spiritual waters is the chief cause of their lightness, piquancy, and sparkling.

When the nature and quantities of the principles contained in a mineral water are ascertained by suitable experiments, we may imitate artificially this water, by adding to pure water the same proportions of the same substances, as Mr Venel has done in examining several waters, especially that of Selters.

We may easily perceive the necessity of using no vessels in these experiments, but such as are perfectly clean and rinsed with distilled water; of weighing the products of the experiments very exactly; of making the experiments upon a large quantity of water as is possible, especially the evaporation, crystallizations, and distillations; and of repeating all experiments several times. We may further observe, that the mixtures from which any precipitates might be expected ought to be kept two or three days, because many of these precipitates require that time, or more, to appear, or to be entirely deposited.

An ALPHABETICAL Table of the most noted Mineral Waters in Europe, exhibiting their Medicinal Properties and Contents.

<table>
<thead>
<tr>
<th>Names of Springs</th>
<th>Countries in which they are found</th>
<th>Contents and quality of the water</th>
<th>Medicinal Virtues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboe</td>
<td>Near St Germain's in France</td>
<td>A cold chalybeate water, containing besides the iron a small quantity of fossil alkali saturated with fixed air.</td>
<td>Diuretic and purgative. Internally used in dropsy, jaundice, and obstructions of the vifera; externally in cutaneous eruptions, ulcers, &amp;c.</td>
</tr>
<tr>
<td>Aberbrothick</td>
<td>County of Forfar in Scotland</td>
<td>A cold chalybeate. Contains iron dissolved in fixed air.</td>
<td>Diuretic and corrodorative. Used in indigestions, nervous disorders, &amp;c.</td>
</tr>
<tr>
<td>Aix-la-Chapelle</td>
<td>Juliers in Germany</td>
<td>Sulphureous and hot. Contains aerated calcareous earth, sea-fall, fossil alkali and sulphur.</td>
<td>Diaphoretic, purgative, and diuretic. Used as baths as well as taken internally. Useful in rheumatics, and all diseases proceeding from a debility of the liver.</td>
</tr>
<tr>
<td>Baden</td>
<td>Swabia in Germany</td>
<td>Hot and sulphureous springs and baths, resembling those of Aix-la-Chapelle.</td>
<td>Similar to Barrowdale water, but weaker.</td>
</tr>
</tbody>
</table>

See Aix-la-Chapelle and Baden, in the order of the alphabet.
Names of Springs. | Countries in which they are found. | Contents and Qualities of the Water. | Medicinal Virtues.  
--- | --- | --- | ---  
Bagnigge | Middlesex, near London. | Epsom salt and murinated magnesia. Cold. A spring contains iron and fixed air. Strongly purgative, three half pints being a dose. The cold bathing also proves purgative when the bowels contain any vitiated matter. Strongly emetic and cathartic. Sometimes useful in the jaundice and dropy, scurvy, chronic obstructions. Used like a bath in cutaneous diseases. Taken in the dose of a pint, containing only about seven drams and an half of sea-salt, so that a great part of the virtue must reside in the aerated calcareous earth. Powerfully corrosor, and very useful in all kinds of weakness. Used as a bath, and taken internally.  
Balemore | Worcestershire in England. | A fine cold chalybeate, containing iron rendered soluble by fixed air, along with some other salt supposed to be oflalkali, and probably foffile alkali. Corroborative and astringent. Drunk to the quantity of two pints, or two and an half.  
Balaruc | Languedoc in France. | Hot, and contain some purging salts. Diuretic and diaphoretic. Useful in diuresis.  
Ballycastle | Antrim in Ireland. | Chalybeate and sulphureous. Cold. Similar in virtue to that of Ballycastle. Used in cutaneous diseases. Taken internally to the quantity of a quart or three pints.  
Ballyfellan | Near Kilkenny in Ireland. | Iron, fixed air, and probably foffile alkali. Corroborative and astringent. Drunk to the quantity of two pints, or two and an half.  
Bagniers | Biggore in France. | Earth and sulphur. Hot.  
Barreges | Biggore in France. | Sea-salt, foffile alkali, calcareous earth, felenites, sulphur, and a fine bituminous oil. Hot. Used as bathing and internally to the quantity of a quart or three pints.  
Barunet, and Northall | Hertfordshire in England. | Epsom salt, and aerated calcareous earth. Powerfully corrosor, and very useful in all kinds of weakness. Used as a bath, and taken internally.  
Bath | Somersatshire in England. | Iron, aerated calcareous earth, felenites, Glauber's salt, and sea-salt. Hot. Used as a bath; and drank from four to eight ounces at a time, to two quarts per day. Useful in consumptions, diabetes, fluor albus, &c.  
Bandola | Italy. | Iron, fixed air, foffile alkali, and a little sulphur. Cold. Diuretic and corrosor. Similar to Harrowgate.  
Bristol | Somersatshire in England. | Calcareaeous earth, sea-salt, Epsom salt Glauber's salt, and felenites. Hot. Used as a bath; and drank from four to eight ounces at a time, to two quarts per day. Useful in consumptions, diabetes, fluor albus, &c.  
Buxton | Derbyshire in England. | A small quantity of sea-salt, foffile alkali, Epsom-salt, and aerated calcareous earth. Hot. Here is also a fine cold chalybeate spring. Useful in gout, rheumatism, and other disorders in which tepid baths are serviceable. Used as baths, and drank to the quantity of five or six pints per day. 

Caroline
Names of Springs. Countries in which they are found. Contents and Quality of the Water. Medicinal Virtues.


Carlton, Nottinghamshire in England. Iron dissolved in fixed air, along with a bituminous oil, which gives it the smell of horse-dung. Cold. Diuretic and corroborative.

Carrickfergus, Antrim in Ireland. Seems from its bluish colour to contain a very small quantity of copper. Cold. Weakly purgative.

Carrickmore, Cavan in Ireland. Foffile alkali, fixed air, and some purging salt. Cold. Purgative and diuretic.


Cafle-Leod, Ross-shire in Scotland. Aerated earth, felenites, Glauber's salt, and sulphur. Cold. Resembles the German Spaw; and is in considerable repute. Diuretic, diaphoretic, and corroborant; useful in cutaneous diseases.


Chau de Fontaine, Liege in Germany. Aerated earth, foffile alkali, and fixed air. Hot. Resembles those of Aix la Chapelle and Buxton. Purgative and corroborant; taken in the quantity of from one to three or four pints. Is useful in cases of indigestion and scorbutic disorders; also in the gravel. Diuretic and corroborative.


Cleves, Germany. Iron, fixed air, and other ingredients of Pyrmont water. Diuretic and corroborant.


Codfalwood, Staffordshire in England. Sulphur, fixed air, and aerated earth. Refembles the Aiferon water.


Commer, or Cumner, Berkshire in England. Some purging salt, and probably aerated earth; the water is of a whitish colour. Purgative, in the quantity of one, two, or three quarts. Purgative, diuretic, and corroborant.

Coolauran, Fermanagh in Ireland. Iron, fixed air, and aerated earth. Diuretic.


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<tbody>
<tr>
<td>Cunley-house</td>
<td>Lancashire in England.</td>
<td>Sulphur, aerated earth, and fixed air.</td>
<td>Purgative, and resembling the Akeron water.</td>
</tr>
<tr>
<td>Das-WildBad</td>
<td>Nuremberg in Germany.</td>
<td>Iron, fixed air, and some saline matter.</td>
<td>Corroborant. Useful in obstructions of the vaeera, and female complaints.</td>
</tr>
<tr>
<td>D'Ax en Foix</td>
<td>15 leagues from Tholoule in France.</td>
<td>Similar to Aix-la-Chapelle. Hot.</td>
<td>Used as a bath, and also drunk, like the Aix-la-Chapelle waters.</td>
</tr>
<tr>
<td>Derryinch</td>
<td>Fermanagh in Ireland.</td>
<td>Sulphur and fossil alkali.</td>
<td>Diuretic and diaphoretic.</td>
</tr>
<tr>
<td>Derrindaff</td>
<td>Cavan in Ireland.</td>
<td>Sulphur and purging salt. Similar to Swadling bar water.</td>
<td>Similar to the Akeron water.</td>
</tr>
<tr>
<td>Derrylester</td>
<td>Cavan in Ireland.</td>
<td>Aerated magnesia, Epnom salt, and sea-salt.</td>
<td>Cooling and purgative, but apt to bring on or increase the fluor albus in women.</td>
</tr>
<tr>
<td>Drumas-naive</td>
<td>Leitrim in Ireland.</td>
<td>Similar to the former.</td>
<td>Purgative and diuretic. Useful in nervous cafes and diseases proceeding from debility.</td>
</tr>
<tr>
<td>Drumgoon</td>
<td>Fermanagh in Ireland.</td>
<td>Similar to the former.</td>
<td>Diuretic and corroborant.</td>
</tr>
<tr>
<td>Dublin salt springs</td>
<td>Ireland.</td>
<td>Sea-salt and Epnom salt.</td>
<td>Similar to Harrowgate water.— That of the salt spring used as a purgative.</td>
</tr>
<tr>
<td>Dunnard</td>
<td>18 miles from Dublin.</td>
<td>Iron dissolved in fixed air.</td>
<td>Purgative, and useful in cutaneous diseases.</td>
</tr>
<tr>
<td>Dunle,</td>
<td>Scotland.</td>
<td>Iron dissolved in fixed air, with a little sea-salt and bittern.</td>
<td>Powerfully diuretic and purgative.</td>
</tr>
<tr>
<td>Durham</td>
<td>England.</td>
<td>Sulphur, sea-salt, and a little aerated earth. In the middle of the river is a salt spring.</td>
<td>Similar to Harrowgate.</td>
</tr>
<tr>
<td>Egra,</td>
<td>Bohemia.</td>
<td>Similar to Cheltenham water.</td>
<td>Gainborough.</td>
</tr>
<tr>
<td>Epnom,</td>
<td>Surrey in England.</td>
<td>Vitriolated and muriated magnesia, with a small quantity of aerated calcarious earth.</td>
<td></td>
</tr>
<tr>
<td>Names of Springs</td>
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</tr>
<tr>
<td>Galway</td>
<td>Ireland.</td>
<td>Similar to Tunbridge water.</td>
<td></td>
</tr>
<tr>
<td>Glanmire</td>
<td>Ireland.</td>
<td>Similar to Peterhead water.</td>
<td></td>
</tr>
<tr>
<td>Glaflonbury</td>
<td>Somersetshire in England.</td>
<td>Similar to Clifton water.</td>
<td></td>
</tr>
<tr>
<td>Glendy</td>
<td>Mears county in Scotland.</td>
<td>Similar to Peterhead water.</td>
<td></td>
</tr>
<tr>
<td>Granthaw</td>
<td>Down in Ireland.</td>
<td>Iron; similar to the German Spa.</td>
<td>Emetic and cathartic.</td>
</tr>
<tr>
<td>Haigh</td>
<td>Lancashire in England.</td>
<td>Green vitriol, iron dissolved by fixed air, with some aerated earth.</td>
<td>Alterative and corroborant. The water is taken from half a pint to several pints; is better in the morning than in the middle of the day, and in cold than hot weather.</td>
</tr>
<tr>
<td>Hampstead</td>
<td>England.</td>
<td>Green vitriol, iron dissolved by fixed air, and a small quantity of aerated earth.</td>
<td>Purgative.</td>
</tr>
<tr>
<td>Hanbridge</td>
<td>Lancashire in England.</td>
<td>Similar to Scarborough water.</td>
<td></td>
</tr>
<tr>
<td>Hartfell</td>
<td>Annandale in Scotland.</td>
<td>Green vitriol.</td>
<td></td>
</tr>
<tr>
<td>Hartlepool</td>
<td>Durham in England.</td>
<td>Sulphur, iron dissolved by fixed air, with some purging falt.</td>
<td>Diuretic and laxative.</td>
</tr>
<tr>
<td>Joseph’s well</td>
<td>Stock Common near Cobham in Surry.</td>
<td>A very large proportion of Epom falt, and possibly a little sea-falt.</td>
<td>Alterative, purgative, and diuretic. Drank to about a quart, it passes briskly without griping; taken in less doses as an alterative, it is a good antiscorbutic.</td>
</tr>
<tr>
<td>Ilmington</td>
<td>Warwickshire in England.</td>
<td>Aerated soluble alkali, with some iron dissolved by fixed air.</td>
<td>Diuretic and laxative.</td>
</tr>
<tr>
<td>Ilkington</td>
<td>Near London.</td>
<td>Iron dissolved by fixed air.</td>
<td>Corroborant. Useful in lownefs of spirits and nervous diseases. Operates by urine, and may be drank in large quantity.</td>
</tr>
<tr>
<td>Kanturk</td>
<td>Cork in Ireland.</td>
<td>Similar to the water at Peterhead.</td>
<td></td>
</tr>
<tr>
<td>Kennington</td>
<td>Near London.</td>
<td>Similar to Acton water.</td>
<td>Emetic and cathartic, in the dose of half a pint.</td>
</tr>
<tr>
<td>Kilbrew</td>
<td>Meath in Ireland.</td>
<td>A large quantity of green vitriol.</td>
<td></td>
</tr>
<tr>
<td>Killburn</td>
<td>Near London.</td>
<td>Fixed air, hepatic air, Epom falt, Glauber’s falt: muriated magnesia, sea-falt, aerated earth, and iron.</td>
<td></td>
</tr>
<tr>
<td>Killalaer</td>
<td>Fermanagh in Ireland.</td>
<td>Sulphur and soluble alkali.</td>
<td>Similar to Swadlingbar water.</td>
</tr>
<tr>
<td>Kilingshan-</td>
<td>Fermanagh, Ireland</td>
<td>Similar to Hanly’s chalybeate water.</td>
<td></td>
</tr>
<tr>
<td>vally</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Names of Springs</td>
<td>Countries in which they are found</td>
<td>Nature of Barrowdale water, but weaker.</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------</td>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Kilroot</td>
<td>Antrim in Ireland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kinalton</td>
<td>Nottinghamshire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kincardine</td>
<td>Merth in Scotland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>King's Cliff</td>
<td>Northamptonshire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirby</td>
<td>Worcesters in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knareborough</td>
<td>See Dropping-well, Lancashire in England</td>
<td>Similar to Scarboroug water.</td>
<td></td>
</tr>
<tr>
<td>Knowsley</td>
<td>Lancashire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaka</td>
<td>Bohemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lancaster</td>
<td>England, Lancashire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Llandrindod</td>
<td>Radnor in South Wales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Llangybi</td>
<td>Caernarvonshire in North Wales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leamington</td>
<td>Warwickshire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leez</td>
<td>Essex in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lincomb</td>
<td>Somersetshire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lis done- Vurna</td>
<td>Fermanagh in Ireland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loanbury</td>
<td>Yorkshire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maceroomp</td>
<td>Cork in Ireland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mahereberg</td>
<td>Kerry in Ireland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mallow</td>
<td>Cork in Ireland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malton</td>
<td>Yorkshire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malvern</td>
<td>Gloucestershire in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark Hall</td>
<td>Essex in England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matlock</td>
<td>Derbyshire in England</td>
<td>Similar to Ilmington.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medicinal Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purgative.</td>
</tr>
<tr>
<td>Laxative, and useful in correcting acidities.</td>
</tr>
<tr>
<td>Operates by insensible perspiration sometimes by spitting, sweat, or urine.</td>
</tr>
<tr>
<td>Useful in the scurvy, leprosy, cutaneous disorders, &amp;c.</td>
</tr>
<tr>
<td>Useful in disorders of the eyes, scrofula, &amp;c.</td>
</tr>
<tr>
<td>Emetic and cathartic. Useful in old sores, and cures mangy dogs.</td>
</tr>
<tr>
<td>Similar to Swadlingbar water.</td>
</tr>
<tr>
<td>Emetic, cathartic, and diuretic.</td>
</tr>
<tr>
<td>Used only for washing mangy dogs and scabby horses.</td>
</tr>
<tr>
<td>Similar to Scarboroug water, but is sometimes apt to vomit.</td>
</tr>
<tr>
<td>Diuretic and cathartic; used also externally. Recommended as excellent in diseases of the skin; in leprous, scrobutic complaints, scrofula, old sores, &amp;c. Also serviceable in inflammations and other diseases of the eyes; in the gout and stone, in bilious and paralytic cases, and in female obstructions. The external use is by washing the part at the spout several times a-day, and afterwards covering it with cloths dipt in the water and kept constantly moist; also by general bathing.</td>
</tr>
</tbody>
</table>

Similar to Ilmington. Warm springs, of the nature of the Bristol water, except that they are very slightly impregnated with iron, but contain a great quantity of aerated earth. They are colder than the Buxton; but their virtues similar to those of the two places mentioned.
<table>
<thead>
<tr>
<th>Names of Springs</th>
<th>Countries in which they are found</th>
<th>Contents and Quality of the Water</th>
<th>Medicinal Virtues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maudley</td>
<td>Lancashire in England</td>
<td>Sulphur and sea-salt.</td>
<td>Similar to Harrowgate.</td>
</tr>
<tr>
<td>Mechan</td>
<td>Fermanagh in Ireland</td>
<td>Sulphur and fossilie alkali.</td>
<td>Similar to the waters of Drumgoon.</td>
</tr>
<tr>
<td>Miller's Spaw</td>
<td>Lancafhire in England</td>
<td>Similar to Tunbridge.</td>
<td>Alterant, diuretic, and sometimes purgative.</td>
</tr>
<tr>
<td>Moffat</td>
<td>Annandale in Scotland</td>
<td>Sulphur, sea-salt, and earth.</td>
<td>Is used as a bath, and the steam of the hot water has been found serviceable in relaxing hard tumors and stiff joints.</td>
</tr>
<tr>
<td>Mois-house</td>
<td>Lancashire in England</td>
<td>Similar to Islington water.</td>
<td>Purges strongly.</td>
</tr>
<tr>
<td>Moreton</td>
<td>Shropshire in England</td>
<td>Similar to Holt water.</td>
<td>Diuretic, purgative, and diaphoretic.</td>
</tr>
<tr>
<td>Mount D'Or</td>
<td>France</td>
<td>Warm, and similar to the waters of Aix-la-Chapelle.</td>
<td>Purgative, diuretic, and diaphoretic.—Powerfully antiseptic in putrid diseases, and excellent in diarrhea, dysenteries, &amp;c.</td>
</tr>
<tr>
<td>Nevil-Holt</td>
<td>Leicestershire in England</td>
<td>Selenite or aerated earth, and Epson salt.</td>
<td>Purgative.</td>
</tr>
<tr>
<td>New Cartmoll</td>
<td>Lancashire in England</td>
<td>Sea-salt and aerated earth.</td>
<td>Similar to the waters of Pyrmont.</td>
</tr>
<tr>
<td>Newham Regis</td>
<td>Warwickshire in England</td>
<td>Similar to Scarborough water.</td>
<td>Similar to Askeron water.</td>
</tr>
<tr>
<td>Newtondale</td>
<td>Yorkshire in England</td>
<td>Aerated calcareous earth or magnesia.</td>
<td>Similar to Islington.</td>
</tr>
<tr>
<td>Newton-Stewart</td>
<td>Tyrone in Ireland</td>
<td>Similar to Tunbridge.</td>
<td>Similar to Askeron water.</td>
</tr>
<tr>
<td>Needenice</td>
<td>Germany</td>
<td>Fixed air, fossilie alkali, iron, and earth.</td>
<td>Similar to Hartfell.</td>
</tr>
<tr>
<td>Nobber</td>
<td>Meath in Ireland</td>
<td>Martial vitriol.</td>
<td>Similar to Akeron water.</td>
</tr>
<tr>
<td>Normanby</td>
<td>Yorkshire in England</td>
<td>Sulphur, much fixed air, some sea-salt, and Epson salt.</td>
<td>Useful in cutaneous diseases.</td>
</tr>
<tr>
<td>Nottingham</td>
<td>Dorsetshire, England</td>
<td>Sulphur, fossilie alkali, and earth.</td>
<td>Purgative.—It intoxicates by reason of the great quantity of air contained in it.</td>
</tr>
<tr>
<td>Otton</td>
<td>Nottingham, England</td>
<td>Much fixed air, Epson salt, and a little sea-salt, with some iron.</td>
<td>Diuretic and diaphoretic.</td>
</tr>
<tr>
<td>Oulton,</td>
<td>Norfolk, England</td>
<td>Similar to Islington.</td>
<td>Diuretic and laxative.</td>
</tr>
<tr>
<td>Owen Breun</td>
<td>Cavan, Ireland</td>
<td>Sulphur, Epson salt, and fossilie alkali.</td>
<td>Similar to Askeron water.</td>
</tr>
<tr>
<td>Pancras</td>
<td>Near London</td>
<td>Epson salt, and aerated earth.</td>
<td>Similar to Akeron water.</td>
</tr>
<tr>
<td>Paffy</td>
<td>Near Paris</td>
<td>Similar to Pyrmont water.</td>
<td>Similar to Islington, but more powerful.</td>
</tr>
<tr>
<td>Peterhead</td>
<td>Aberdeen county, Scotland</td>
<td>A strong chalybeate but of which no analysis has been published.</td>
<td>Similar to Akeron water.</td>
</tr>
<tr>
<td>Pettigoe</td>
<td>Donnegal, Ireland</td>
<td>Sulphur and purging salt.</td>
<td>Gently purgative. Very useful in erythematous and scorbutive habits.</td>
</tr>
<tr>
<td>Pitkeathly</td>
<td>Perthshire, Scotland</td>
<td>Sea-salt, a small quantity of muriated and likewife of aerated earth.</td>
<td>Used as a bath, and for washing ulcers. Inwardly taken it cures complaints from acidity, hemorrhages, &amp;c.</td>
</tr>
<tr>
<td>Plombiers</td>
<td>Lorraine, France</td>
<td>Saline matter, probably fossilie alkali, with a small portion of oil.—Warm!</td>
<td>Diuretic and laxative.</td>
</tr>
<tr>
<td>Pontgibault</td>
<td>Auvergne, France</td>
<td>Fossilie alkali and calcareous earth.</td>
<td></td>
</tr>
<tr>
<td>Pougtues</td>
<td>Nivernois, France</td>
<td>Calcarea earth, magnesia, fossilie alkali, sea-salt, earth, of alum, and siliceous earth.</td>
<td></td>
</tr>
</tbody>
</table>

Pyrmont,
<table>
<thead>
<tr>
<th>Names of Springs</th>
<th>Countries in which they are found</th>
<th>Contents and Quality of the Water</th>
<th>Medicinal Virtue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vullum</td>
<td>Wurtemberg, Germany</td>
<td>Aerated iron, calcareous earth, magnesia, Epsom salt, and common salt.</td>
<td>Diuretic, diaphoretic, and laxative. Recommended in cafes where the constitution is relaxed; in female complaints, in cutaneous diseases, in nervous disorders, in the gravel and urinary obstructions; and considered as among the best restoratives in decayed and broken constitutions. Used in scrofulous and cutaneous disorders.</td>
</tr>
<tr>
<td>St. Bernard's well</td>
<td>Near Edinburgh</td>
<td>Sulphureous volatile acid and phlogiston.</td>
<td>Somewhat congenial with Moffat and Harrowgate. In nervous and febrile cafes, analeptic and restorative; in scorbatical, scrofulous, and scrofulous disorders, reckoned a specific. Similar to Barrowdale water.</td>
</tr>
<tr>
<td>St Ermus's well</td>
<td>Staffordshire, England</td>
<td>Aerated calcareous earth, Epsom salt, sea-salt, and iron.</td>
<td>Diuretic and purgative. Excellent in cholic pains, both as a cure and preventative.</td>
</tr>
<tr>
<td>Scolliersis</td>
<td>Switzerland</td>
<td>Iron, foetid alkalii, and a great quantity of fixed air.</td>
<td>Strongly purgative. Diuretic. Useful in the gravel, rheumatic, scurvy, scrofula, &amp;c.</td>
</tr>
<tr>
<td>Sediitz</td>
<td>Bohemia</td>
<td>Epsom salt. Calcareous earth, magnesia, foetid alkalii, and fixed air.</td>
<td>Emetic and cathartic. Similar to Akeron water.</td>
</tr>
<tr>
<td>Sedleitz</td>
<td>Germany</td>
<td>Similar to Elington. Similar to Sediitz.</td>
<td>Similar to Harrowgate water.</td>
</tr>
<tr>
<td>Sene, or Send</td>
<td>Wiltshire, England</td>
<td>Green vitriol. Sulphur and purging salt.</td>
<td>Similar to Harrowgate.</td>
</tr>
<tr>
<td>Seydlschutz</td>
<td>Germany</td>
<td>Emetic and cathartic. Similar to Akeron water.</td>
<td>Similar to Harrowgate.</td>
</tr>
<tr>
<td>Shadwell</td>
<td>Near London</td>
<td>Similar to Sediitz.</td>
<td>Corroborant and alterative. Useful for washing foul ulcers and cancers.</td>
</tr>
<tr>
<td>Shapmoor</td>
<td>Wiltshire, England</td>
<td>Epsom salt. Calcareous earth, magnesia, foetid alkalii, and fixed air.</td>
<td>Diuretic and purgative. Serviceable in many disorders. See the article Spaw.</td>
</tr>
<tr>
<td>Somersham</td>
<td>Huntingdonshire, England</td>
<td>Green vitriol, alum and fixed air.</td>
<td>Alternative and diaphoretic.</td>
</tr>
<tr>
<td>Spaw</td>
<td>Liege in Belgium</td>
<td>Foetid alkalii, iron, aerated earth, Epsom salt, and sea-salt.</td>
<td>Similar to Shadwell.</td>
</tr>
<tr>
<td>Stanger</td>
<td>Cumberland, England</td>
<td>Green vitriol.</td>
<td></td>
</tr>
</tbody>
</table>
MINEHEAD, a town of Somersetshire, 166 miles from London. It is an ancient borough, with a harbour in the Briolf channel, near Dunfer castel, much frequented by passengers to and from Ireland. It was incorporated by Queen Elizabeth, with great privileges, on condition the corporation should keep the quay in repair; but its neglect, and they were at the expense of new-building the quay. In pursuance of another act, confirming the former, a new head has been built to the quay, the beach cleared, &c., so that the biggest ship may enter, and ride safe in the harbour. The town contains about 500 houses, and 2000 souls. It was formerly governed by a portreeve, and now by two constables chosen yearly at a court-leet held by the lord of the manor. Its chief trade is with Ireland, from whence about 40 vessels used to come hither in a year with wool; and about 4000 chaldrons of coals are yearly imported at this place. Watchet and Poriock, from South Wales, which lies directly opposite to it, about seven leagues over, the common breadth of this channel all the way from Holmes to the Land's End. Here are several rich merchants, who have some trade also to Virginia and the West Indies; and they correspond much with the merchants of Barnef:aple and Briolf in their foreign commerce. Three or four thousand barrels of herrings, which come up the Severn in great shoals about Michaelmas, are caught, cured, and shipped off here every year, for the Mediterranean, &c. The market here is on Wednesday, and fair on Whitsun-Wednesday.

MINERALOGY,
MINERALOGY.

It is that science which teaches us the properties of mineral bodies, and by which we learn how to characterize, distinguish, and classify them into a proper order.

INTRODUCTION.

MINERALOGY seems to have been in a manner coeval with the world. Precious stones of various kinds appear to have been well known among the Jews and Egyptians in the time of Moses; and even the most rude and barbarous nations appear to have had some knowledge of the ores of different metals. As the science is nearly allied to chemistry, it is probable that the improvements both in chemistry and mineralogy have nearly kept pace with each other; and indeed it is but of late, since the principles of chemistry were well understood, that mineralogy has been advanced to any degree of perfection. The best way of studying mineralogy, therefore, is by applying chemistry to it; and not contenting ourselves merely with inspecting the outsides of bodies, but decompounding them according to the rules of chemistry. This method has been brought to the greatest perfection by Mr. Pott of Berlin, and after him by Mr. Cronstedt of Sweden. To obtain this end, chemical experiments in the large way are without doubt necessary: but as a great deal of the mineral kingdom has already been examined in this manner, we do not need to repeat all those experiments in their whole extent, unless some new and particular phenomena should discover themselves in those things we are examining; else the tediousness of those processes might discourage some from going farther, and take up much of the time of others that might be better employed. An easier way may therefore be adopted, which even for the most part is sufficient, and which, though made in miniature, is as scientific as the common manner of proceeding in the laboratories, since it imitates that, and is founded upon the same principles. This consists in making the experiments upon a piece of charcoal with the concentrated flame of a candle directed through a blow-pipe. The heat occasioned by this is very intense; and the mineral bodies may here be burnt, calcined, melted and fused, &c. as well as in any great works.

For a description of the blow-pipe, the method of using it, the proper fluxes to be employed, and the different subjects of examination to which that instrument is adapted, see the article Blow-pipe, where all those particulars are concisely detailed. It may not be improper here, however, to resume those details at greater length; avoiding, at the same time, all unnecessary repetitions. After which we shall exhibit a scientific arrangement of the mineral kingdom according to the most approved system.

PART I. EXPERIMENTAL MINERALOGY; with a DESCRIPTION of the NECESSARY APPARATUS (A).

SECT. I. Of experiments upon Earths and Stones.

When any of these substances are to be tried, we must not begin immediately with the blow-pipe; but some preliminary experiments ought to go before, by which those in the fire may afterwards be directed. For instance, a stone is not always homogenous, or of the same kind throughout, although it may appear to the eye to be so. A magnifying glass is therefore necessary to discover the heterogeneous particles, if there be any; and these ought to be separated, and every part tried by itself, that the effects of the different things, examined together, may not be attributed to one alone. This might happen with some of the finer minerals, which are now and then found mixed with small particles of quartz, scarcely to be perceived by the eye.

The trapp (in German schwartzlein) is also sometimes mixed with very fine particles of felspar (pottam fustilans) or of calcareous spar, &c. After this experiment, the hardness of the stone in question must be tried with steel. The flint and garnets are commonly known to strike fire with steel; but there are also other stones, which, though very seldom, are found so hard as likewise to strike fire. There is a kind of trapp of that hardness, in which no particles of felspar are to be seen. Coloured glasses resemble true gems; but as they are very soft in proportion to these, they are easily detected by means of the file. The common quartz-crystals are harder than coloured glasses, but softer than the gems. The loadstone discovers the presence of iron, when it is not mixed in too small a quantity in the stone, and often before the stone is roasted. Some kinds of haematites, and particularly the cærulecents, greatly resemble some other iron ores; but this distinguishes itself from them by a red colour when poured, the others giving a blackish powder, and so forth.

The management of the Blow-pipe has been described under that article; but a few particulars may be here recapitulated, or added. The candle ought to be snuffed often, but so that the top of the wick may retain some fat in it, because the flame is not hot enough when the wick is almost burnt to ashes; but only the top must be snuffed off, because a low wick gives too small a flame. The blue flame is the hottest; this ought, therefore, to be forced

forced out when a great heat is required, and only the point of the flame must be directed upon the subject which is to be aflayed. M. Magellan recommends, as being most cleanly and convenient, that the candle be made of wax, and the wick should be thicker than ordinary. Its upper end must be bended towards the matter intended to be heated, and the flame of air must be directed along the surface of the bended part, so as not absolutely to touch it.

The piece of charcoal made use of in these experiments must not be of a disposition to crack. If this should happen, it must gradually be heated until it does not crack any more, before any aflay is made upon it. If this be not attended to, but the aflay made instantly with a strong flame, small pieces of it will split off in the face and eyes of the aflayer, and often throw along with them the matter that was to be aflayed. Charcoal which is too much burnt consumes too quick during the experiment, leaving small holes in it, wherein the matter to be tried may be loft; and charcoal that is burnt too little, catches flame from the candle, burning by itself like a piece of wood, which likewise hinders the process.

Of those things that are to be aflayed, only a small piece must be broken off for that purpose, not bigger than that the flame of the candle may be able to act upon it at once, if required; which is sometimes necessary, as, when the matter requires to be made red hot throughout, the piece ought to be broken as thin as possible, at least the edges; the advantage of which is obvious, the fire having then more influence upon the subject, and the experiment being more quickly made.

Some of the mineral bodies are very difficult to be kept steady upon the charcoal during the experiment, before they are made red hot; because, as soon as the flame begins to act upon them, they split afunder with violence, and are dispersed. Such often are those which are of a soft confluence or a particular figure, and which preserve the same figure in however minute particles they are broken; for instance, the calcareous spar, the fparry gypsum, fparry flour, white fparry hematite ore, the potters ore, the tafficated mock-lead or blende, &c. even all the common flues which have no determinate figure. These not being so compact as common hard flues, when the flame is immediately urged upon them, the heat forces itself through and into their clefts or pores, and causes this violent expansion and dispersion. Many of the clays are likewise apt to crack in the fire, which may be for the most part ascribed to the humidity, of which they always retain a portion.

The only way of preventing this inconvenience is to heat the body as slowly as possible. It is best, first of all, to heat that place of the charcoal where the piece is intended to be put on; and afterwards lay it thereon; a little cracking will then ensue, but commonly of no great consequence. After that the flame is to be blown very slowly towards it, in the beginning not directly upon, but somewhat above it, and so approaching nearer and nearer with the flame until it become red hot. This will do for the most part; but there are nevertheless some, which, notwithstanding all the precautions, it is almost impossible to keep on the charcoal. Thus the flues are generally the most difficult; and as one of their principal characters is discovered by their effects in the fire per se, they ought necessarily to be tried that way. To this purpose, it is best to make a little hole in the charcoal to put the flour in, and then to put another piece of charcoal as a covering upon this, leaving only a small opening for the flame to enter, as this flue will nevertheless split and fly about, a larger piece thereof than before-mentioned must be taken, in order to have at least something of it left.

But if the experiment is to be made upon a flue whose effects one does not want to see in the fire per se, but rather with fluxes, then a piece of it ought to be forced down into melted borax, when always some part of it will remain in the borax, notwithstanding the greatest part may sometimes fly away by cracking.

1. Of substances to be tried in the fire per se. As the flues undergo great alterations when exposed to the fire by themselves, whereby some of their characteristic, and often the most principal, are discovered, they ought first to be tried that way, observing what has been said before concerning the quantity of matter, direction of the fire, &c. The following are generally the resuits of this experiment.

Calcaceous earth or flues, when it is pure, does not melt by itself, but becomes white and friable, so as to break freely between the fingers; and, if suffered to cool, and then mixed with water, it becomes hot, just like common quick-lime. As in these experiments only very small pieces are used, this last effect is best discovered by putting the proof on the outside of the hand, with a drop of water to it, when instantly a very quick heat is felt on the skin. When the calcareous substance is mixed with the vitriolic acid, as in gypsum, or with a clay, as in marle, it commonly melts by itself, yet, more or less difficultly in proportion to the differences of the mixtures. Gypsum produces generally a white, and marle a grey, glass or flag. When there is any iron in it, as a white iron ore, it becomes dark, and sometimes quite black, &c.

The silex never melts alone, but become generally more brittle after being burnt. Such of them as are coloured become colourless, and the sooner when it does not arise from any contained metal; for instance, the topazes, amethysts, &c. some of the precious flues, however, excepted: And such as are mixed with a quantity of iron grow dark in the fire, as some of the jaspers, &c.

Garnets melt always into a black flag, and sometimes so easily that they may be brought into a round globe upon the charcoal.

The argillacea, when pure, never melt, but become white and hard. The flame effects follow when they are mixed with phlogiston. Thus the soap-rock is easily cut with the knife; but being burnt it cuts glass, and would strike fire with the feel, if as large a piece as is necessary for that purpose could be tried in this way. The soap-rocks are sometimes found of a dark brown and nearly black colour, but nevertheless become quite white in the fire like a piece of China ware. Hence care must be taken not to urge the flame from the top of the wick, there being for the most part a footy smoke, which commonly will darken all that it touches; and if this is not observed, a mistake in the experiment might easily happen. But if
it is mixed with iron, as it is sometimes found, it does not so easily part with its dark colour. The argillaceous when mixed with lime melt by themselves, as above-mentioned. When mixed with iron, as in the boles, they grow dark or black; and if the iron is not in too great a quantity, they melt alone into a dark flag; the same happens when they are mixed with iron and a little of the vitriolic acid, as in the common clay, &c. *Misc. and of fableum become somewhat hard and brittle in the fire, and are more or less refractory, though they give some marks of fusibility.

The flux discover one of their chief characteristics by giving a light like phosphorus in the dark, when they are slowly heated; but lose this property, as well as their colour, as soon as they are made red hot.- They commonly melt in the fire into a white opaque flag, though some of them not very easily.

Some sorts of the zeolites melt easily, and foam in the fire, sometimes nearly as much as borax, and become a frothy flag, &c.

A great many of those mineral bodies which are impregnated with iron, as the boles, and some of the white iron ores, &c. as well as some of the other iron ores, viz. the bloodstone, are not attracted by the loadstone before they have been thoroughly roasted, &c.

2. Of substances heated with fluxes. After the mineral bodies have been tried in the fire by themselves, they ought to be heated with fluxes to discover if they can be melted or not, and some other phenomena attending this operation. For this purpose, three different kinds of fluxes are used as fluxes, viz. talcia, borax, and talca fusible microsilicum; (see the article Blow-Pipe.)

The talcia is, however, not so much used in these small experiments, its effects upon the charcoal rendering it for the most part unfit for it; because, as soon as the flame begins to act upon it, it melts instantly, and is almost wholly absorbed by the charcoal. When this flux is employed to make any experiment, a very little quantity is wanted at once, viz. about the cubical contents of an eighth part of an inch, more or less. This is laid upon the charcoal, and the flame blown upon it with the blow-pipe; but this flux commonly is in a form of powder, it is necessary to go on very gently, that the force of the flame may not disperse the minute particles of the flux. As soon as it begins to melt, it runs along on the charcoal, almost like melted tallow; and when cold, it is a glassy matter of an opaque dull colour spread on the coal. The moment it is melted, the matter which is to be tried ought to be put into it, because otherwise the greatest part of the flux will be soaked into the charcoal, and too little of it left for the intended purpose. The flame ought then to be directed on the matter itself; and if the flux spreads too much about, leaving the proof almost alone, it may be brought to it again by blowing the flame on its extremities, and directing it towards the subject of the experiment. In the ashy made with this flux, it is true, we may find whether the mineral bodies which are melted with it have been dissolved by it or not; but we cannot tell with any certainty whether this is done hastily and with force, or gently and slow; nor whether a less or a greater part of the matter has been dissolved; neither can it be well distinguished if the matter has imparted any weak tincture to the flux; because this flux always bubbles upon the charcoal during the experiment, nor is it clear when cold, so that scarcely any colour, except it be a very deep one, can be discovered, although it may sometimes be coloured by the matter that has been tried.

The following are entirely soluble in this flux with effervescence: Agate; chalcedony; carnelian; Turkey ftone, &c. (cos Turcica); fluor mineralis; onyx; opal; quartz; common flint; ponderous spar. The following are divisible in it with or without effervescence, but not entirely soluble: Amanthius; aebutius; basaltus; chrysolite; granate; hornblend; jasper; marlilite; mica; the mineral of alum from Tolfa; petroflex; aluminae and roof-flate from Helsingia; emerald; fletites; common flint; schoeler; talc; trapp; tripoli; tourmalin. And the following are neither fusible nor divisible in it: Diameter; hyacinth; ruby; fapphire.

The other two fluxes, viz. borax and the talca microsilicum, are very well adapted to these experiments, because they may by the flame be brought to a clear un.coloured and transparent glass; and as they have no attraction to the charcoal, they keep themselves always upon it in a round globular form. The talca fusible microsilicum is very scarce, and perhaps not to be met with in the shops; it is made of urine.

The following are fusible in borax, with more or less effervescence: Fluor mineralis; marl; mica; the mineral of alum from Tolfa; aluminas and roof-flate from Helsingia; ponderous spar; schoeler; talc; tourmalin. And the following without effervescence: Agate; diamond; amanthius; aebutius; basaltus; chalcedony; carnelian; chrysolite; cos turcica; granate; hyacinth; jasper; lapis ponderosus; onyx; opal; petroflex; quartz; ruby; fapphire; common flint; fletite; trapp; tripoli; topaz; zeolite; hydrophanes.

In the microsilicum flux, the following are soluble with more or less effervescence: Basaltus; bole; fluor mineralis; marl; mica; the mineral of alum from Tolfa; aluminas and roof-flate from Helsingia; common flint; t. The following without visible effervescence: Agate; diamond; amanthius; aebutius; chalcedony; carnelian; chrysolite; granate; hyacinth; jasper; onyx; opal; petroflex; quartz; ruby; fapphire; common flint; emerald; talc; topaz; trapp; tripoli; zeolite; hornblend; hydrophanes; lathomarga; fletites.

Calcaceous earth, ponderous spar, gypsum, and other additaments, often afflit the solution, as well in the microsilicum flux as in borax. To which it is necessary to add, that in order to observe the effervescence properly, the matter added to the flux should be in the form of a small particle rather than in fine powder; because in this last there is always air between the particles, which being afterwards driven off by the heat afford the appearance of a kind of effervescence (a).

(a) In the above lists, the articles marked † effervesc very little; those marked ‡ not at all; those marked ❀ require a larger quantity of the flux and a longer continuance of heat than the rest; those marked ✡ are more difficultly dissolved than the others.
The quantity of those two salts required for an experiment is almost the same as the 

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**Part I.**

The quantity of those two salts required for an experiment is almost the same as the *salts*; but as the former are crystallized, and consequently include a great deal of water, particularly the borax, their bulk is considerably reduced when melted, and therefore a little more of them may be taken than the before mentioned quantity.

Both those salts, especially the borax, when exposed to the flame of the blow-pipe, bubble very much and foam before they melt to a clear glass; which for the most part depends on the water they contain. And as this would hinder the affayer from making due observations on the phenomena of the experiment, the salt which is to be used must first be brought to a clear glass before it can serve as a flux; it must therefore be kept in the fire until it become so transparent that the cracks in the charcoal may be seen through it. This done, whatsoever is to be tried is put to it, and the fire continued.

Here it is to be observed, that for the affayers, making due observations on the phenomena of the experiment, the salt which is to be used must first be brought to a clear glass before it can serve as a flux; because it may then be better distinguished in what manner the flux acts upon the matter during the experiment. If this be not observed, the flux, communicating itself with every point of the surface of the mineral body, spreads all over it, and keeps the form of this salt, which commonly is flat, and by that means hinders the operator observing all the phenomena which may happen.

Besides, the flux being in too small a quantity in proportion to the body to be tried, will be too weak to act with all its force upon it. The best proportion therefore is about a third part of the mineral body to the flux; and as the quantity of the flux abovementioned makes a globe of a due size in regard to the greatest heat that is possible to procure in these experiments, so the size of the mineral body must be a third part less here than when it is to be tried in the fire by itself.

The *salts* as has been already observed, is not of much use in these experiments; nor has it any particular qualities in preference to the two last mentioned salts, except that it dissolves the zeolites easier than they do.

The microcosmic salt flows almost the fame effects in the fire as the borax, only differing from it in a very few circumstances; of which one of the principal is, that when melted with manganese, it becomes of a crimson hue instead of a jacinth colour, which borax takes. This salt is, however, for its scarcity, still very little in use, borax alone being that which is commonly employed. Whenever a mineral body is melted with any of these two salts on mineral bodies may be put to it, and the flux continued. When the flux is put to it, and the fire continued. Here it is to be observed, that for the affayers, when metals are often disguised, as has been already observed, is not of much use in these experiments; nor has it any particular qualities in preference to the two last mentioned salts, except that it dissolves the zeolites easier than they do.

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In order farther to illustrate what has been said about these experiments, we shall give a few examples of the effects of borax upon the mineral bodies. — The calcareous substances, and all those stones which contain any thing of lime in their composition, dissolve readily and with effervescence in the borax. The effervescence is the more violent the greater the portion of lime contained in the stone. This cause, however, is not the only one in the gypsum, because both the constituents of this do readily mix with the borax, and therefore a greater effervescence arises in melting gypsum with the borax than lime alone. — The *salts* do not dissolve; some few excepted which contain a quantity of iron. — The argillaceous, when pure, are not acted upon by the borax; but when they are mixed with some heterogeneous bodies, they are dissolved, though very slowly; such are, for instance, the stone-marrow, the common clay, &c.

The granites, zeolites, and trapp, dissolve but slowly. The *salts*, *opals*, and *micas*, dissolve for the most part very easily; and so forth. Some of these bodies melt to a colourless transparent glass with the borax; for instance, the calcareous substances when pure, the foids, some of the zeolites, &c. Others tinge the borax with a green transparent colour, *viz.* the granites, trapp, some of the argillaceous, and some of the micas, and asbestos. This green has its origin partly from a small portion of iron which the granites particularly contain, and partly from phlogiston.

Borax can only dissolve a certain quantity of the mineral body proportional to its own. Of the calcareous kind it dissolves a vast quantity; but turns at last, when too much has been added, from a clear transparent to a white opaque flag. When the quantity of the calcareous matter exceeds but little in proportion, the glass looks very clear as long as it remains hot: but as soon as it begins to cool, a white half opaque cloud is seen to arise from the bottom, which spreads over the third, half, or more of the glass globe, in proportion to the quantity of calcareous matter; but the glass or flag is nevertheless shining, and of a glaify texture when broken. If more of this matter be added, the cloud rises quicker and is more opaque, and so by degrees till the flag becomes quite milk white. It is then no more of a shining, but rather dry appearance, on the surface; is very brittle, and of a grained texture when broken.

**Sect. II. Of Experiments upon Metals and Ores.**

What has been hitherto said relates only to the stones and earths: We shall now proceed to describe the manner of examining metals and ores. An exact knowledge and nicety of procedure are so much the more necessary here, as the metals are often so disguised in their ores, as to be very difficultly known by their external appearance, and liable sometimes to be mistaken one for the other: Some of the cobalt ores, for instance, resemble much the pyrites arsenical; there are also some iron and lead ores, which are nearly like one another, &c.

As the ores generally consist of metals mineralized with sulphur or arsenic, or sometimes both together, they ought first to be exposed to the fire by themselves, in order not only to determine with which of these they are mineralized, but also to set them free from those volatile mineralizing bodies: This serves instead of calculation, by which they are prepared for further assays.

Here:
Here it must be repeated, that whenever any metal or fusible ore is to be tried, a little concavity must be made in that place of the charcoal where the matter is to be put; because, as soon as it is melted, it forms itself into a globular figure, and might then roll from the charcoal, if its surface was plain; but when borax is put to it, this inconvenience is not so much to be feared.

Whenever an ore is to be tried, a small bit being broke off for the purpose, it is laid upon the charcoal, and the flame blown on it slowly. Then the sulphur or arsenic begins to part from it in form of smoke: these are easily distinguished from one another by their smell; that of sulphur being sufficiently known, and the arsenic smelling like garlic. The flame ought to be blown very gently as long as any smoke is seen to part from the ore; but after that, the heat must be augmented by degrees, in order to make the calcination as perfect as possible. If the heat be applied very strongly from the beginning upon an ore that contains much sulphur or arsenic, the ore will presently melt, and yet lose very little of its mineralizing bodies, by that means rendering the calcination very imperfect. It is, however, impossible to calcine the ores in this manner to the utmost perfection, which is easily seen in the following instance, viz. in melting down a calcined potter's o're with borax, it will be found to bubble upon the coal, which depends on the sulphur which is still left, the vitriolic acid of this uniting with the borax, and causing this motion. However, lead in its metallic form, melted in this manner, bubbles upon the charcoal, if any sulphur remains in it. But as the lead as well as some of the other metals, may raise bubbles upon the charcoal, although they are quite free from the sulphur, only by the flames being forced too violently on it, these phenomena ought not to be confounded with each other.

The ores being thus calcined, the metals contained in them may be discovered, either by being melted alone or with fluxes; when they show themselves either in their pure metallic state, or by tinging the flag with a colour peculiar to each of them. In these experiments it is not to be expected that the quantity of metal contained in the ore should be exactly determined; this must be done in larger laboratories. This cannot, however, be looked upon as any defect, since it is sufficient for a mineralogist only to find out what part of metal is contained in the ore. There is another circumstance, which is a more real defect in the miniature laboratories, which is, that some ores are not at all capable of being tried by so small an apparatus; for instance, the gold ore called pyrites aureus, which consists of gold, iron, and sulphur. The greatest quantity of gold which this ore contains is about one ounce, or one ounce and a half, out of 100 pounds of the ore, the rest being iron and sulphur: and as only a very small bit is allowed for these experiments, the gold contained therein can hardly be discerned by the eye, even if it could be extracted; but it goes along with the iron in the flag, this last metal being in so large a quantity in proportion to the other, and both of them having an attraction for each other. The blende and black-jacks, which are mineral zinc ores, containing zinc, sulphur, and iron, cannot be tried this way, because they cannot be perfectly calcined, and besides the zinc flies off when the iron forifies. Neither can those blends, which contain silver or gold mineralized with them, be tried in this manner, which is particularly owing to the imperfect calcination. Nor are the quicksilver ores fit for these experiments: the volatility of that semi-metal makes it impossible to bring it out of the poorer fort of ores: and the rich ores, which sweat out the quicksilver when kept close in the hand, not wanting any of these affays, &c. These ores ought to be assayed in larger quantities, and even with such other methods as cannot be applied upon a piece of charcoal.

Some of the rich silver ores are easily tried: for instance, minera argenti vitrea, commonly called silver-glafls, which consists only of silver and sulphur. When this ore is exposed to the flame, it melts instantly, and the sulphur goes away in some, leaving the silver pure upon the charcoal in a globular form. If this silver should happen to be of a dirty appearance, which often is the case, then it must be melted anew with a very little borax: and after it has been kept in fusion for a minute or two, so as to be perfectly melted and red-hot, the proof is suffered to cool: it may then be taken off the coal; and being laid upon the flesh plate, the silver is fenned from the flag by one or two strokes of the hammer. Here the use of the blow-pipe is manifest; for this ought first to be placed upon the plate, to hinder the proof from flying off by the violence of the stroke, which otherwise would happen. The silver is then found inclosed in the flag of a globular form, and quite shining, as if it was polished. When a large quantity of silver is contained in a lead ore, viz. in a potter's o're, it can likewise be discovered through the use of the blow-pipe, of which more will be mentioned hereafter.

Tin may be melted out of the pure tin ores in its metallic state. Some of these ores melts very easily, and yield their metal in quantity, if only exposed to the fire by themselves; but others are more refractory; and as these melts very slowly, the tin, which sweats out in form of very small globules, is instantly burnt to ashes before these globules have time to unite in order to compose a larger globule, which, might be seen by the eye, and not so soon destroyed by the fire; it is therefore necessary to add a little borax to these ores at the beginning, and then to blow the flame violently at the proof. The borax does here preserve the metal from being too soon calcined, and even contributes to the reader collecting of the small metallic particles, which soon are seen to form themselves into a globule of metallic tin at the bottom of the whole mass, nearest to the charcoal. As soon as so much of the metallic tin is produced as is sufficient to convince the operator of its presence, the fire ought to be discontinued, though the whole of the ore be not yet melted; because the whole of this kind of ore can be seldom or never reduced into metal by means of these experiments, a great proportion being always calcined; and if the fire is continued too long, perhaps even the metal already reduced may likewise be burnt to ashes; for the tin is very soon deprived of its metallic state by the fire.

Most part of the lead ores may be reduced to a metallic state upon the charcoal. The minera plumbi calciforae, which are pure, are easily melted into lead; but
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but such of them as are mixed with an acher ferri, or any kind of earth, as clay, lime, &c. yield very little of lead, and even nothing at all, if the heterogenea are combined in any large quantity: this happens even with the minera plumbi calciformes arsine mixta. These therefore are not to be tried but in larger laboratories. However, every mineral body suspected to contain any metallic substance may be tried by the blow-pipe, so as to give sufficient proofs whether it contain any or not, by its effects being different from those of the flones or earths, &c.

The minera plumbi minerales which leave the lead in a metallic form, if not too large a quantity of iron is mixed with it. For example, when a tellurated or flesh-grained lead ore is exposed to the flame, its sulphur, and even the arsenic if there be any, begins to fume, and the ore itself immediately to melt into a globular form; the rest of the sulphur continues then to fly off, if the flame be blown slowly upon the mass; but, on the contrary, very little of the sulphur will go off, if the flame be forced violently on it: in this case, it rather happens that the lead itself crackles and dilates, throwing about very minute metallic particles. The sulphur being driven out as much as possible, which is known by finding no sulphureous vapour in the flame, the whole is suffered to cool, and then a globule of metallic lead will be left upon the coal.

If any iron is contained in the lead-ore, the lead, which is melted out of it, is not of a metallic shining, but rather of a black and uneven surface: a little borax must in this case be melted with it, and as soon as no bubble is seen to rise any longer from the metal into the borax, the fire must be discontinued: when the mass is grown cold, the iron will be found scorified with the borax, and the lead left pure and of a shining colour.

Borax does not scorify the lead in those small experiments when it is pure: if the flame is forced with a violence on it, a bubbling will ensue, resembling that which is observed when borax dissolves a body melted with it; but when the fire ceases, the flag will be perfectly clear and transparent, and a quantity of very minute particles of lead will be seen spread upon the borax, which have been torn off from the mass during the bubbling.

If such a lead ore is rich in silver, this last metal may likewise be discovered by this experiment; because as the lead is volatile, it may be forced off, and the silver remain. To effect this, the lead, which is melted out of the ore, must be kept in constant fusion with a slow heat, that it may be consumed. This end will be sooner obtained, and the lead part quicker, if during the fusion the wind through the blow-pipe be directed immediately, though not forcibly, upon the melted mass itself, until it begin to cool; at which time the fire must be directed on it again. The lead, which is already in a volatilitytive state, will by this artifice be driven out in form of a subtle smoke; and by thus continuing by turns to melt the mass, and then to blow off the lead, as has been said, until no smoke is any longer perceived, the silver will at last be obtained pure. The same observation holds good here also, which was made about the gold, that, as none but very little bits of ores can be employed in these experiments, it will be difficult to extract the silver out of a poor ore: for some part of it will fly off with the lead, and what might be left is too small to be discerned by the eye. The silver, which by this means is obtained, is easily distinguished from lead by the following external marks, viz. that it must be red-hot before it can be melted: it cools sooner than lead: it has a silver colour; that is to say, brighter and whiter than lead: and is harder under the hammer.

The minera cupri calciformes (at least some of them), when not mixed with too much flene or earth, are easily reduced to copper with any flux; if the copper is not found not to have its natural bright colour, it must be melted with a little borax, which purifies it. Some of these ores do not all discover their metal if not immediately melted with borax; the heterogenea contained in them hindering the fusion before these are scorified by the flux.

The grey copper ores, which only consist of copper and sulphur, are tried almost in the same manner as above-mentioned. Being exposed to the flame by themselves, they will be found instantly to melt, and part of their sulphur to go off. The copper may afterwards be obtained in two ways: the one, by keeping the proof in fusion for about a minute, and afterwards suffering it to cool; when it will be found to have a dark and uneven appearance externally, but which after being broken discovers the metallic copper of a globular form in its centre, surrounded with a regular, which still contains some sulphur and a portion of the metal: the other, by being melted with borax, which last way sometimes makes the metal appear sooner.

The minera cupri pyriticae, containing copper, sulphur, and iron, may be tried with the blow-pipe if they are not too poor. In these experiments the ore ought to be calcined, and after that the iron scorified. For this purpose a bit of the ore must be exposed to a slow flame, that as much of the sulphur as possible may part from it before it is melted, because the ore commonly melts very soon, and then the sulphur is more difficultly driven off. After being melted, it must be kept in fusion with a strong fire for about a minute, that a great part of the iron may be calcined; and after that, some borax must be added, which scorifies the iron, and turns with it to a black flag. If the ore is very rich, metallic copper will be had in the flag after the scorification. If the ore be of a moderate richness, the copper will still retain a little sulphur, and sometimes iron: the product will therefore be brittle, and must with great caution be separated from the flag, that it may not break into pieces; and if this product is afterwards treated in the same manner as before said, in speaking of the grey copper-ores, the metal will soon be produced. But if the ore is poor, the product after the first scorification must be brought into fusion, and afterwards melted with some fresh borax, in order to calcine and scorify the remaining portion of iron; after which it may be treated as mentioned in the preceding paragraph. The copper will in this last case be found in a very small globule.

The copper is not very easily scorified with this apparatus, when it is melted together with borax, unless it has first been exposed to the fire by itself for a while in order to be calcined. When only a little of this metal is dissolved, it instantly tinges the flag of a reddish
Metals and this difh brown colour, but as soon as this flag is kept in fusion for a little while, it becomes quite green and transparent; and thus the presence of the copper may be discovered by the colour, when it is concealed in heterogeneous bodies, so as not to be discovered by any other experiment.

If metallic copper is melted with borax by a slow fire, and only for a very little time, the glafs or flag becomes of a fine transparent blue or violet colour, inclining more or less to the green: but this colour is not properly owing to the copper, but it may rather be to its phlogiston; because the same colour is to be had in the same manner from iron; and these glusses, which are coloured with either of these two metals, soon lose their colour if exposed to a strong fire, in which they become quite clear and colourless. Besides, if this glafs, tinged blue with the copper, is again melted with more of this metal, it becomes of a good green colour, which for a long time keeps unchanged in the fire.

The metals, when pure, can never be melted by the means of the blow-pipe alone; nor do they yield their metal when melted with fluxes, because they require too strong a heat to be brought into fusion; and as both the ore and the metal itself very soon lose their phlogiston in the fire, and cannot be supplied with a sufficient quantity from the charcoal, fo likewise are they very soon calcined in the fire. This easy calculation is also the reason why the fluxes, for infance borax, readily scorify this ore, and even the metal itself. The iron loses its phlogiston in the fire sooner than the copper, and is therefore more easily scorified.

The iron is, however, discovered without much difficulty, although it were mixed but in a very small quantity with heterogeneous bodies. The ore, or those bodies which contain any large quantity of the metal, are all attracted by the loadstone, some without any previous calculation, and others without having been roaled. When a clay is mixed with a little iron, it commonly melts by itself in the fire; but if this metal is contained in a limestone; it does not promote the fusion, but gives the stone a dark and sometimes a deep black colour, which always is the character of iron. A minera ferris californianae pura cristallifata, is commonly of a red colour: This being expoed to the flame, becomes quite black; and is then readily attracted by the loadstone, which it was not before. Besides these signs, the iron discovers itself, by tinging the flag of a green transparent colour, inclining to brown, when only a little of the metal is scorified; but as soon as any larger quantity thereof is dissolved in the flag, this becomes first a blackish brown, and afterwards quite black and opaque.

Bismuth is known by its communicating a yellowish brown colour to borax; and arsenic by its volatility and garlic smell. Antimony, both in form of regulus and ore, is wholly volatile in the fire when it is not mixed with any other metal except arsenic; and is known by its particular smell, easier to be distinguished when once known than described. When the ore of antimony is melted upon the charcoal, it bubbles constantly during its volatilizing.

Zinc ores are not easily tried upon the coal; but the regulus of zinc exposed to the fire upon the charcoal burns with a beautiful blue flame, and forms itself almost instantly into white flowers, which are the common flowers of zinc.

Cobalt is particularly remarkable for giving to the glass a blue colour, which is the zaffire or smalt. To produce this, a piece of cobalt ore must be calcined in the fire, and afterwards melted with borax. As soon as the glafs, during the fusion, from being clear, seems to grow opaque, it is a sign that it is already tinged a little: the fire is then to be discontinued, and the operator must take hold, with the nippers, of a little of the glafs, whilst yet hot, and draw it out flowly in the beginning, but afterwards very quick, before it cools, whereby a thread of the coloured glass is procured, more or less thick, wherein the colour may be easie be seen than in a globular form. This thread melts easily, if only put in the flame of the candle without the help of the blow-pipe. If this glafs be melted again with more of the cobalt, and kept in fusion for a while, the colour becomes deeper; and thus the colour may be bettered at pleasure.

When the cobalt ore is pure, or at least contains but little iron, a cobalt regulus is almost instantly produced in the borax during the fusion; but when it is mixed with a quantity of iron, this last metal ought first to be separated, which is easily performed since it scorifies sooner than the cobalt; therefore, as long as the flag retains any brown or black colour, it must be separated, and melted again with fresh borax, until it shows the blue colour.

Nickel is very seldom to be had; and as its ores are seldom free from mixtures of other metals, it is very difficultly tried with the blow-pipe. However, when this femimetal is mixed with iron and cobalt, it is easily freed from these heterogeneous metals, and reduced to a pure nickel regulus by means of scorification with borax; because both the iron and cobalt sooner scorify than the nickel. The regulus of nickel itself is of a green colour when calcined; it requires a pretty strong fire before it melts, and tingles the borax with a hueaith colour. Manganese gives the same colour to borax; but its other qualities are quite different, so as not to be confounded with the nickel.

By means of the foregoing explanations, and those given under the article Blow-Pipe, any gentleman, who is a lover of this science, will be able, in an easy manner, to amuse himself in discovering the properties of those works of nature, with which the mineral kingdom furnishes us; or more usefully to employ himself by finding out what sorts of stones, earths, ores, &c. there are on his estate, and to what economical purposes they may be employed. The scientific mineralist may, by examining into the properties and effects of the mineral bodies, discover the natural relation these bodies stand in to each other, and thereby furnish himself with materials for establishing a mineral system, founded on such principles as Nature herself has laid down in them; and this in his own study, without being forced to have recourse to great laboratories, crucibles, furnaces, &c. which is attended with much trouble, and is the reason why few can have an opportunity of gratifying their desire of knowledge in this
MINERALOGY.

A traveller, who has seldom an opportunity of carrying many things along with him, may very well be contented with this laboratory and its apparatus, which are sufficient for most part of such experiments as can be made on a journey. There are, however, other things very useful to have at hand on a journey, which ought to make a separate part of a portable laboratory, if the manner of travelling does not oppose it; this consists of a little box including the different acids, and one or two mortars, in order to try the mineral bodies in liquid menstrua if required.

These acids are, the acid of nitre, of vitriol, and of common salt. Most of the flones and earths are attacked, at least in some degree, by the acids; but the calcareous are the safest of all to be dissolved by them, which is accounted for by their calcareous properties. The acid of nitre is that which is most used in these experiments; it dissolves the limestone, when pure, perfectly, with a violent effervescence, and the solution becomes clear: when the limestone enters into some other body, it is nevertheless discovered by this acid, through a greater or less effervescence in proportion to the quantity of the calcareous particles, unless there are so few as to be almost concealed from the acid by the heterogeneous ones. In this manner a calcareous body, which sometimes nearly resembles a felsigne or argillaceous one, may be known from the latter, without the help of the blow-pipe, only by pouring one or two drops of this acid upon the subject, which is very convenient when there is no opportunity nor time of using this instrument.

The gypsea, which consists of lime and the vitriolic acid, are not in the least attacked by the acid of nitre, if they contain a sufficient quantity of their own acid; because the vitriolic acid has a stronger attraction to the lime than the acid of nitre: but if the calcareous subsistence is not perfectly saturated with the acid of vitriol, then an effervescence arises with the acid of nitre, more or less in proportion to the want of the vitriolic acid. These circumstances are often very essential in distinguishing the calcarea and gypsea from one another.

The acid of nitre is likewise necessary in trying the zeolites, of which some species have the singular effect to dissolve with effervescence in the above-mentioned acid; and within a quarter of an hour, or even sometimes not until several hours after, to change the whole solution into a clear jelly, of so firm a consistence, that the glass wherein it is contained may be reversed without its falling out.

If any mineral body is tried in this menstruum, and only a small quantity is suspected to be dissolved, though it was impossible to distinguish it with the eye during the solution, it can be easily discovered by adding to it ad futuratem a clear solution of the alkalii, when the dissolved part will be precipitated, and fall to the bottom. For this purpose the solid foce may be very useful.

The acid of nitre will suffice for making experiments upon flones and earths; but if the experiments are to be extended to the metals, the other two acids are also necessary.

Another instrument is likewise necessary to a complete

Plate

CCXIII.
MINERALOGY.

Part I.

Mort le ores, may be separated from each other, and from the adherent rock, by means of water. This trough is very common in laboratories, and is used of different sizes; but here only one is required of a moderate size, such as 12 inches and a half long, three inches broad at the one end and one inch and a half at the other end, sloping down from the sides and the broad end to the bottom, where it is three quarters of an inch deep. It is made of much smaller dimensions. It is commonly made of wood, which ought to be chosen smooth, hard, and compact, wherein are no pores in which the minute grains of the pounded matter may conceal themselves. It is to be observed, that if any such matter is to be washed as is suspected to contain some native metal, such as silver or gold, a trough should be procured for this purpose of a very shallow slope; because the minute particles of the native metal have then more power to assemble together at the broad end, and separate from the other matter.

The management of this trough, or the manner of washing, consists in this: That when the matter is mixed with about three or four times its quantity of water in the trough, this is kept very loose between two fingers of the left hand, and some light strokes given on its broad end with the right, that it may move backwards and forwards; by which means the heaviest particles assemble at the broad and lower end, from which the lighter ones are to be separated by inclining the trough and pouring a little water on them. By repeating this process, all such particles as are of the same gravity may be collected together, and separated from those of different gravity, provided they were before equally pounded: though such as are of a clayey nature, are often very difficult to separate from the rest, which, however, is of no great consequence to a skilful and experienced washer.

The washing process is very necessary, as there are often rich ores, and even native metals, found concealed in earths and sand in such minute particles as not to be discovered by any other means.

SECTION III. Description of an Improved Portable Laboratory for Assaying Minerals.

The chief pieces and implements of the portable laboratories are represented in Plate XCIX. at Blow-Pipe, and in Plate CCCXIII. annexed to the present article.

1. The first contains those belonging to the Dry Laboratory, so called on account of its containing whatever is required to try all kinds of faults in the dry way by fire, without any of the humid memorandum. They are made to pack in a box of the size of an odlavo book, lined with green velvet, and covered with black fish-skin; the inside divided into different compartments, suited to the size, form, and number of the implements it is to contain. Of these the principal are described under Blow-Pipe. We must here, however, add the following remarks and alterations of that instrument by Mr Magellan.

D and Q (fig. 13.) are the two pieces that form the blow-pipe, which is here represented entire. This very useful instrument has been considerably improved of late in England. The mouth-piece aa is made of ivory, to avoid the disagreeable sensation of having a piece of metal a long time between the teeth and lips, which, if not of silver or gold, may be very noxious to the operator; a circumstance that has been hardly noticed before.

1. If the mouth-piece aa be made of a round form, it cannot be held for any length of time between the teeth and lips, to blow through it, without flaining the muscles of the mouth, which produces a painful sensation. It must, therefore, have such an external figure, as to adapt itself accurately to the lateral angles of the lips, having a flattish oval form externally, with two opposite corners to fit those internal angles of the mouth, when it is held between the lips, as may be seen in that represented in the figure.

2. The small globe b is hollow, for receiving the moisture of the breath; and must be composed of two hemispheres, exactly screwing into one another in BB; the male-screw is to be in the lower part, and foldered on the crooked part of the tube QD, at such a distance, that the inside end of the crooked tube be even with the edge of the hemisphere, as represented by the dotted lines in the figure. But the upper hemisphere is to be foldered at the end of the straight tube D. By these means, the moisture arising from the breath falls into the hollow of the lower hemisphere, where it is collected round the upper inside end of the crooked part Q of the blow-pipe, without being apt to fall into it.

3. The small nozzles, or hollow conical tubes, advised by Meflrs Engeftrom, Bergman, and others, are wrong in the principle; because the wind that paffes from the mouth through such long cones loses its velocity by the lateral friction, as happens in hydraulic spouts; which, when formed in this manner, do never throw the fluid so far as when the fluid paffes through a hole of the same diameter, made in a thin plate of a little metallic cap that screws at the end of the large pipe. It is on this account that the little cap s is employed, having a small hole in the thin plate, by which serves as a cover to it; and there are several of these little caps, with holes of smaller and larger sizes, to be changed and applied whenever a flame is required to be more or less strong.

4. Another convenience of these little caps is, that even in case any moisture should escape falling into the hemisphere bb, and pass along with the wind through the crooked pipe Q, it never can arrive at nor obstruct the little hole of the cap s, there being room enough under the hole in the inside, where this moisture must be stopped till it is cleaned and wiped out.

The stream of air that is impelled by the blow-pipe (as seen in fig. 3.) upon the flame, must be constant and even, and must last as long as the experiment continues to require it. This labour will fatigue the lungs, unless an equal and uninterrupted inspiration can at the same time be continued. To succeed in this operation without inconvenience, some labour and practice are necessary, as already explained under the detached article.

Every assay ought always to begin by the exterior flame, which must be first directed upon the mass under examination; and, when its efficacy is well known, then the interior blue flame is to be employed.
Part I.

MINERALOGY.

3. Concentrated marine acid, with its specific gravity.
4. Marine acid dephto-
gificated.
5. Aqua regia for gold. 6. Aqua regia for platina viz. 2 nit. and 1 mar-
ine.
7. Nitrous solution of sil-
er. 8. Nitrous solution of mer-
cury, made in the col.
9. Muriatic solution of mer-
cury barytes.
10. Muriatic solution of mercury in its metal-
lic state.
11. Corrosive sublimate.
12. White arsenic.
13. Acid of sugar.
14. Liquor probatarius
15. Nitrous solution of copper.
17. Hepar sulphuris.
18. Oil of tartar per de
gnium.
19. Salt of tartar.
21. Pearl-ashes.
22. Caustic vegetable al-
kalii.
23. Nitre.
26. Vitriolated argilla
(alum.)
27. Vitriol of iron (cop-
28. Nitrous solution of permu-
per.)
31. Phlogisticated alkali.
32. Lime-Water.
33. Lime-water phlogisti-
34. Caustic volatile alkali,
cated by the Prussian blue.
35. Mild volatile alkali.
36. Rectified spirit (al-
37. Ether.
38. Spirituous tincture
of galls.

The following tests are very useful for these alloys, viz. 39. Spirituous solutions of soap; 40. Spirituous solution of violets; 41. Tincture of limes; 42. Tincture of Brail
wood; 43. Tincture of turmeric; 44. Oil of olives;
45. Oil of linseed; 46. Oil of turpentine; 47. Essential oil of wild-foreset; 48. Hepar sulphuris; 49. Sugar of lead; 50. Solution of alum.

The method of applying the above tests of acids and re-agents may be seen in Bergman’s treatises of the Analysis of Waters, and of Affaying by the Hu-
mid Way; in Kirwan’s Elements of Mineralogy; in the Elements of Chemistry of Dijon; in the Memoirs of the same Academy; in Fourcroy’s Lectures of Chem-
istry, &c.

III. The Lamp-furnace Laboratory, for experiments both by the humid and the dry way, is a very curious and useful, though small apparatus. It is an improvement of that which was contrived by M. de Mercutie, in con-sequence of the information he received from his friend the president de Viry, who, at Upsal how advantageously the late eminent professor Bergman availed himself of this convenience for many analytical procexes in miniature, by the use of very small glass vessels about one inch diameter, and other implements of proportional size, for performing various chemical operations. (See the Dijon Memoirs for 1783, Part 1, p. 171.)
There can be no doubt but that whenever these proceeees are properly conducted, though in miniature, the lamp-furnace will prove amply sufficient to perform in a few minutes, and with very little expense, the various solutions, digestions, and distillations, which otherwise would require large vesseis, hlls, retorts, reverberatory furnaces, &c. to ascertain the component parts of natural bodies: though it is not always sufficient to ascertain their proper quantities. In this last case, operations must be performed in great laboratories, and on a large scale, at a considerable expense. But the substances are sometimes too valuable; as, for instance, when precious stones are examined; and of course the last way never can be attempted in such cases.

These small processes have likewise another advantage before noticed, which cannot be obtained in works at large. It confines in one's being able to observe the gradual progress of each operation; of easily retarding or urging it, as it may require; and of ascertaining at pleasure each step of every experiment, together with the phenomena attending the same.

The large round cavity in the middle of the parallelogram, fig. 5, is to receive the lamp \( L \), fig. 3, when all the implements are packed up in their case of black silk skin: and the cover of the lamp is represented by, fig. 12.

But if the operator has the double bellows, fig. 14 and 15, he fixes them, at a due distance, to the stand by the brass clamp \( y \). He then uncrews the tube pipe at \( s \), joins the mouth \( n \) of the flexible tube of the hemispherical receiver, passing each orifice through the leather tube fig. 11, and tying both ends with waxed thin pack-thread. If he works with his foot on the pedal, the string of which is seen hanging from the end of the bellows, fig. 15. (and is always up, on account of the weight \( z \), then the air is absorbed by the bellows fig. 15 from whence it is propelled by the motion of the foot on the pedal to the bellows, fig. 14. whose constant weight \( r \) drives it out through the flexible pipe, fig. 10. It of course enters the curved piece \( x \) of the blow-pipe, and drives the flame up to the piece \( m \) of the ore, that is to be examined upon the charcoal.

[N. B. 1. This double bellows is packed up by itself in a mahogany case, about 9 inches long, 6½ wide, and about 3½ deep, outside measure. 2. The leaf blowing bellows, fig. 14, has an inside valve, which opens when the upper surface of it is at its greatest height; in order to let the superfluous air escape out, as it would otherwise Issue with great velocity out of the tube, fig. 11, and spoil the operation.] If the operator chooses to apply the vital or dephlogisticated air in his process, let him fill the glass jar \( b \), fig. 17, with this air; and put it within the tube marked by \( abeh \), filled with water, fastening the neck of the jar within by a cross-board \( cd \), which has a hole in it for that purpose: then introducing the two ends of the flexible hollow tube, fig. 16, both to the mouth of the jar and to the hole of the bellows fig. 15, he opens the hole \( m \) of the jar, that was stopped with the stopple \( n \); the column of the water passes in through \( m \), and forces up the vital air, which enters the bellows, and of course, by the alternate motion of the pedal, passes through the end of the blow-pipe, to urge the flame upon the piece of ore \( m \), fig. 2, on the charcoal \( g \). But the dephlogisticated air may be also received at the same time that it is produced, by tying the pipe, fig. 16, to the mouth of an earthen retort, or even of a glass retort well-coated, according to the method of Mr Willis, described in the Transactions of the Society of Arts, Vol. V. p. 96. This leaf confines in dissolving two ounces of borax in a pint of boiling water, and adding to the solution as much flaked lime as is necessary to form a thin paste. This glass retort is to be covered all over with tins, by means of a painter's brush, and then suffered to dry. It must then be covered with a thin paste made of linseed oil and flaked lime, except the neck that enters into the receiver. In two or three days it will dry of itself; and the retort will then bear the great fire without cracking. Two ounces of good nitre being urged in the retort, by a good fire on a chafing-dish, will afford about 700 or 800 ounce-measures of dephlogisticated air.

To make any other kind of chemical affairs, the forceps of fig. 2, which supports the charcoal, is taken off by uncrewing the screw \( b \); the blow-pipe is also taken off, by loofening the screw \( n \); the hoop fig. 7, is put in its place, where the metallic basin of fig. 19, is put filled with sand; the piece of fig. 8, is fast on the other pillar \( r \), fig. 1, to hold the matras, fig. 18, upright, or the receiver fig. 20, &c.

In the same manner, the retort, fig. 9, may be put in the sand-bath instead of the matras, with its receiver fig. 20, which may be supported on a bit of cork or wood, hollowed to its figure, and held by the pillars, instead of the charcoal fig. 2.

But if the operation is to be made in the naked fire,
MINERALOGY.

PART II. ARRANGEMENT (A) of MINERAL BODIES (B).

The bodies belonging to the mineral kingdom are divided into four different classes, viz.

1. **Earths** (c), or those substances which are not ductile, are mostly indiffusible in water or oil, and preserve their constitution in a strong heat.

2. **Salts**: these diffuse in water, and give it a taste; and when the quantity of water required to keep them in diffusion is evaporated, they are solidified again into solid and angular bodies.

3. **Inflammables**, which can be diffused in oils, but not in water, and are inflammable.

4. **Metals**, the heaviest of all bodies: some of which are malleable, and some can be compounded.

Here, however, it must be observed, that these classes are unavoidably blended one with another; and therefore some exceptions must be allowed in every one of them: for instance, in the first class, the calcareous earth is in some measure diffusible in water, and pipe-clay with some others diminish somewhat in their bulk when kept for a long time in a calcining heat.

In the third class, the calx of arseneous has nearly the same properties as salts; and there is no possible definition of salt that can exclude the arseneous, though at the same time it is impossible to arrange it elsewhere than among the semimetals. In the fourth class, it is to be observed, that the metals and semimetals, perfect or imperfect, have not the same qualities common to them all, because some of them may be calcined, or deprived of their phlogiston, in the same degree of fire in which others are not in the least changed, unless particular artificial processes are made use of: of some of them also may be made malleable, while others are by no means to be rendered so. That the convex surface metals take after being melted, is a quality not particularly belonging to them, because every thing that is perfectly fluid in the fire, and has not an attraction for the vessel in which it is kept, or to any added matter, takes the same figure, as we find borax, 

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(a) According to the system of Cronfield; (b) altered, augmented, and improved from the Observations of other Mineralogists.

(b) Of the different bodies enumerated in the following classification, full explanations are given under their respective names as they occur in the course of this Work. See also Metallurgy, and Chemistry.

(c) By *earths* the author (Mr Cronfield) does not mean (strictly speaking) only earths, but includes under that title all the kinds of stones or solids not inflammable, saline, or metallic.

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Notes:

- The text is a continuation of the discussion on the use of small retorts and receivers for chemical operations, emphasizing the importance of proper equipment and safety measures.
- It highlights the need for careful handling and selection of apparatus to ensure successful chemical reactions, particularly in the context of mineral and earth sciences.
- The text also mentions Morveau's observations on the expense of chemical operations, noting that they are more manageable for smaller scale experiments.
- The section on mineral bodies classifies them into four main categories: earths, salts, inflammables, and metals, each with distinct properties and uses.

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**Summary:**

- The text is focused on the practical aspects of chemical operations, particularly with respect to the use of retorts and receivers.
- It underscores the importance of choosing appropriate glassware and apparatus for different types of chemical processes.
- The discussion includes observations on the cost and efficiency of chemical operations, as well as the practicalities of managing various types of mineral bodies in the laboratory environment.
MINERALOGY.

Part II.

Class I. Earths.

Earths, are those mineral bodies, not ductile, for the most part not dissoluble in water or oils, and which preserve their constitution in a strong heat.

(b) Calcaneous earth is most commonly found in the form of limestone; hard, compact, and of various colours; under which general name may be comprehended all the different kinds of marbles. Near Bath in England is found a kind of grey stone, rather softer than hard. This contains calcaneous earth in a mild state, and likewise some in a state of causticity: hence, when newly dug out of the earth, it will dissolve sulphur, or make lime-water without any calcination. By attraction of fixed air from the atmosphere, it soon hardens after it has been dug up.

Mr. Williams divides the lime-stones of Scotland into the following species:

1. Grey, whitish, and pure white; regularly stratified, of a granulated texture; and much used in the Highlands and building bridges. Some of it is composed of fine glittering spangles like the scales of fishes; and some is as pure white as the best refined sugar, which kind he thinks may be called Parian marble.

2. Coarse-looking grey mountain-limestone, hard and strong, of a granulated texture, difficult to work, in some places rough and unequal, in others smooth and even. Sometimes regularly stratified, at other times appearing like one vast irregular bed or rock, of various thicknesses.

3. Ash-coloured mountain-limestones, consisting of small grains of a fine smooth texture; when broken resembling flint. In the Highlands there are hills of this kind of stone, which our author informs us he has seen; some of which have regular strata, while others appear in one vast mass as a rock of granite.

4. Regularly-stratified lime-stone, found in the low countries, exhibiting a vast variety of colours; as black, blue, grey, brown, purple, red, and ash-coloured; with various mixtures, of all degrees of hardness and purity.

5. Lime-stone accompanying coal, and frequently the immediate roof of the vein. This likewise shows a great variety of colour, texture, and quality; some being so much adulterated with clay and other heterogeneous mixtures as to be good for nothing, while others are very pure and fine. These lime-stones are always found in regular strata. "They are found (says our author) as regular as the coals they accompany; and the coal-strata are more regular in continuation upon the bearing, as far as the class of strata belonging to the coal reaches, than any other that I have investigated; and I look upon it, that this observation may be of use in practice."

For discovering limestone at some distance, Mr. Williams gives the following directions:—Let them keep the line of the stretch, or bearing of the strata; and in the coal-country, they will be sure to discover it at nearly the same parallel distance from a seam of coal or other given stratum, as the place where it was last seen. But many of the mountain-limestones are not much to be depended on. Though you may have a good and plentiful quarry in one place, yet, perhaps, half a mile, or half a quarter of a mile farther forward, you cannot discover it; it is dwindled away to nothing, and yet will appear again farther forward; which makes the mountain-limestones uncertain to be discovered where you do not see them; as these rocks very frequently grow thicker or thinner, and sometimes squeeze out to nothing: and I comprehend under this denomination all the limestone not accompanying the coals and coal-metals.—The lime-stones of the coal fields are often distinguishable by containing a great variety of shells, coral, and other marine bodies, which are found blended in the heart and composition of the stone.

6. The Scotch marbles are of great variety and beauty; and the parts of the kingdom most unfit for cultivation are found to abound most in them. Afllint in Sutherland has a kind of white statuary marble, which Mr. Williams says is the purest and best he ever saw. "I am persuaded (says he) there is none better, if any so good, in all Europe, and there is enough of it to serve all Britain; perfectly solid and pure, free of any blemishes, flaws, or flaws, and blocks or slabs of any size may be cut out: but there is bad access to it; nor would it be easily quarried, there being a little cover above it, of a soft, loose, whitish limestone. This marble accompanies a prodigious rock of grey limestone, of a granulated texture, appearing in regular strata at Afllint; but it is one of those which varies in thickness as you advance along the bearing of the strata. The good white marble of Afllint is only to be seen in the bed of the river, near a considerable house a mile or two south of the church; but I cannot remember the name of the particular place."

Near Blairgourie in Perthshire, not far from the side of the high road, is an excellent, granulated, broad bedded limestone, of a sugar-loaf texture, and as white as the finest statuary marble, which Mr. Williams approves to be a good species of the true Parian marble, and that it requires only to be known and brought into use to become of great value. In the Duke of Gordon's lands, in the forest of Glenavon, there is also a kind of marble composed of broad glittering grains like spangles, as large as the scales of fishes; but the situation is remote, and difficult of access.
Part II.

MINERALS.

Clastic Earths.

1. Fine grained.
   - White. b. Semi-transparent, from Solothurn in Italy, in which native brimstone is found.

2. Very fine grained.
   - White and green. b. White and black.

C. Scaly limestone.
   1. With coarse or large scales.
      a. White. b. Reddish yellow.
   2. With small scales.
      a. White.

3. Fine glittering or sparkling.

D. Lime or calcareous spar.
   1. Transparent or diaphanous.
      a. Transparent or diaphanous.
   2. Common spar, which shows the object single.
      a. White, or colourless.
      b. Yellowish and phosphorescent.

E. Crystallized calcareous spar. Spar, Druzen (s).
   1. Transparent.
      a. Hexagonal truncated.
      b. Pyramidal.
      1. Dog's teeth; Pyramidulae dentatae.
      2. Balls of crystallized spar, Pyramidulae conica.

F. Stalactitical spar; Stalactites calcareus. Stalacities.
   1. Scaly stalacities of very fine particles.
      a. Of a globular form.
   1. White, the pea-flake.

II. Serta.

In Lochaber, near the farm houses on the north side of the ferry of Ballachyleith, is a limestone or marble rock, of a beautiful athen-grey colour, and a fine regular uniform grain or texture; capable of being raised in blocks or slabs of any size, and of receiving a fine polish. It is beautifully sprinkled with fine bright grains of mawick or pyrites, and likewise with grains or specks of beautiful lead ore of a fine texture.

About three miles south of Fort-Wilhelm, in the bed of a river, is a curious kind of marble with a black ground, flowered with white, like fine needle-work, or rather resembling the froth-flowering upon glass windows in winter; and this flowering is not only on the outside, but quite through all parts of the body of the stone.

Scotland has also chalk in abundance; some of which is regularly stratified, and much appears in thick irregular masses like sediment.

The translator of Mr. Cronfield's Treatise has adopted this German term groupen into the English language, for a cluster of regular figured bodies, as a group conveys the idea of a cluster only, whether regular or of indeterminate figures.
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<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Color</th>
<th>Characteristics</th>
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<td>1.</td>
<td>White</td>
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<td>2.</td>
<td>Yellow</td>
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**Gypsum**

1. **Sparry Gypsum**
   - With fine fibres
   - White

2. **Selenite**
   - By some called *glacies mariae*
   - Pure selenites
   - Transparent
     - Yellow

**Calcereous Earths**

1. **Gypsum, Plaster-stone, or Parget.**
   - Loose and friable than a pure calcareous earth.

2. **Indurated.**
   - When burnt, without being red hot, its powder readily concretes with water into a mass, which soon hardens; and then,

3. **It readily falls into a powder in the fire.**

4. **Burnt**
   - Without being red hot, its powder readily concretes with water into a mass, which soon hardens; and then,

5. **No heat is perceived in the operation.**

6. **It is nearly as difficult to be melted by itself as the lime-stone, and shows mostly the same effects with other bodies as the lime-stone:**

7. **The acid of vitriol.**

8. **Gypsum combined with or saturated with the acid of common salt.**

9. **Of no visible particles; in French, *grignard.***

10. **Of a transparent figure.***
    - Yellow

11. **Of a sparry-like texture.***
    - White and yellow

12. **Of an irregular figure.***
    - White

**Calcereous Earths Saturated with the Acid of Common Salt.**

1. **Sal ammoniacum fixum naturale.***

2. **This is found:**
   - In sea-water
   - In salt-pits

**Calcereous Earth Combined or Saturated with Sparry Acid.**

1. **Globular, consisting of cuneated rays proceeding from the centre.***

2. **Stalactitical Gypsum.***

3. **Called fluxing, vitreous, or glassy sars; because most part of them have a sparry form and appearance:**

4. **They are only known in an indurated state, and distinguish themselves from the other earths by the following characters:**

   1. They are scarce harder than common calcareous sars, and consequently do not strike fire with steel.
   2. They do not ferment with acids neither before nor after calcination.
   3. They do not melt by themselves, but crack and split to pieces when exposed to a strong fire. But,
   4. In mixtures with all other earths they are (generally) very fusible, and especially with calcareous earth, with which they melt into a corroding glass that dissolves the strongest crucibles, unless some quartz or apyrous clay be added thereto.
   5. When heated slowly, and by degrees, they give a phosphorescent light; but as soon as they are made red-hot, they lose this quality. The coloured ones, especially the green, give the strongest light, but none of them any longer than whilst they are well warm.
   6. They melt and dissolve very easily by the addition of borax, and next to that, by the microcosmic salt, without effusion.

**Indurated Fluor.***

1. **Loose and friable.**

2. **Gypsum earth, properly so called; *gabra.***

3. **Indurated.**
   - Solid, or of no visible particles, Alabaster.
     - White, alabaster
      - Clear and transparent
      -Opaque
      -Transparent, from the Eastern countries
   - Opaline

4. **Gypsum of a scalled or granulated structure.***
   - This is the common plaster-stone.
     - With coarse scales
     - With small scales
   - Fibrous gypsum, or plaster-stone, improperly (though commonly) called *English talc* by the druggists.

5. **When the fibres coarse.**
   - White, from Livonia.
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Calcereous Earths.

1. Solid, of an indeterminate figure; of a dull texture, semitransparent, and full of cracks in the rock.
   a. White.

2. Sparry fluor. This has nearly the figure of spar; though on close observation it is found not to be so regular, nothing but the glossy surfaces of this stone giving it the resemblance of spar.

3. Crystalised fluor.
   2. Of a cubic figure. a. Yellow. b. Violet.

V. Calcereous earth saturated with a particular acid, perhaps of the metallic kind, viz. the tungstic acid. The tungsten of the Swedes.

This resembles the garnet-stone and the tin-grains; is nearly as heavy as pure tin; very refractory in the air, and excessively difficult to reduce to metal. Iron has, however, been melted out of it to more than 30 per cent.

It is very difficultly dissolved by borax and the nitric acid.

The specimen united in this manner with the calcereous earth, being dark or black in proportion as the phlogiston, gives a black earth. They receive their colour from the phlogiston, being dark or black in proportion as the phlogiston predominates.

1. Solid and fine-grained.
   a. Reddish or fisch-coloured. b. Yellow.
2. Spathose, and with an uneven surface.
   a. White. b. Pearl-coloured.

VI. Calcereous earth united with the inflammable substance.

These have a very offensive smell, at least when rubbed. They receive their colour from the phlogiston, being dark or black in proportion as it predominates.

Calcereous earth mixed with phlogiston alone; Lapis saullus, fetid stone and spar, or swine-stone and spar.

A. Solid, or of no visible or distinct particles.
   a. Black.
   B. Grained.
   a. Blackish brown.
   C. Scaly, particulis micaceous.
      1. With coarse scales. a. Black.
   D. Sparry.
   E. Crystalised.
      1. In a globular form.

VII. Calcereous earths blended with an argillaceous earth. Marle, Marga.

1. When crude, it makes an effervescence with acids; but,
2. Not after having been burnt; by which operation it is observed to harden, in proportion as the clay exceeds the calcereous substance.
3. It easily melts by itself into a glass, and even when it is mixed with the moft refractory clay.
4. It is of great use in promoting the growth of vegetables, since the clay tempers the drying quality of the calcereous earth.

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5. When burnt in a calcining heat, it readily attracts water; and, exposed to the air, in time it falls into a powder.

The varieties of this kind worthy to be taken notice of, depend on the different quantities of each of their component parts, and on the quality of the clay. The following are specified as examples.

A. Loose and compact, Marga friabilis.
   a. Reddish brown.
   b. Pale red. This, when burnt, is of a yellowish colour, and used for making earthen ware in fome places.

B. Semi-indurated; which is nearly as hard as stone when first dug up, but moulders in the open air.

C. Indurated or stone marle.
   a. In loose pieces, Marga indurata amorpha; by the Germans called duckstein or topfein.
      a. White. b. Grey, formed from a sediment which the water carries along with it.
   b. In continued strata. Hard flaty marle.

VIII. Calcereous earth united with a metallic calx.

Here, as well as in the others, such a mixture or combination is to be understood, as cannot be discovered by the eye alone without the help of some other means.

The subjects belonging to this division lose the property of raising an effervescence with acids, when they are rich in metal, or contain any vitriolic acid. However, there have been found some that contained 30 or 30 per cent. of metal, and yet have shown their calcereous nature by the nitric acid.

There are no more than three metals hitherto known to be united in this manner with the calcereous earth, viz.

1. With iron. White spar like iron ore, Minera ferri alba. The flamblein or weisse eisenerz of the Germans.
   1. This ore, however, is not always white, but commonly gives a white powder when rubbed.
   2. It becomes black in the open air, as likewise in a calcining heat.
   3. In this last circumstance it loses 30 or 40 per cent. of its weight, which by distillation has been found owing to the water that evaporates; and it is possible that some small quantity of vitriolic acid may, at the same time, evaporate with the water.
   4. It is of all the iron ores the most easy to melt, and is very corrosive when melted.

This kind is found,

A. Loose; the moulder part of the indurated fort.
   a. Black, like foot.
   b. Dark brown, somewhat resembling umbre.

B. Indurated.
   1. Solid, of no distinct particles.
      a. Red. Looks like red ochre, or the red haematites, but dissolves in the acid of nitre with a great effervescence.
   2. Scaly, particulis micaceous.
      a. White.
      b. Blackish grey.
      a. Light brown.

K 4. Drufen.
IX. The following compounds of calcareous earth with different mineral substances are added from Mr Kirwan's Elements of Mineralogy.

1. A compound of calcareous and argillaceous earths; such as,
   a. The green Campan marble from the Pyrenees. It is flinty and somewhat magnetic. According to Mr Bayen, it contains 65 parts of mild calcareous earth, 32 of the argillaceous, and 3 of semiphlogilicated iron.

2. Compounds of calcareous and argillaceous earths; such as,
   a. The red Campan marble: this is not magnetic; it contains 82 parts of mild calcareous earth, 11 of argillaceous flint, and 7 of semiphlogilicated iron.

3. Compounds of calcareous earth, mixed with two or more kinds of earth; such as,
   a. The cipolin from Rome. This is a green marble, which contains 87 parts of mild calcareous, 25 of quartz, 8 of flint, and 0.2 of iron, besides the iron contained in the argillaceous flint.

4. Compounds of calcareous earth and mica; such as,
   a. The cipolin from Autun in France: it is of a green colour, and consists of 83 parts of chalk, 12 of green mica, and 1 of iron.

5. Compounds of calcareous and felsiferous earths; such as,
   a. The pietra talchina of the Italians, which consists of white fspar with veins of talc.
   b. The piemontina of the French, which consists of white fspar with veins of talc.
   c. The pietra signore di Siena, which consists of white fspar with veins of talc.

6. Calcareous volcanic pudding-stone; such as,
   a. The cipolin from Java, in a calcareous cement, mentioned by Mr Feri.
   b. The marble mixed with veins of black or green lava, mentioned by the same author.

7. Compounds of calcareous earth, mixed with two or more kinds of earth; such as,
   a. The cipolin from Rome, which is a green marble with white zones: it strikes, though difficultly, fire with fivel; it contains 67.8 parts of mild chalk, 25 of quartz, 8 of flint, and 0.2 of iron, besides the iron contained in the argillaceous flint.

b. The calcareous porphyry, which consists of quartz, fivel-fspar, and mica in separate grains united by a calcareous cement.

b. The limefl:one interfpered with fivel and mica.

d. To these compounds belongs the pyritaceous limefl:one called by the French Pierre de St Ambroise. It is of an iron grey colour, interfpered with shining particles. Its texture is compact, and fiercely gives fire with fivel. Its specific gravity is 2.7034. It is soluble in acids, and melts with effervescence; calcines in a strong fire; makes nitre slightly detonate; and if distilled affords a small portion of vitriolic acid, and some sulphur sublimes. Its component
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Order II. Ponderous Earth.

Ponderous earth, (Terra Ponderosa): Caüx, or chalk. See Earth, Art. I. This is a particular kind of earth (like chalk in appearance, but with some very different properties), discovered in Sweden about 1774, which by its results with other bodies has some similarity to the known alkalis. It has not yet been found pure, but mixed with other substances; however, its great specific weight easily distinguishes it from the others, it being the heaviest of all earths.

1. Its specific gravity when considerably purified by art is 3.775.
2. This earth combines with aerial acid: and in this case effervesces with stronger acids.
3. With vitriolic acid it forms the ponderous spar, which is insoluble in water.
4. Its crystallization, after being combined with the nitrous, or with the muriatic acids, is hardly soluble;
5. But with acetoic acid, it becomes deliquescent.
6. When pure; viz. without any mixture of acid or alkali, it does not vitrify in the fire.
7. If deprived of the aerial acid (fixed air) by calcination, is then soluble in 900 times its weight of boiling water. This solution exposed to air, forms a cream, like that of lime-water in the same circumstances, and like it changes also the vegetable colours.
8. Whilt combined with aerial acid, it is only soluble in about 1500 times its weight of water, chiefly if the water has been impregnated also with the same aerial acid.
9. It expels the caustic volatile alkali from ammoniacal salt.
10. Mixed with brimstone it produces a heparr sulphuris, whose solution in water is but incompletely decomposed either by the nitrous or the muriatic acid, on account of the great attraction between this earth and the acid of sulphur, which is so strong that it
11. Separates this acid (the vitriolic) from the vegetable alkali.

I. Combined with aerial acid; Terra Ponderosa aerata. See Chemistry-Index.

A. Spar-like gypsum.
1. Samitranparent, fratum Bononiense. The Bononian stone, or native phosphorus.
B. Ponderous Drufen spar.
1. Jagged, crista ram. These resemble cock's combs, and are found in clots and fissures accreted on the surfaces of balls of the same substance.
2. White.
3. Reddish.
II. United with phlegiston and the vitriolic acid.

Order III. Magnesian, Micaceous, and Asbestine Earths.

§ 1. Magnesian Earths.

Magnesia is a white, loose, and light earth, only known since the beginning of this century. It is generally found combined or mixed with other heterogeneous substances, as other simple earths are.

1. When pure its specific gravity is 2.330, and then,
2. It neither hardens, contracts, nor melts by the application of heat, even by the solar rays.
3. But it melts afly with borax, or microcosmic salt; though it is scarcely affected by fixed alkalies or calces of lead.
4. Mixed with other earths, it produces by fire different hard mafises.
5. It gives no causticity except to the volatile alkali: and,
6. Does not effervescce with any acid.
7. When mixed with water it shows a very small degree of heat, but without any effervescence. And when the water exceeds the weight of magnesia about 7.692 times, it is totally dissolved.
8. and 9. Being put in water and afterwards dried, it contains 878 parts of its weight; though when saturated with aerial acid, it will absorb and retain after being dried 88 parts of water.
10. This earth combined with aerial acid is more soluble in cold than in hot water.
11. Combined with vitriolic acid it crystallizes into a bitter salt, known by the name of Epfom and Seydilite or Stiebelichte salt, which is soluble in little more than its own weight of water.
12. With nitrous acid it forms a deliquescent salt.
13. With the muriatic or the acetoic acids it does not crystallize: and the mafs being dried, attracts humidity from the air.
14. It has a stronger attraction to the fluor acid than to any other (Berg.): and crystallizes with it into hexagonal prisms whose ends are formed of two low pyramids, of three rhombs (Romb de l'Ille).
15. It is not precipitated from other acids by the vitriolic, as calcareous earth is.
16. According to Lavoisier and Macquer, when magnesia is calcined, it becomes phosboroececent.

I. Magnesia combined with vitriolic and other acids.

A. When satureted with the vitriolic acid, it forms a bitter salt, called English or Epfom, Seyfburn or Seldrite salt. The salts known under these different
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ferent names only differ from one another on account of some heterogeneous substance, which is combined in them, the vitriolated magnesia being the characteristic and principal ingredient in them all.

B. Magnesia is found not only combined with the vitriolic acid in the waters of Epfom, Sedlitz, &c., but also with the marine acid to a considerable quantity in sea-water and other salt springs.

C. It is contained frequently in fresh waters, where it is dissolved by means of a quantity of aerial acid.

II. Combined with other earths.

A. Magnesia, when combined with siliceous earth, is commonly unctuous to the touch, and more or less difficult to be cut or turned in proportion to its different degrees of hardness.

It is not diffusible in water: grows hard, and is very refractory in the fire.

When pounded and mixed with water, it will not easily cohere into a paste; however, if it is managed with care, it may be baked in the fire to a mass, which being broken, shows a dull and porous texture.

It takes for the most part, and without much labour, a fine polish. It is found,

1. Compact and soft; Smetllis, Briosaon or French chalk.
   a. White, from the Lands-End, in Cornwall.
   b. Yellow.

2. Solid and compact; of impalpable particles; Steatites or soap-rock.
   c. Yellow.

3. Solid, and of visible particles; serpentine stone.
   a. Of fibrous and coherent particles. This is composed, as it were, of fibres, and might therefore be confounded with the asbestos, if its fibres did not coalesce with one another, as not to be seen when the stone is cut and polished. The fibres themselves are large, and seem as if they were twisted.
   b. Deep green. It is sold for the lapis naphricus, and is dug at some unknown place in Germany. b. Light green, from Skienflyttan, in Weftmanland; is used by the plate-smiths instead of French chalk.
   r. Of granulated particles; fine grained serpentine stone; the Zoeblitz serpentine.
   a. Black. b. Deep green. c. Light green. d. Red. e. Bluish grey. f. White. These colours are all mixed together in the serpentine stone from Zoeblitz, but the green is the most predominant colour.

B. Porcelain earth mixed with iron; terra porcellana.

This is,

a. Diffusible in water.
   a. Red, from Montmartre, and China. The water-clinkers which are imported from certain places in Germany seem to be made of this kind.

b. Indurated.
   1. Martial soap earth.
      a. Red.
      b. Martial soap-rock.
   C. The telugite of the Swedes; lapis ollaris.

The serpentine stone has many varieties; being found, (1.) Veined or spotted with green fleasites. (2.) Red, with veins of asbestos. (3.) Red, green, yellow, or black with spots or white calcareous spar, is called patevera. The black is called muro di prato; the green verde di Siena; but these names are not restricted to this species. (4.) Veined or spotted with gypsum. (5.) Veined or spotted with bariferite. (6.) Veined or spotted with shifus.—And, (7.) With veins of quartz, feldspar, or fheer. (Kirwan's Mineralogy.)

What is commonly called serpentine is a true lapis ollaris; but being variegated with green, yellowish, and brown spots, like the skin of some common serpents, it is called by that name. Great quantities of this stone are found in Italy and Switzerland, where it is often worked into the shape of dishes and other vases. (Fr. bro.) And the gato of the Italians is nothing else but a kind of serpentine. (Kirwan.)


These are known by the following characters:

1. Their texture and composition consist of thin flexible particles, divisible into plates or leaves, having a shining surface.

2. These leaves or scales exposed to the fire lose their flexibility and become brittle, and then separate into inner leaves: but in a quick and strong fire, they curl or crumple, which is a step towards fusion; though it is very difficult to reduce them into pure glass by themselves or without addition.

3. They melt pretty easily with borax, the microcosmic salt, and the alkaline salt: and may by means of the blow-pipe be brought to a clear glass with the two former salts. The martial mica is, however, more fusible than the uncoloured ones; its specific gravity is 3.000.

A. Colourless or pure mica; daze, glimmer, or glint.

1. Of large parallel plates; Mufcovy glass. This is transparent as glass; found in Siberia and Elfdalen in the province of Wermeland.

2. Of small plates, from Silverberg, and Runneby, in the province of Blekinge.

3. Of fine particles like chaff; chaffy mica.

B. Coloured and martial glimmer.


2. Of fine and minute scales.

3. Twisted or crumpled glimmer.
   a. Light green.

   a. Black.

5. Chry-
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MINERALOGY.

Siliceous Earths.

Siliceous earth is, of all others, the most difficult to describe and to distinguish perfectly; however, it may be known by the following characters, which are common to all bodies belonging to this order.

1. In its indurated state it is hard, if not in regard to the whole, yet at least in regard to each particle of it, in a degree sufficient to strike fire with steel, and to scratch it, when rubbed against it, though the steel be ever so well tempered.

2. When pure, and free from heterogeneous particles, it does not melt by itself, neither in a reverberatory nor in a blast furnace.

3. After being burnt, it does not fall to a powder, neither in the open air nor in water, as the calcareous earth does, but becomes only a little looser and more cracked by the fire, unless it has been very slowly, and by degrees, heated.

4. It excites no effervescence with acids.

5. In the fire it melts easier of all to a glass with the fixed alkaline salt; and hence it has got the name of vitreous, though this name is, properly speaking, less applicable to this order than to a great many other earths.

To the above we may add the following properties from Bergman.

6. It is not soluble in any of the known acids, the fluoric acid only excepted. But,

7. It may be dissolved by the fixed alkali, both in the dry and wet way.

8. If the fixed alkali is only half the weight of the siliceous earth, it produces a diaphanous and hard glass: but when it is in a double or triple proportion, then the glass deliquesces of itself by attracting the humidity of the atmosphere.

9. It melts easily with borax; but

10. With microscopic salt it is more difficult, and requires a longer time to melt.

11. This earth has a great analogy to acids, as it is perfectly dissolved in that wonderful natural hot-water spout above ninety feet high at Geyser, in Iceland, where by cooling it forms a siliceous mass.

§ 1. Gems, or precious stones.

I. Diamond. Adamas gemma. — See DIAMOND.

1. Of all stones, it is the hardest.

2. Is commonly clear, or transparent; which quality, however, may, perhaps, only belong to its crystals, but not to the rock itself from which they have their origin.

3. Its specific gravity is nearest 3.5 to. When brought to Europe in its rough state, it is in the form either of round pebbles with shining surfaces, or of crysytals of an octoedrical form.

a. Colourless, or diaphanous, or the diamond properly so called.

But it also retains this name when it is tinged somewhat red or yellow. Being rubbed, it discloses some electrical qualities, and attracts the mastic.

b. Red; Ruby. Adamas ruber; Rubinus.— Which, by lapidaries and jewellers, is, in regard to the colour, divided into

1. The ruby of a deep red colour inclining a little to purple,

2. Spinell, of a dark colour.

3. The bidelberg, pale red, inclining to violet.

4. This is supposed to be the mother of the rubies.

5. The rubicell, reddish yellow.

However, all others do not agree in the characters of these stones.

II. Sapphire. Saphyrus gemma.

It is transparent, of a blue colour; and is said to be in hardness next to the ruby, or diamond.
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III. Topaz. *Topazius gemma.*

a. The pure yellow topaz; which is nearly uncoloured.

b. The yellow topaz.

c. Deep yellow, or gold coloured topaz, or oriental topaz.

d. Orange-coloured topaz.

e. The yellowish green topaz, or chrysole.

f. The yellowish green, and cloudy topaz, the *chrysobrese* (a)

g. Bluish green topaz, or the beryl.

This varies in its colours; and is called, when

1. Of a sea-green colour, the *aqua-marina.*

2. When more green, the *beryl.*

IV. Emerald. *Smaragdus gemma.*

Its chief colour is green and transparent. It is the softest of precious stones and when heated it is phosphorescent like the fluor.

V. To the precious stones belong also the jacinths, or byazins; which are chrysolites harder than quartz crystals, transparent, of a fine reddish-yellow colour when in their full lustre, and formed in prisms pointed at both ends; these points are always regular, in regard to the number of the facets, being four on each point; but the facets seldom tally; the sides also which form the main body, or column, are very uncertain in regard both to their number and shape; for they are found of four, five, fix, seven, and sometimes of eight, sides; further the column or prism is in some also so compressed, as almost to resemble the face of a spherical facetted gem.

Mr Cronstedt says, he got some jacinths of a quadrangular figure, which did not melt in the fire, but only became colourless.

VI. The amethyst is a gem of a violet colour, with great brilliancy, and as hard as the best kind of rubies or fapphires, from which it only differs by its colour. This is called the *oriental amethyst,* and is very rare: when it inclines to the purple, or rosy colour, it is more esteemed than when it is nearer to the blue.

These amethysts have the same figure, hardness, specific gravity, and other qualities, as the best fapphires or rubies; and come from the same places, particularly from Persia, Arabia, Armenia, and the West Indies.

The amethysts called *occidental,* are of the same nature as rock crystals, and have the same gradations. viz. of a violet inclining to the purple.

(a) In the *Annals of Chemistry,* Vol. I, we have the following account of the method of digging for the chrysobras, and of the earths and stones with which it is accompanied.

This precious stone is found in certain mountains in Silesia, which seem to begin those of Tradas, extending to within half a league of Olasz. These mountains appear, in general, to consist of a number of strata, horizontal or inclined, composed chiefly of substances containing magnesia, but likewise mixed with calcaceous, argillaceous, and sileceous earths. The greatest part of these consist of serpentine, mixed with albitos and amethysts, grey argillaceous earths, bones, and red or green ochres, flone marrow, fleatites, or soapstone, and tale. In those mountains also we meet with quartz, petroflxer, opal, and chalcedony, in detached fragments, and sometimes in continued veins. We also discover in them veins of silece, of the nature of granite. Sometimes the serpentine is met with at the surface; sometimes at the depth of 20 or 30 feet. The stone marrow seems here to be produced by the decomposition of a very milky species of opal agate named *calcedony:* for at the depth of 50 feet and upwards the veins of this foapy earth assume a degree of solidity, and we find nothing but hard and semitransparent calcedony.

The abovementioned strata are crossed by a great number of cracks filled with green-coloured earths and stones; but these frequently do not contain a single true chrysobras. They are sometimes found immediately under the vegetable mould, or at the depth of some feet, in flapeless masses, covered with a heavy clay, and sometimes enveloped by a stuccous earth of a beautiful green colour, which it derives from the calx of nickel. In other places, the chrysobras has been found in uneven lamina of several yards in length and breadth, either immediately under the mould, or in the upper strata of serpentine, which have little solidity; and very beautiful ones have been found at the depth of seven or eight fathoms; and some have been met with in grey clay at the depth of four fathoms. In some places also they are met with in a kind of red ochre, which is attracted by the magnet; in others they are found in the clefts of rocks. The beautiful green chrysobras is found most plentifully in the mountain of Glassendorf. In another mountain named Kofemutz, where it is also found, the pieces are so porous, and so much spotted with white, &c. that sometimes upwards of 1000 of them have not afforded one large enough for the use of the jewellers. The defects are frequently only discoverable on polishing, as the green opal, while rough, perfectly resembles the chrysobras; but, on polishing the stones in which it is contained, it is detected by its want of lustre.

The quantity in which these stones are found is not sufficient to afford the expenses of regular mining: the most profitable way, therefore, of obtaining them is by making trenches in the earth from four to six feet deep. Almost all the mountain of Kofemutz, however, has already been examined in this manner; so that they now dig for the chrysobras in quarries by uncovering a bank of earth or stone, and descending to other banks by steps in the open air, so as to throw the rubbish back from bank to bank. This method, however, cannot be continued farther than 24 or 30 feet, otherwise the produce would not defray the expense.

The only tools employed in digging for the chrysobras are a spade and pick-axe; the former to remove the earth, the latter to detach the chrysobras itself from the stones which surround it.

Various accounts have been given of the component parts of this precious stone. Lehmann thinks, that
Part II. MINERALOGY

Siliceous Earths.

The garnet, (Grana/tus.) This stone, when transparent and of a fine colour, is reckoned among the gems: but it varies more than any, both in the form of its crystals and in its colour, some being of a deep and dark red, some yellowish and purplish, and some brown, blackish, and quite opaque. In general, their lustre is less than that of other gems, as well as their hardness, which yields to the file, although they may strike fire with steel. But, as to their form, these crystals take almost all sorts of figures, as the rhomboidal, tetradecaedral, &c. and some are of an irregular form.

Their colour proceeds from the iron which enters into their composition; and, according to M. de Saunfure, even the finest oriental garnets attract the magnetic needle at a small distance.

The Syrian garnet is the finest and best esteemed. It is of a fine red, inclining to the purple colour, very diaphanous, but less brilliant than the oriental amethyst. It seems to be the amethyst santant of Pliny: the Italians call it rubino di roca.

The colour of it is owing to some ferruginous particles modified in a particular manner: but the experiments he adduces for this opinion are not satisfactory. Mr. Sage attributes the colour to cobalt from the blue colour it imparts to glasses. Mr. Achard thinks the stone contains calx of copper as well as calx of iron; because a part of the metal separable from it may be dissolved in volatile alkali. The following are the experiments of M. Klaproth upon the subject.

1. On heating pieces of very pure chrysofrofus red hot, and quenching them in water, the colour was changed from green to bluish grey; and, on repeating the operation, it became a white grey. They were found to have lost in weight one and a half per cent. and were easily pulverizable in a glass mortar.

2. Three hundred grains of chrysofrofus were mixed with double its weight of mild mineral alkali, and the mixture heated for some hours red hot, in a porcelain crucible. The mass was then powdered, and digested in distilled water. By filtration, a yellowish grey residuum was obtained, weighing 44 grains; the filtered liquor was limpid and colourless, a copious precipitate being formed with muriatic acid, which being washed and dried was found to be siliceous earth.

3. The 44 grains of yellowish grey residuum were digested in a retort, with 352 grains of aqua regia; a great part of which was evaporated. The acid which came over was returned into the retort, and filtered after a second digestion. The residuum was a very fine white siliceous earth, which, after being washed, dried, and heated red hot, weighed 20 grains.

4. The filtrated solution was of a pale green, but on super saturation with volatile alkali immediately turned of a bluish colour, precipitating a small quantity of brownish gelatinous matter; which, when collected, twice digested with nitrous acid, and afterwards strongly heated, yielded a brown calx of iron, weighing no more than a quarter of a grain: whence our author concludes, that iron does not contribute to the colour of the chrysofrofus, as we know many colourless stones which contain as great a quantity of that metal. This small quantity of calx was left after digesting the gelatinous residuum. On precipitating the soluble parts, they appeared to consist of alumina earth, in an excessively divided state; which being washed and dried, weighed half a grain.

5. To find whether the solution contained calcareous earth or not, he mixed with that, super saturated with volatile alkali, a saturated solution of mild mineral alkali, which precipitated four grains and an half of white and very pure siliceous earth.

6. Nothing more was precipitated from the solution, either by acids or alkalies, after the separation of the calcareous earth, though it still retained a bluish colour. It was poured into a retort, and evaporated to dryness; the residuum was of a yellowish colour, which became green on being dissolved in distilled water. Mild mineral alkali threw down only a little earth of a greenish white colour; which being redissolved in rediphlogistic nitrous acid, and precipitated with Prussian alkali, the liquor yielded 17 grains of a sea-green powder. This precipitate, in our author's opinion, is the colouring principle of the chrysofrofus; and this principle he afterwards found to be calx of nickel.

7. Our author likewise attempted to analyse the chrysofrofus in the mildest way by concentrated vitriolic acid; in which process his chief view was to discover whether the stone contained any volatile particles or not. On an ounce of crude chrysofrofus, therefore, when put into a retort, he poured an equal quantity of rectified vitriolic acid, and two parts of distilled water. After the latter had passed over into the receiver, the fire was increased to force over the superabundant acid; a part arose in white vapours, and some fell into the receiver with an hissing noise. Boiling water, which had been distilled, was then poured upon the residuum, and the solution filtered. The powdered chrysofrofus left on the filter had not been perfectly dissolved, and,
THE fine garnet of a red inclining to a yellow colour, is the sarrans of the ancients, the vermeille of the French, and the giacinto guarnacino of the Italians. Its name is taken from Sorian, or Surinam, a capital town of Pegu, from whence these gems are brought: when they have a brownish taint, they are then called hyacinth.

The occidental garnet is of a deep and dark red, and its hardness is less. However, some very fine hard garnets are found in Bohemia.—Garnets are also found in Hungary, at Pyrma in Silebia, at S. Sapho in the canton of Berne, in Spain, and in Norway.

The garnet melts in the focus of a good burning glafs into a brown mass, which is attracted by the lodestone; and this shows that iron enters considerably into its composition.

Some garnets are found, which contain a little gold. Thofe called zingrafjen by the Germans contain tin.

VIII. Tourmalin; Lapis electricus.

This is a kind of hard stone, lately brought into notice by its electrical properties. See TOURMALIN.

1. Its form is a prism of nine sides of different breadths, mostly truncated, and feldom terminating in a pyramid at each end, which is either composed of three pentagons, or of nine triangles.

2. When heated in the fire, it gives figns of contrary electricity on the two oppofite ends of their prismatic form. But many of these stones are not in the left electric. However, on being rubbed, they become electric in their fides, like other diaphanous gems.

3. It is as hard almost as the topaz, and striking fire with fhefl.

4. It melts by itself in a strong fire, though with difficulty.

5. With the microcosmic falt it melts perfectly; but only in part with borax.

6. With mineral alkali it is divided into a kind of powder.

7. The three mineral acids difsolve it when first reduced to a powder.

8. It bears a greater fimilarity to schoerl than to any other ftone: but its component parts show
show that it may be ranged with propriety in this place, along with other precious stones: as the argillaceous earth is also the most prevalent in its composition.

a. The oriental tourmalines are found in the island of Ceylon. They are transparent, of a dark brown yellow; and their specific gravity is from 3062 to 3295.

b. From Brazil. Transparent. These are green for the most part; but there are also some red, blue, and yellow: their specific gravity is from 3075 to 3180.

c. From Tyrol. Of so dark a green as to appear opaque. Their specific gravity is about 3050. These are found in beds of felsites and lapis-ellaris, among the micaceous veins, talcs, and hornblende of Schneeberg, Jurzagl, and Zillerthal, in the mountains of Tyrol.

d. From the mountains of Old Castile in Spain. These are transparent, and have the same properties as the preceding ones.

IX. The opal. Opala; the girafe of the Italians. This is the most beautiful of all the flint kind, owing to the changeable appearance of its colours by reflection and refraction, and must therefore be described under both these circumstances.

1. The opal of Nomius, the Sangenon of the Indians. This appears olive-coloured by reflection, and seems then to be opaque; but when held against the light, is found transparent and of a fine ruby red colour.

There is, however, another of the same kind in Sweden, which by reflection appears rather brown; but by refraction it is red, with violet veins.

2. The white opal. Its ground is white, of a glass-like complexion, from whence are thrown out green, yellow, purple, and bluish rays; but it is of a reddish or rather flame-colour when held against the light.

a. Of many colours; the oriental opal.

b. Of a milky colour.

c. Bluish, and semi-transparent. This is not

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§2. Of Quartz.

This stone is very common in Europe, and easier to be known than described. It is distinguished from the other kinds of the siliceous order by the following qualities:

1. That it is most generally cracked throughout, even in the rock itself; whereby,
2. As well as by its nature, it breaks irregularly, and into sharp fragments.
3. That it cannot easily be made red-hot without cracking still more.
4. It never decays in the air.
5. Melted with potashes, it gives a more solid and fixed glas than any other of the siliceous order.
6. When there has been no interruption in its natural accretion, its substance always crystallizes into hexagonal prisms pointed at one or both ends.
7. It occurs in clefts, fissures, and small veins in rocks. It very seldom forms large veins, and still rarer whole mountains, without being mixed with heterogeneous substances.

According to Mr Kirwan, quartz neither loses its hardness nor its weight by calculation. Its texture is lamellar. These stones are in general the purest of the siliceous kind, though most contain a slight mixture of other earths; the most obvious distinction among them arises from their transparency or opacity.

Quartz is found,

1. Solid, of no visible particles, with a glossy surface. Fat Quartz.

a. Un-coloured and clear. This has no crystallized form, but is nevertheless as clear as quartz crystals of the best water.

b. White, the common fat quartz.

c. Blue
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c. Blue.
d. Violet.

B. Grained.

C. Sparry quartz.

This is the scarcest; and ought not to be confounded with the white felt-spar, being of a smoother appearance, and breaking into larger and more irregular planes.

D. Crystallized quartz. Rock crystal. Quartz crystal.

1. Opaque, or semi-transparent.
   a. White, or of a milk colour.
   b. Red, or of a carminian colour.
   c. Black.

2. Clear.
   a. Blackish brown, smokey topaz, or rauch topaz of the Germans.
   b. Yellow; found in Bohemia, and sold instead of topazes.
   c. Violet; the amethyst from Saxony, Bohemia, and Dammmemore in Upland (b.)
   d. Uncoloured: rock crystal, properly so called. When these coloured crystals are not clear, they are called fluss; for instance, topaz fluss, amethyst fluss, &c (c.)

2. Impure quartz.

a. Mixed with iron, in form of a black calc.—This is of a glofy texture, and contains a great quantity of iron.
b. Mixed with copper in form of a red calc.
   a. Red.

§ 3. Of Flint.

The flint (Silica pyromachus, Lapis cornus, or the hornstein of the Germans) forms a kind of intermediate substance between quartz and jasper; both which, however, it so nearly resembles, that it is not easy to point out such characters as shall readily distinguish it from them. We can only, therefore, speak of its properties comparatively.

1. It is more uniformly solid, and not so much cracked in the mass as the quartz; and,
2. It is more pellucid than the Jasper.
3. It bears being exposed to the air without decaying better than the Jasper, but not so well as the quartz.
4. It is better for making of glases than the Jasper, but is not quite so good as quartz for that purpose.
5. Whenever there has been an opportunity in this matter of its flowing into crystals, quartz crystals are always found in it; just as if the quartz made one of its constituent parts, and had in certain circumstances been squeezed out of it; this is to be seen in every hollow flint and its clefts, which are always filled up with quartz.
6. It often shows most evident marks of having been originally in a soft and fliny tough flake like glue or jelly.

The several varieties of this species have obtained more distinct names with respect to their colours than from any real difference in their substance; but these are still necessary to be retained, as the only names used by jewellers and others, who know how to value them accordingly.

I. Jade. Lapis nephriticus, Jaspachites.

The true lapis nephriticus seems to belong to this siliceous order, as it gives fire with fied, and is semi-pellucid like flint; it does not harden.

(b.) The most transparent are called false diamonds, Bristol, Kerry flints, and Alengon diamonds, &c. The coloured transparent crystals derive their tinges generally from metallic calces, though in exceeding small portions they all loss their colours when strongly heated. These are what we call false gems, viz.

The red, from Oran in Barbary, false rubies.
The yellow, from Saxony, false topazes.
The green, from Dauphiny, (very rare) false emeralds, or perosis.
The violet, from Vil in Catalonia, false amethysts.
The blue, from Puy in Valay, France, false sapphires.

There are also opal, or rainbow crystals, some of which make a very fine appearance; the various colours of which are thrown out in zones across the surface, though they never shine like the oriental opal.

(c) M. Fourcroy makes a remarkable difference between the crystals and the quartz, by affirming that the former are unalterable in the fire, in which they never loose their hardness, transparency, nor colour; whilst the quartz loses the same qualities, and is reduced by it to a white and opaque earth. He classifies the rock crystals,

1. According to their form, viz. 1. Insulated-hexagonal crystals, ending in two pyramids of six faces, which have a double refraction or show two images of the same object when looked through. 2. Hexagonal crystals united, having one or two points. 3. Tetrahedral, dodecaedral, flated crystals, and which though hexagonal have nevertheless their planes irregular. 4. Crystals in large masses, from the island of Madagascar, which have a simple refraction.
2dly. As to the colour, they are either diaphonous, redish, smokey, or blackish.
3dly. As to accidental changes, some are hollow; some contain water within one or more cavities: some are caled, viz. one within the other: some are of a round form, as the pebbles of the Rhine: some have a crust of metallic calces, or of a pyrites: some are of a geodical form, viz. crystallized in the inside of a cavity: some seem to contain amianthe, or asbestos, and others contain thurls.

The same author reckons among crystals, the oriental topaz, the hyacinth, the oriental sapphire, and the amethyst. Mr Daubenou had always looked on this last as a quartzous crystal.
den in fire, but melts by the solar heat in the focus of a burning lens into a transparent, green glaft with fome bubbles. That called by the name of circioneflon flone, which comes from the Amazon river, melts easier, in the fame solar fire, into a brown opaque glafs, which is far lefs hard than the flone itself. (Macquer.)

This flone is superior in hardness to quartz, though from its unctuity to the touch, one would fufpeft it to contain a large portion of argillaceous earth, or rather of magnetian earth, as Mr Kirwan feems to fufpeft.

Its specific gravity is from 2.970 to 3.389.—It is of a granular texture, of a greasy look, and exceedingly hard: is scarcely soluble in acids, at leaft without particular management, and is infufible in the fire. M. Sauffure feems to have extracted iron from it.

a. It is fometimes of a whitefli milky colour, from China: but moftly
b. Of a greenifh, or
c. Deep-green colour, from America.

1. Grey, yellowifh, and olive colour: there are the vulgar lapis nephritis, they being fuppofed to cure the nephritic pains by their external application to the loins.

The femi-pellucidity, hardness, and specific gravity, are the characters by which the lapis nephriticus may be diftinguifhed from other ftones.

II. Cat's eye; Pseudopalus. The fun-flone of the Turks, called ganeche. This flone is opaque, and reflects green and yellowifh rays from its surface: it is found in Siberia. It is very hard and femi-transparent, and has different points, from which light is reflected with a kind of yellow-brown radiation, somewhat fimilar to the eyes of cats, from whence it had its name. Jewellers do not fail to cut them round to the greatefl advantage. The beft of these ftones are very fcarce. One of thefe of one inch diameter was in the cabinet of the grand duke of Tufcany.

III. Hydrophane, or Oculus Mundi; also called Lapis mutabilis. The principal property which diftinguifhes this from all other ftones, is that it becomes transparent by mere infufion in aqeous fluid; but it gradually refumes its opacity when dry.

IV. The onyx. Onyx cameojua. Memphis. It is found of two forts.

a. Nail-coloured onyx, having pale fheft-coloured and white lines.

b. With black and white lines. The oriental onyx.

c. The chalcedony, or white agate, is a flint of a white colour, like milk diluted with water, more or lefs opaque: it has veins, circles, and round spots.

It is said to be fferer than the onyx, but much harder than thofe agates which are fometimes found of the fame colour.

a. The white opaque Chalcedony, or cabalong, from the Buckharith Calmucks. This was first made known by one Renesz, a Swedifh officer, who for feveral years had been in the country. The inhabitants find this flint on the banks of their rivers and work idols and domestic vef- fels out of it.

b. Of white and femi-transparent onyx; from Ceylon.

c. Bluifh grey: from Ceylon and Siberia.

VI. The carnelian. Carniolus. Is of a brownifh red colour, and often entirely brown. Its name is originally derived from its refeemble to fhef, or to water mixed with blood.

a. Red.

b. Yellowifh brown, looks like yellow amber. It is faid not to be fo hard as the chalcedony.

VII. The fardonyx. This is a mixture of the chalcedony and carnelian, sometimes flrated, and fometimes confufedly blended and mixed together.

a. Stripped with white and red ftrata; this serves as well cut in cameo as the onyx.

b. White, with red dendritical figures. This very much refembles that agate which is called the mocha fone; but with this difference, that the figures are of a red colour in this, inftead of black, as in that agate.

Between the onyx, carnelian, chalcedony, fardonyx, and agate, there feems to be no real difference, except some inexplicable degrees of hardness.

VIII. The agate; Achatas. This name is given to fints that are variega- ted with different colours, promifcuoufly blended together: and they are efteemed in proportion to their mixture of colours, their beauty, and elegance. Hence alfo they have obtained variety of names, mostly Greek, as fhe businefs of the lapidary in cutting of them, and admiring their feveral beauties and figures, had been derived from that nation alone. (p)

a. Brown opaque agate, with black veins, and dendritical figures: the Egyptian pebbles.

b. Of a Chalcedony colour; achatas chaledonifan.

c. Semi-transparent, with lines of a blackifh brown colour, and dendritical figures; the mocha fone.

d. Semi-transparent, with red dots; Gemma divi Stephani. When the points are very minute, fo as to give the flone a red appearance, it is by fome called Sardoa.

(p) On the fide of a hill near the church of Rothes in Moray, is a quantity of fintoagate of elegant red, and white colours. It is very hard, heavy, of a smooth uniform texture, and of a confiderable brightnefs; in which the red are remarkably clear, and finely mixed, and shaded through the fone. Mr Williams fays, that this is the largest and most beautiful agate rock he ever faw; and fo fide and hard as to be capable of the highest luftre in polishing.
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loose and single irregular noules, and hardly in rocks, as the chert, it is a circumstance very insufficient to establish a difference between them; for there is the agate-flone, near Constantinople, running vein-like across the rock with its country of the same hardness, and as fine and transparent as those other agates which are found in round nodules at Deux-ports. We must, therefore, content ourselves with this remark concerning flints, viz. That they seem to be the only kind of flone hitherto known, of which a very large quantity has been formed in the shape of loose or separate nodules, each surrounded with its proper crust; and that the matter which constitutes this flint has been separated from the rest of the substance, in like manner as sandiver or glass-gall separates from, and twins upon, glasses, during its vitrification; though sometimes the formation of this flint may be prevented by the too sudden hardening of the matter itself.

Other species of flones, which are found in loose pieces or nodules, except ores and some sorts of flalafites, show evidently by their cracks, angles, and irregular figures, that they have been torn from rocks, rolled about, and rubbed against one another in torrents, or by some other violent motions of water.

That flints had originally been in a soft state, Mr. Cronstedt observes, is easy to be seen in the Egyptian pebbles, which have impressions of small flines, sand, and sometimes, perhaps, grafs; which, however, have not had any ingress into the very flint, but seem only to have forced the above agate gall or crust out of the way.

§ 4. Of Jaspers.

Jasper, japis, (the diafper of the Italians), is a name given to all the opaque flints whose texture resembles dry clay and which have no other known quality whereby they may be distinguished from other flints, except that they may be more easily melted in the fire; and this quality perhaps may proceed from the heterogeneous mixture, probably of iron.

I. Pure Jasper, which by no means yet known can be decamped.


II. Jasper containing iron: japis martialis Simole.

A coarse-grained.

a. Red and reddish brown; sanguine. B. Steel-grained, or fine-grained.

a. Reddish brown; looks like the red ochre or chalk used for drawing; and has partition veins, which are unequous to the touch, like a fine clay, and other like kinds.

C. Of a solid and shining texture, like a flag.

a. Liver-coloured; and, b. Deep red. c. Yellow. This last mentioned, when calcined, is attracted by the loadstone: and being affayed, yields from 12 to 15 per cent. of iron. (s.)

§ 5

(s.) Near Portfay in Banff-shire is an extensive rock of Jasper; some parts of which contain a beautiful mixture of green and red, which appear finely shaded and clouded through the body of the flone when polished. Mr. Williams is of opinion that it would be a very valuable quarry if worked.
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2. Crystallized.
   a. Blackish-brown.
   b. Light-green or white.

C. Garnet mixed with iron and lead.
   1. Crystallized.
   a. Reddish-brown.

II. Cockle, or shill. *Cornus cristallizatus* Wallerii; *Stannum cristalla columnaribus nigra Linnæi*.

This is a heavy and hard kind of stone which flows into crystals of a prismatic figure, and whose chief colours are black or green. Its specific gravity is the same as the garnets, viz. between 3000 and 3400, though always proportionable to their different solidity.

a. Cockle, or shill, mixed with iron.
   1. Coarse, without any determined figure.
      a. Green.
   2. Sparry.
      a. Deep green, (the mother of the emeralds), from Egypt.
      b. Pale green.
      c. White. This occurs very frequently in the scaly limetones; and its colour changes from deep green to white, in proportion as it contains more or less of iron.
   3. Fibrous, striated cockle, or shill: it looks like fibres or threads made of glafs.
      c. White.
      b. Of concentrated fibres: The starred cockle, or shill, from its fibres being laid stellarwise.
   4. Crystallized cocks, or shill.
      a. Black. To this variety belong most of these substances called *imperfecta albeïtis*; and as the cockle perfectly resembles a flag from an iron furnace, both in regard to its metallic contents and its glassey texture, it is no wonder that it is not soft enough to be taken for an albeïtus. It has, however, only for the sake of its structure, been ranked among the albeïtis. The striated cockle, or shill, compared to the albeïtis, is of a shining and angular surface (though this sometimes requires the aid of the magnifying-glasses to be discovered) always somewhat transparent, and is pretty easily brought to a glas with the blow-pipe, without being consumed as the pure albeïtis seem to be.
      b. Deep green.
      c. Light green.
      d. Reddish brown. The *tauffstein* is of this colour, and consists of two hexagonal crystals of cockle grown together in form of a cross; this the Roman Catholics use as an amulet, and is called in Latin *lapit crucifer*, or the cross stone.

The figure of the cockle crystals is uncertain, but always prismatic: the cockle from Ysfio, at Nya Köppenberge, is quadrangular; the French kind has nine sides or planes, and the tauffstein is hexagonal.

The name *cockle* for these substances is an old Cornish mineral name; but is also given sometimes to other very different matters. 

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III. Rowley rag. (Kirwan). This stone is of a dusky or dark grey colour, with numerous minute shining crystals: its texture is granular: by exposure to the air it acquires an ochry crust. Its specific gravity is 2.748. Heated in an open fire it becomes magnetic. In strong heat it melts per se, but with more difficulty than basaltes. According to Dr Withering's analysis, 100 parts of it contain 47.5 of siliceous earth, 32.5 of argil, and 20 of iron.

IV. Siliceous muriatic spar. (Id.) This stone is of a hard, solid, and sparry texture: of a grey, ochry, dull colour, but internally bright. It gives fire with steel: yet it effervesces with acids. In a strong heat it grows brown: but at last it melts per se. One hundred parts of this stone contain fifty parts of siliceous earth, the remainder is magnesia and iron; but in what proportion it is not mentioned. (See Journal de Physique, Supplement, vol. xiii. p. 216.)

V. Turkish stone; cos Turcica. (Id.) This stone is of a dull white colour, and often of an uneven colour, some parts appearing more compact than others, so that it is in some measure shattery. It is used as a whetstone: and those of the finest grain are the best hones for the most delicate cutting tools, and even for razors, lancets, &c. Its specific gravity is 2.598. It gives fire with steel: yet effervesces with acids. Mr Kirwan found that 100 parts of it contains 25 of mild calcareous earth, and no iron. There probably are two sorts of stones known by this name, as Mr Wallerius affirms, that which he describes neither to give fire with steel nor effervesce with acids.

VI. Ragg stone. The colour of this stone is grey. Its texture is obliquely laminar, or rather fibrous, but the laminae or fibres consist of a congeries of grains of a quartzy appearance, coarse and rough. Its specific gravity is 2.729. It effervesces with acids; and gives fire with steel. Mr Kirwan found it to contain a portion of mild calcareous earth, and a small proportion of iron. It is used as a whetstone for coarse cutting tools.

[The siliceous grit, cos arenarius, and other compounds of the siliceous earth, &c. will be found in a subsequent division of this article.]

Observations on the economical Use of the Siliceous Order.

Europeans have no farther trouble with the precious stones than either to cut them from their natural or rough figure, or to alter them when they have been badly cut in the East Indies; in which latter cir-

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Argillaceous Earths. 

It appears likewise probable that the quartz-like matter makes the grind and whetstone fit for their intended purposes. (Magellan.)

Order V. The Argillaceous Earths.

The principal character whereby those may be distinguished from other earths is, that they harden in the fire, and are compounded of very minute particles, by which they acquire a dead or dull appearance when broken.

I. Argylla aerata; lac bona.

This fanciful name was herefore thought to denote a very fine species of calcarceous earth; but Mr Sceber has lately shown, that the earth to which this name is given, is a very uncommon species of argill. It is generally found in small cakes of the hardnes of chalk; and like that, it marks white. Its hardnese is nearly as that of flitepites, and it does not feel so fat as common clay does. Its specific gravity is 1669; its colour from white. When examined with a microscope, it is found to consist of small transparent crystals; and by his experiments it appears plainly to be an argill saturated with fixed air. It effervesces with acids, and contains a very small quantity of the inflammable principle.

2. Friable and lean. 

a. White.

b. Bluish grey.

c. Black.

d. Violet.

These contain a phlogiflon, which is discovered by exposing them to quick and strong fire, in which they become quite black interiorly, affuming the appearance of the common flints, not only in regard to colour, but also in regard to hardnes; but if heated by degrees, they are first white, and afterwards of a pearl colour. The matter they seem to be, which may be judged both by their feeling smooth and unctuous, and by their shining when scraped with the nail, they contain a larger quantity of the inflammable principle. It is difficult to determine, whether this strongly inherent phlogiflon be the cause of the abovementioned pearl-colour, or prevents them from being burnt white in a strong fire; yet no heterogeneous substance can be extracted from them, except sand, which may be separated from some by means of water; but which sand does not form any of the constituent parts of the clays. If they be boiled in aqua regis in order to extract any iron, they are found to lose their viability.

II. Porcelain clay; Terra porcellana, vulgo Argylla opaca, very refractory; the kaolin of the Chinese.

1. Pure.

a. Diffusible in water.

b. Coherent and dry.

2. Friable and lean. 

a. White.

b. Bluish grey.

c. Black.

d. Violet.

These contain a phlogiflon, which is discovered by exposing them to quick and strong fire, in which they become quite black interiorly, affuming the appearance of the common flints, not only in regard to colour, but also in regard to hardnes; but if heated by degrees, they are first white, and afterwards of a pearl colour. The matter they seem to be, which may be judged both by their feeling smooth and unctuous, and by their shining when scraped with the nail, they contain a larger quantity of the inflammable principle. It is difficult to determine, whether this strongly inherent phlogiflon be the cause of the abovementioned pearl-colour, or prevents them from being burnt white in a strong fire; yet no heterogeneous substance can be extracted from them, except sand, which may be separated from some by means of water; but which sand does not form any of the constituent parts of the clays. If they be boiled in aqua regis in order to extract any iron, they are found to lose their viability.

11. Stone-marow; Lithæagna Kystil of the Tartars.

1. When dry, it is as fat and slippery as soap; but, when wet, it is not wholly diffusible in water, in which it only falls to pieces, either in large bits, or resembles a curd like mafs.

2. It breaks into irregular fealy pieces.

A. Of coarse particles; Coarse stone-marow.

a. Grey.

b. Whitish yellow, from the Crim Tartary, where it is called kektik, and is said to be used for washing instead of soap.

B. Of very fine particles; fine stone-marow.

a. Yellowish brown; Terra Leunia.—Is of a thinning texture, falls to pieces in the water with a crackling noise; it is more indurated than the preceding, but has otherwise the same qualities.

IV. Bole; (iron clay.)

This is a fine and dense clay of various colours, containing a great quantity of iron, which makes it impossible to know the natural and specific qualities of the bone itself, by any easy method hitherto in use. It is not easily soaked in water, contrary to what the porcelain and the common clays are, (I. and VI.); but either falls to pieces in form of small grains, or repels the water, and cannot be made dullife. In the fire it grows black, and is then attracted by the leadstone.

A. Loose and friable boles, or those which fall to a powder in water.

1. Flesh-coloured bole.

2. Red.

3. Fine; Bolus Armenus.

4. Coarse; Bolus communis officinalis.

5. Hard; Terra rubrica.

6. Green; Terra virte.

1. Fine.

2. Coarse.

3. Bluish grey, is dulcite as long as it is in the rock, but even then repels the water; it contains 40 per cent. of iron; which metal being melted out of it in a close vessel, the iron crystallizes on its surface.


1. Crystallized in a spherical polygonal figure.

2. Of an undeterminate figure.

B. Indurated bole.

1. Of no visible particles.

This occurs very often in form of flate, or layers, in the earth; and then is made use of as an iron ore. However, it has usually been considered more in regard to its texture than to its constituent parts; and has been called flate, in common with several other earths which are found to have a flame texture.

2. Reddish-brown; in most colilities, between the seams of coal.

b. Grey.

3. Of fealy particles.—The bornblende of the Swedes.
M I N E R A L O G Y.

Part II.

VI. Tripoli.

This is known by its quality of rubbing or wearing hard bodies, and making their surfaces to shine; the particles of the tripoli being so fine as to leave even no scratches on the surface. This effect, which is called polishing, may likewise be effected by other fine clays when they have been burnt a little. The tripoli grows somewhat harder in the fire, and is very refractory: it is with difficulty dissolved by borax, and still with greater difficulty by the microcosmic salt. It becomes white when it is heated: when crude, it imbibes water, but is not diffusible in it: it taints like common chalk, and is rough and sandy between the teeth, although no sand can by any means be separated from it. It has no quality common with any other kind of earth, by which it might be considered as a variety of any other. That which is here described is of a yellow colour, and is sold by druggists. This kind of tripoli has been lately discovered in Scotland. But the rotten-stone, so called, is another sort found in England, viz. in Derbyshire. It is in common use in England among workmen for all sorts of finer grinding and polishing, and is also sometimes used by lapidaries for cutting of stones, &c.

The tripoli is found,
   b. Yellowish.
   c. Spotted like marble.
2. Friable and compact.
   a. Granulated.
   b. Brown.
   c. Yellowish.

VII. Common clay, or brick clay.

This kind may be distinguished from the other clays by the following qualities:
1. In the fire it acquires a red colour, more or less deep.
2. It melts pretty easily into a greenish glaze.
3. It contains a small quantity of iron and of the vitriolic acid, by which the preceeding effects are produced.

It is found,
A. Diffusible in water.
1. Pure.
   a. Red clay.
   b. Flesh-coloured, or pale-red.
   c. Grey.
   d. Blue.
   e. White.
   f. Fermenting clay.
2. Mixed with lime. See Marl, above,
B. Indurated.
1. Pure.
   a. Grey flint.
   b. Red flint.
2. Mixed with phlogiston, and a great deal of the vitriolic acid. See Alum Ores, above.
3. Mixed with lime. See Lime, above.

VIII. Argillaceous fine frits.

These and many other different kinds of earth have been comprehended under the denomination of...
MINERALOGY.

Part II.

Argillaceous Earths.

of schistis; but to avoid ambiguity we will confine this name to flones of the argillaceous kind.

1. The bluish purple schilus, or common roof slate; schilus scriptarius. Its colour varies to the pale, to the slightly purple, and to the bluish.

2. The dark-blue flate, schilus scriptarius.

3. The bituminous schilus. This is of a grey colour, brown, blue, or black.

4. The argillaceous grit. This is of a grey, yellowish, or reddish white colour.

5. The argillaceous flate. This is called also sand stone and free stone, because it may be cut easily in all directions.


This flate is of a pale grey or greenish colour; either lamellar, or coarsely granular. It is found chiefly in Cornwall.

7. Toadstone.

Dr Withering, who has given an analysis of this flate, describes it as being of a dark brownish grey colour, of a granular texture, not giving fire with steel, nor effervescing with acids. It has cavities filled with crystalized spar, and is fusible per se in a strong heat. It is found in Derbyshire. See Toadstone.

For the economical uses of the argillaceous earths, see the article Clay.

Class II. Salts.

By this name those mineral bodies are called which can be dissolved in water, and give it a taste; and which have the power, at least when they are mixed with one another, to form new bodies of a solid and angular shape, when the water in which they are dissolved is diminished to a less quantity than is required to keep them in solution; which quality is called crystallisation.

In regard to the principal known circumstances or qualities of the mineral salts, they are divided into

1. Acid salts, or mineral acids.

2. Alkaline salts, or mineral alkalies.

Order I. Acid Salts.

For the characters, properties, and phenomena of these, see the article Acid, and Chemistry-Index.

Thus no more mineral acids were known than the vitriolic and marine; the boracic or soda salt being reckoned as produced artificially: but later discoveries have proved that we may reckon at least eleven mineral acids; out of which only two or three have been found in an uncombined state. Those hitherto known are the following, viz. the vitriolic, the nitrous, the marine, the sanguine, the arsenical, the molybdenic, the tungstenic, the phosphoric, the boracic, the fuscous, and the aerial. See the article Acid, and Chemistry-Index.

I. The vitriolic acid. See Chemistry-Index.

II. Nitrous acid.

This acid is by some excluded from the mineral kingdom, because they suppose it to be produced from putrefaction of organic bodies. But these bodies, when deprived of life, are again received amongst fossils, from whence their more fixed parts were originally derived. For the nature of this acid, see Chemistry-Index.

III. Acid of common or sea-salt. See Chemistry-Index, at Acid and Marine.

IV. The fluors acid, or sparly fluors acid. See Chemistry-Index.

This acid is obtained by art, as it has never been found disengaged, but united to calcareous earth, forming a sparly fluors, called Derbyshire fluors. See Fluors Cornish fluors, but John, or amethyst root, when of a spar purple colour. See p. 72. col. 2. concerning the substances arising from the combination of this acid with calcareous earth.

V. The acid of arsenic. See Chemistry-Index.

VI. The acid of molybdena. Ibid.

VII. The acid of tungsten. Ibid.

VIII. The phosphoric acid. Ibid.

IX. The boracic acid. Ibid.

X. The fuscous or amber acid. Ibid.

XI. Aerial acid, or fixed air. Ibid.

Order II. Alkaline Mineral Salts.

For the characters, properties, and phenomena of these, see the article Alkali; also Chemistry-Index, at Alkali Alkalis.

New acids are daily detected; but no additions have been made to the three species of alkali long since known. These alkali salts are,

I. Vegetable fixed alkali (A.)

(M) vegetable
M I N E R A L O G Y.

Part II.

Vegetable fixed alkali, deprived of every acid, is not found any where by itself; but it is sometimes met with in combination with the vitriolic acid or the muriatic, generally with the nitrous, rarely with the aerial.

The fixed vegetable alkali (or potash of Moreau), is of a powdery appearance, and of a dead white colour. When pure, it is much more caustic than the neutral salt; it forms with the aerial acid, and even corrodes the skin. Its properties of deliquescing, are thereby deprived of its property of deliquescing.

1. It changes the blue colours of vegetables into a deep green.
2. It has no smell when dry; but when wetted, it has a slight limiduous odour.
3. Its taste is strongly acid, burning, caustic, and urinous (n). This last sensation arises from the volatile alkali it difengages from animal subsances.
4. When exposed to the air, it attracts humidity, and is reduced into a transparent colourless liquor. According to Gellert, it attracts three times its own weight of water.
5. It likewise attracts sometimes the aerial acid from the atmosphere, and is thereby deprived of its property of deliquescing.
6. When it is dissolved in an equal weight of water, it has an oily feel, owing to its action on the fatty parts of the skin, whence it is, though improperly, called oil of tartar.
7. In a moderate heat it melts; but in a more violent fire, it is disperfed or volatilised.
8. It is a moft powerful solvent by the dry way; in a proper heat, it dissolves calcareous, argilaceous, siliceous, and metallic earths: and when the alkali is nearly equal in quantity to the earth, it forms various kinds of hard, solid, and transparent glasses.
9. But if the alkali be in quantity three or four times that of the earth, the glass is deliquescent.
10. The mild vegetable alkali unites with the vitriolic acid with a violent effevescence, and produces vitriolated tartar.

II. Fossil fixed alkalis.

A. Alkali of the sea, or of common salt (e).

1. Pure.

This has nearly the same qualities with the lixivious salt, which is prepared from the ashes of burnt vegetables. It is the same with the sal soda, or kelp: for the kelp is nothing else than the ashes remaining, after the burning of certain herbs that abound in common salt; but which common salt, during the burning of those vegetables, has lost its acid (r). The properties of the fossil alkali are as follows:

trary, that which is got from tartar, properly burned, then dissolved in boiling water, and purified by filtration and crysallification, is called salt of water. It is the best.

(b) The vegetable alkali is by no means found in the earth, except in wells of towns, as at Doway, or in the argilaceous alun-ore of la Tolfa; it is found also united to the nitrous acid, near the surface of the earth, in Spain, and in the East Indies, probably from the putrefaction of vegetables.

(c) Common vegetable alkali, salt of tartar, and potash, were formerly considered by chemists as simple alkalis; but Dr Black has demonstrated them to be true neutral salts, arising from the combination of the vegetable alkali with the aerial acid. From hence it follows, that the above common alkalis, even after any other extraneous substance has been extracted, must be freed from this acid, by putting each in a crucible, and expooting it to a strong fire, which will dil معظم this aerial acid. The alkali so purified, is to be put in a glass vessel before it be entirely cold, and kept clese with a proper stopple; otherwise the aerial acid which floats in large quantities on the atmosphere will combine again with the pure alkali. (Monges.)

(d) The alkali must be largely diluted with water, in order to be tasteless; otherwise it will act on the tongue, and corrode the parts where it touches. (Macquer.)

(e) This salt is not met with pure in Europe; but it is said to be found in both the Indies, not only in great quantity, but likewise of a tolerable purity: it is there collected in form of an effevescence in the extensive deferts, a profitable trade being carried on in it for the making of soaf and glass; and, therefore, it is very probable that the ancients meant this salt by the natron or baurus. (Magellan.)

(f) The mineral alkali is often combined with the vitriolic and marine acid, also with the aerial acid.
Part II.

MINERALOGY.

Alkaline Salts.

1. It effervesces with acids, and unites with them.
2. It turns the syrup of violets to a green colour.
3. Precipitates sublimate mercury in an orange-coloured powder.
4. Unites with fat substances, and forms soap.
5. Diffuses the siliceous earth in the fire, and makes glasses with it, &c. It distinguishes itself from the salt of the pot-ashes by the following properties (c).
6. It shoots easily into rhomboidal crystals; which
7. Fall to powder in the air, merely by the loss of their moisture (n).
8. Mixed with the vitriolic acid, it makes the "sal mirabilis" Glauber's.
9. It melts more easily, and is fitter for producing the "sal commune regeneratum, nitrum cubisum," &c. Perhaps it is also more conveniently applied in the preparation of several medicines.

10. It is somewhat volatile in the fire.

Volatile mineral alkali.

This perfectly resembles that salt which is extracted from animals and vegetables, under the name of alkali volatile or sal urinum, and is commonly considered as not belonging to the mineral kingdom; but since it is discover'd, not only in most part of the clays, but likewise in the sublimations at Solfatara, near Naples, it cannot possibly be quite excluded from the mineral kingdom (1).

Its principal qualities are,

a. In the fire it rises in forma fissa, and volatilities in the air in form of corrosive vapours, which are offensive to the eyes and nose (k).
b. It precipitates the solution of the mercurial sublimate in a white-powder.
c. It also precipitates gold out of aqua regia, and detonesates with it; because,
d. It has a re-action in regard to the acids, though not so strongly as other alkalies.

M 2

c. It

Acid with which last it retains not only the name but many of the properties of a pure alkali, because this last acid is easily expelled.

It is easily known by its crystallisation and its solubility in two times and an half of its weight of water, at the temperature of 60 degrees.

One hundred parts of this salt, when pure and recently crystallised, contain 20 of mere alkali, 16 of aerial acid, and 64 of water. (Monges.)

Mineral alkali is found in Hungary, in marshy grounds, of an argillaceous or marly nature, either mixed with water or crystallised and efflorescing. It is also found in Egypt at the bottom of lakes, and dried up by the summer's heat; and also in the province of Sothena, 28 days journey from Tripoli, where it has the name of Trena; in Syria, Persia, as well as in the East-Indies, and China, where it is called Kim. It sometimes germinates on walls, and is called by many apronitron. In its native state, it is frequently mixed with manganian earth, common salt, uric acid, and marine sepheline. (Kirwan.)

(c) This mineral alkali likewise differs from the vegetable, 1. By its taste, which is less corrosive and burning.
2. By its not deliquescing.
3. By the small degree of heat it produces if calcined, and afterwards added to water.
4. By its property of crystallizing, by evaporating the water from its solution, as is practised with neutral salts; whereas the vegetable alkali does not crystallize unless combined with a large portion of aerial acid.

(n) This alkali being a very useful commodity, and essentially necessary in a number of manufacturies, many ingenious processes have been contrived and attempted to procure it at a cheap rate, by decomposing the salt; but it is believed, that till lately none of these new manufactures have succeeded, except that of Mr. Turner, mentioned by Mr. Kirwan in the second part of the Philosophical Transactions for 1782.

The process is said to consist in mixing a quantity of lime with half its weight of common salt, which, on being trituated with water till it attains a white colour, is left to stand some hours; after which, a decomposition ensues, the alkali being left alone, whilst the acid unites to the metallic calx; and this last being urged by a proper degree of fire, produces a fine pigment of a greenish yellow colour, whose sale pays for the most part of the expenses.

Mr. Kirwan says, in the place already quoted, that if common salt perfectly dry be projected on lead heated to incandescence, the common salt will be decomposed, and a horn-like formed, according to Margraff. He adds also, that according to Scheele, if a solution of common salt be digested with litharge, the common salt will be decomposed, and a caustic alkali produced; and finally, that Mr. Scheele decomposed common salt by letting its solution flowly passes through a funnel filled with litharge.

(1) It is easily known, by its smell, though in a mild state, by its volatility, and by its action on copper; the solutions of which, in the mineral acids, are turned blue by an addition of this alkali. It is frequently found, though in small quantities, in mould, marble, crystal, chalcedon, and in some mineral waters. It probably derives its origin in the mineral kingdom, from the putrefaction or combustion of animal or vegetable substances. (Kirwan.)

The name is causticus when combined with any acid, not excepting even the aerial acid. It differs from the other two alkalies in many essential particulars. 1. By its aeriform or gaseous nature. For the volatile alkali, it is a state of purity, is nothing more than an alkaline gas diffused in water, as Dr. Priesley has demonstrated. 2. By its volatility. 3. By the nature of the salt it forms with acids, which are very different from those whose bases are formed either of the vegetable or mineral alkali. (Monges.)

(k) Pure volatile alkali, in an aerial form, resembles atmospheric air, but is more heavy. Its smell is
Neutral Salts.

Acids united to alkalies form neutral salts. These dissolved in water are in no ways disturbed by the addition of an alkali; and generally, by evaporation, concrete into crystals. If, by proper tests, they show neither acid nor alkaline properties, they are said to be perfect neutrals; but imperfect, when, from defect in quantity or strength of one ingredient, the peculiar properties of the other more or less prevail.

I. Vitriolated tartar, vitriolated vegetable alkali, or (as Morveau calls it) the vitriol of pot-ash. This is a perfectly neutral salt, which results from the combination of the vitriolic acid with the vegetable fixed alkali. According to Bergman, it seldom occurs spontaneously in nature, unless where tracks of wood have been burnt down: and Mr Bowles, quoted by Mr Kirwan, says it is contained in some earths in Spain. See Chemistry-Index.

It is easily obtained, by pouring the vitriolic acid on a solution of fixed vegetable alkali till it is saturated. Crystals of this neutral salt are then formed. This crystallisation succeeds better by evaporation than by cooling, according to Mongez.

The taste of this salt is disagreeable, though somewhat resembling common salt.

II. Common nitre, (Alkali vegetable nitrum) is known in commerce by the name of fels-petre, and is also called prismatic nitre, to distinguish it from the cubic nitre after-mentioned.—It is perfect neutral salt; resulting from the combination of the nitrous acid with the pure vegetable alkali.

According to Bergman, it is formed upon the surface of the earth, where vegetables, especially when mixed with animal-substances, putrify.—See Chemistry-Index, at Nitre.

III. Digestive salt, salt of Sylvius, (Alkali vegetable saltum). This neutral salt is sometimes, though rarely, met with on the earth, generated perhaps, as procéd for Bergman observes, by the destruction of animal and vegetable substances.

According to Macquer, this salt has been very wrongly called regenerated marine salt; and the epithet of frisburage has also been given to it, without any good reason, to evince that it has such a property. But M. de Morveau calls it nitrate de potasse with great propriety.

This salt is produced by a perfect combination of the vegetable alkali with marine acid. It has been wrongly confounded with common salt.—It is found in some bogs in Picardy, and in some mineral waters at Normandy, according to Monet, quoted by Kirwan. Mongez adds also the seawater, as containing this salt, and that it is never found in large quantities, although its component parts are abundantly produced by nature.

See Chemistry-Index, at Digestive.

IV. Mild vegetable alkali, (alkali vegetabile aeratum.) This salt was formerly considered as a pure alkali, known by the name of potash and salt of tartar: but since the discovery of the aerial acid, it is very properly classified among the neutral salts, and ought to be called aerated potash.

It results from a combination of the vegetable alkali with the aerial acid, and is hardly ever found native, unless in the neighbourhood of woods destroyed by fire.

On being exposed on a piece of charcoal, urged by the blow-pipe, it melts, and is absorbed by the coal; but,

In the metallic spoon, it forms a glassy bead, which becomes opaque when cold.

V. Vitriolated acid faturated with mineral alkali; Glauber's salt. Alkali mineral vitriolatum.

This is a neutral salt, prepared by nature (as well as by art), containing more or less of iron, or of a calcareous earth; from which arises also some difference in its effects when internally used. It shoots easily into prismatic crystals, which become larger in proportion to the quantity of water evaporated before the crystallisation. When laid on a piece of burning charcoal, or else burnt with a phlogiston, the vitriolic acid dissolves itself by the smell resembling the hepatic sulphur.

It is found in a dissolved state in springs and wells. Some of the lakes in Siberia and African, penetrating, and suffocates animals. Its taste is acid and caustic. It quickly converts blue vegetable colours to green, and produces heat during its combination with water. But if the water be frozen, it melts, producing at the same time an extreme degree of cold. It has a remarkable action on most metals, particularly copper.

This substance is obtained by the putrefactive fermentation from animal and some vegetable matters. It is this salt which causes that strong smell which is perceived in drains and privies on a change of weather. (Blengius.)

Its volatility arises from a very subtle and volatile (or phlogistic) oil, which enters as a principle into its composition. (Mongez).

(1) The solution of copper by this alkali, which is of a fine blue, presents a remarkable phenomenon. For if it be kept in a well clozed phial, the colour decays, and at length disappears, giving place to transparency. But on opening the phial, the surface or part in contact with the air becomes blue, and the colour is communicated through the whole mass. This experiment may be many times repeated with the same success.
This neutral salt is a combination of the mineral alkalii with the aerial acid or fixed air. It is
found plentifully in many places, particularly in Africa and Asia, either concreted into crys-"ta-"lized
flata, or fallen to a powder; or effervescing on old brick walls; or lastly, dissolved in springs.
It frequently originates from decomposed common salt.

This is an imperfect neutral salt, and was formerly considered as a pure alkalii; but the disco-
very of the aerial acid has shown the mistake.

1. It has nearly all the properties of the pure mineral alkalii N° 11. A. 1. (p. 90.), but with
less energy.

2. The vegetable blue colours are turned green by this salt; it effervescs with acids, and
has an urinous flavour. See Chemistry-Index, at Sea-salt.

3. It is soluble in twice its weight of cold water; but if the water is hot, an equal weight
is sufficient for its solution.

4. It effervescs when exposed to the action of the atmosphere.

5. It fuses easily on the fire, but without being decomposed.

6. Facilitates the fusion of vitrifiable earths, and produces glaist more or less fine accord-
ing to their qualities.

7. It is decomposable by lime and ponderous earths, which attract the aerial acid.

8. And also by the mineral acids, but these expel the aerial acid of this salt, by fixing
its alkaline basis. (Minerals.)

Wallerius confounds this salt with the aphyroni-trum after mentioned, and calls it hauaisrum, when
it contains some phlogiston. Mr Kulbel, quoted by Wallerius, shewed that it exists in some vege-
table earths, and takes it to be the cause of their fertility; but this (M. Magellan obvers) can
only be on account of its combination with the oily parts of them, and forming a kind of soap,
which is miscible with the watery juices.

X. Vitriolic ammoniac, (Alkali volatile vitriol'atium.)

This neutral salt was called secret salt of Glaubers, and is a combination of the volatile alkalii with
vitriolic acid. According to Bergman, it is scarcely found any where but in places where the
phlogificated flames of vitriolic acid arise from burning sulphur, and are absorbed in putrid places.
by the volatile alkali. Thus at Fahlen the acid vapour from the roasted minerals produces this
salt in the necessary-houses. Dr Withering, however, obvers, that as volatile alkalii may be ob-
tained in large quantities from pit-coal, and produced by processes not dependent upon putrefac-
tion, there is reason to believe that the vitriolic ammoniac may be formed in several ways not no-
ticed by the above author.
It is said to have been found in the neighborhood of volcanoes, particularly of Mont Vesuvius, where, indeed, it might well be expected; yet its existence seems dubious, since Mr Bergman could not find any trace of it among the various specimens of salts from Vesuvius which he examined. The reason (according to M. Magellan) probably is, that the vitriolic acid disengaged by the combustion of sulphur is in a phlogiticated state; and all its combinations in this state are easily decomposed by the marine acid, which plentifully occurs in volcanoes. It is also said to be found in the mineral lakes of Tuscany, which is much more probable, as the vitriolic acid when united to water easily parts with phlogiston, and recovers its superiority over other acids. It is said likewise that this neutral salt is found on the surface of the earth in the neighbourhood of Turin.

1. This salt is of a friable texture, and has an acrid and urinous taste.
2. Attracts the moisture of the atmosphere.
3. Is very soluble in water, it requiring only twice its weight of cold water, or an equal weight of boiling water, to be dissolved.
4. It becomes liquid on a moderate fire; but if urged,
5. It becomes red hot, and volatilizes.
6. The nitrous and muriatic acid decompose this salt by seizing the volatile alkali. But
7. Lime, ponderous earth, and pure fixed alkali, set the volatile alkali free, and combine with the vitriolic acid.
8. According to Kirwan, 100 parts of this salt contain about 42 parts of real vitriolic acid, 40 of volatile alkali, and 18 of water. This vitriolic ammoniac is easily known; for if quicklime or fixed alkali be thrown into its solution, the smell of the volatile alkali is perceived; and if this solution be poured into that of chalk or ponderous earth by the nitrous acid, a precipitate will appear.

XI. Nitrous ammoniac. (Alkali volatilis nitratum.)

This is a neutral salt, which results from the combination of the nitrous acid with the volatile alkali. It is frequently found in the mother-liquor of nitre. When mixed with a fixed alkali, the volatile betrays itself by its smell.

1. It is of a friable texture, of a sharp bitter, and of a nitrous or cooling taste.
2. According to Mongez, it attracts the moisture of the atmosphere; but Romé de l'Île affirms, that its crystals are not deliquescent: the experiment may be easily tried, and the truth ascertained.
3. It is soluble in cold water; but half the quantity of water, if boiling, is sufficient for dissolving it.
4. It liquefies on the fire, and afterwards it becomes dry.
5. It detonates with a yellow flame before it is red hot; and what is peculiar to this salt, it needs not, like common nitre, the contact of any combustible matter for its detonation;

from whence it appears that the volatile alkali itself possesses a great share of phlogiston.

6. Its component parts, viz. the nitrous acid and the volatile alkali, are not very intimately united; and of course,
7. It is easily decomposed by all the substances that have any affinity to either of them.
8. Mixed with the muriatic acid, it makes aqua regia.
9. One hundred parts of this neutral salt contain 46 of nitrous acid, 40 of volatile alkali, and 14 of water, as Mr Kirwan thinks.

XII. Native salt ammoniac. The muriatic (or marine) acid saturated with a volatile alkali.

This is of a yellowish colour, and is sublimed from the flaming crevices, or fire-springs, at Solfluara, near Naples.

XIII. Aerated or mild volatile alkali.

This neutral salt results from the combination of volatile alkali united to the aerial acid. It was formerly considered as a pure alkali:—But the discovery of the aerial acid (or fixed air) has shown it to be a true neutral salt, though imperfect; as it retains still all the properties of an alkali, though in a weaker degree, on account of its combination with the aerial acid, which is itself the most weak of all acids, and of course other stronger acids easily dislodge it from its base, and from various ammonial salts.

1. This imperfect neutral salt has an urinous taste, and a particular smell, which is very penetrating, though less pungent, than the pure volatile alkali; and in the same manner it turns the blue vegetable juices green.
But,
2. It effervesces with other acids stronger than the aerial one, which the pure or caustic volatile alkali does not.
3. It sublimes very easily with a small degree of heat;
4. And dissolves in twice its weight of cold water; but in a lesser quantity, when this salt is boiling hot.
5. It acts on metallic substances, chiefly on copper, with which a blue colour is produced.

According to Bergman, this salt was found in a well in London (Phil. Trans. for 1767), at Frankfort on the Main, and at Lauchstadt.—Mefsrs. Hierne, Henkel, and Brandt, have found also this salt in the vegetable earth, in various kinds of argl, and in some saline substances. Mr Vozel found it also in some of the incrustations at Gottingen; and Mr Maloutin in some acidulous waters in France.

M. Magellan observes, that the borax and the three aerated alkalies are called imperfect neutrals; whilst the other neutral salts have acquired the name of perfect, because these last do not exhibit any of the distinguishing properties of their component parts. The three aerated alkalies have a very distinct alkaline character, as they turn blue vegetable juices green, though not so vivid a colour as the caustic alkali.
alkali and the borax is capable of receiving almost an equal quantity of its sedative acid, without losing all its alkaline properties.

In general, those neutral salts, consisting of fixed alkalies combined with acids, are more saturated than those composed of volatile alkali called ammoniacal salts, or those called aerated which last are only composed by the combination of the aerial acid, united to any alkaline or earthy base.

The aerated alkalies are called also by the name of mild alkalies, because they possess no longer that sharp corroding quality which they exhibit when deprived of the aerial acid or fixed air; in which case they are termed caustic alkalies.

These aerated alkalies differ also from the caustic ones, not only on account of the mildness of their taste, from which comes their epithet of mild alkalies, but also by their property of crystallizing, and by their effervescing with other acids, which expel the aerial one, the weakest of all acids we know.

Order IV. Earthy Neutral Salts.

The compounds of earths and acids which possess solubility are decomposed and precipitated by mild, but not by phlogisticated alkalies.

I. Calcareous earth combined with vitriolic acid.—

Vitriolated calx; Selenite; Gypsum. See p. 72. col. 1. supra.

The gypsum, or plaster, is not only found dissolved in various waters, but also in many places it forms immense strata. It is placed by all mineralogists among the earths, which it greatly resembles, but it rather belongs to the saline substances of the neutral kind, as appears by its constituent parts. When burnt, it generates heat with water, but in a less degree than lime does.

Berg. Scag. § 59. This salt has a particular taste, neither bitter nor astringent, but earthy, when applied to the tongue, and it is owing to it that some waters, chiefly from pumps and wells, are called hard waters, because they lie heavy on the stomach. It is unalterable whilst kept in a dry place, but on being exposed to moist air, it is much altered, and suffers a kind of decomposition. When exposed to fire so as to lose the water of its crystallization, it assumes a dead-white colour; and it is then what we call plaster of Paris; but if the fire is too strong, it melts and vitriifies, after losing the vitriolic acid with which it is saturated. See Gypsum.


It is found also in the vegetable kingdom.—Mr. Model found that the white spots in the root of rhubarb are the selenitical or gypseous earth. (Journal de Phys, vol. vi, p. 14.)

What is called foill flour (farine siffile in French), generally found in the fissures of rock and gypseous mountains, is very different from the agaricus mineralis p. 71, col. 1. and from the lac lune, p. 87. col. 1. as it is a true gypseous earth, already described p. 72. col. 1., which, according to Mongez, is of a white and shining colour, though sometimes it assumes a reddish or bluish colour, on account of some martial mixture.

II. Nitre of lime, (Calx nitrata). This earthy salt is sometimes found in water, but very sparingly. It is said that the chalk hills in some parts of France become spontaneously impregnated with nitrous acid, which may be washed out, and after a certain time they will become impregnated with it again. It is a combination of the nitrous acid with calcareous earth.

Berg. Scag. § 59. 1. It is deliquecscnt, and is soluble in twice its weight of cold water, or in an equal weight of boiling water. 2. Its taste is bitter. 3. It is decomposed by fixed alkalies, which form the cubic and the prismatic nitrates. 4. But caustic volatile alkali cannot decompose it. 5. It does not deglurate in the fire; yet paper moistened with a saturated solution of it crackles in burning. 6. In a strong heat it loses its acid. 7. Its solution does not trouble that of silver in nitrous acid. 8. The vitriolic acid precipitates its basis. 9. As does likewise the acid of sugar. 10. One hundred parts of it contain, when well dried, about 33 of nitrous acid, 32 of calcareous earth, and 35 of water. It exists in old mortar, and in the mother liquor of nitre; and also in the chalk rocks near Roche Guyon, in France. (Kirwan.)

III. Muriatic chalk, or fixed salt ammoniac. Acidum, salis communis terra calcarea satura tum. This somewhat deliquesces, or attracts the humidity of the air. It is found in the sea water. It is with great impropriety that this salt has obtained the name of ammoniac, on account only of its being formed in the chemical laboratories during the decomposition of the ammoniacal salt with lime, in the process for making the caustic volatile alkali. In this case, the muriatic acid unites to the calcareous basis, while this last gives its water to the volatile alkali; which, therefore, comes over in a fluid caustic state, but if chalk is employed instead of lime, the volatile alkali receives the aerial acid instead of water, and comes over in a concrete form. In neither case, the new combination of calcareous earth with muriatic salt has any volatile alkali to deserve the name of ammoniacal salt. (Masquer.)

1. This earthy salt has a saline and very disagreeable bitter taste. It is supposed to be the cause of that bitterness and nauseous taste of sea-water. 2. It fuses in the fire, and becomes phosphorescent, after undergoing a strong heat. 3. It becomes hard, so as to strike fire with steel. 4. It is then the phosphorus of Homberg. 5. It is decomposable by ponderous earth and fixed alkalies.
M I N E R A L O G Y.

6. And also by the vitriolic or nitrous acid, which expel the muriatic acid, to unite with the calcareous bafis. *(Menges.)*

7. Its solution renders that of silver in the nitrous acid turbid, at the same time that it becomes soluble in water, and has a flight pungent bitter tafle. It is commonly found dissolved in waters, in consequence of an excess of the aerial acid. When this greatly abounds, the water is said to be hard *(cruda).* By boiling or by evaporation, it deposits streaks or crusts of calcareous matter.

But when the calcareous earth is only saturated with the aerial acid without excess, it is not easily soluble; it is then the calcareous spar, p. 71. col. 2. and is properly referred to the class of earths, p. 71. col. 1.

V. Vitriolated ponderous earth. *Terra ponderosa vitriolata; barytes vitriolata.*

This earthy tafte, known by the name of ponderous spar, is a combination of the ponderous earth described in p. 75. col. 1. with the vitriolic acid; and has been already treated of.

The nitrous ponderous earth, according to Bergman, has not yet been found, although it may perhaps exist somewhere, and of course be discovered in nature.


This earthy falt consists of marine acid united to the ponderous earth. It is said to have been found in some mineral waters in Sweden; and may be known by its easy precipitability with vitriolic acid, and by the great insolubility and weight of this resulting compound, which is the true ponderous spar of the preceding fection.

VII. Aerated ponderous earth. *Barytes aerata.*

This earthy neutral falt was found by Dr. Withering in a mine at Allon-moor in the county of Cumberland in England. He says that it is very pure, and in a large mass. This fubstance is a new acquisition to mineralogy, and may be turned to useful purposes in chemistry.

1. It effervesces with acids, and melts with the blow-pipe, though not very readily.

2. In a melting furnace, it gave some figns of fusion; but did not feel caufic when applied to the tongue, nor had it lost its property of effervescing with acids.

3. But the precipitated earth from a faturated solution of it in the marine acid, by the mild vegetable or mineral alkali being burned, and thrown into water, gave it the properties of lime-water, having an acrid tafle in a high degree: and a single drop of it added to the solutions of vitriolated falt, as the Glauber's falt, vitriolated tartar, vitriolated ammonia, alom, Epfom falt, felenite, occasioned immediately a precipitation; from whence it appears to be the nicest tefl to discover the vitriolic acid. By it the marine acid may also be eafily freed from any mixture of vitriolic acid, by means of this caflx of ponderous earth. See Chemistry n. 1049. ef. feq.

VIII. Vitriolated magnesia.

This earthy neutral falt is called by the English Epfom falt; Sel d'Angleterre by the French, and allo fel de Sedilite, de Scydshubes, fel amor, fel cebartique amor, &c. These various names are given to it, either on account of its properties, it being a very mild purgative; or from the places where it is found, besides many others, as in the waters of Egra, of Creutzbourg, Obetnental, Urb. &c. It has also been found native, mixed with common falt and coaly matter, germinating on some free ftones in coal mines. See Kirwan's Mineralogy, p. 183.

1. It has a very bitter tafle.

2. It is soluble in one part and a half of its weight of cold water: but in hot water, a given weight of it dissolves the double of this falt.

3. It effervesces when exposed to a dry atmosphere, and is reduced to a white powder.

4. Exposed to the fire, it lofs the water of its folution, the calcareous earth of lime-water shows much when applied to bergman, as in the marine acid of water. But when urged by the flame with the blow-pipe, it froths; and may be melted by being repeatedly urged with that instrument.

9. With borax it effervesces, and also when burned with the microcosmic falt.

10. According to Bergman, 100 weight of this falt contains only 19 parts of pure magnesia, 33 of vitriolic acid: and 42 of water. But according to Kirwan, 100 parts of it contain about 24 of real vitriolic acid, 19 of magnesian earth, and 57 of water.

IX. Nitrated magnesia; nitrous Epfom falt.

This earthy falt is usually found together with nitre. It is a combination of the nitrous acid with the magnesian earth.

1. It has an acrid tafle, very bitter.

2. Attracts the moisture from the atmosphere, and deliquesces.

3. Is very soluble in water.
M I N E R A L O G Y.

4. Is easily decomposable by fire.
5. The ponderous and calcareous earths decompose it, and also the alkalies.
6. On being urged by the blow-pipe, it swells up with some noise, but does not detonate.
7. If saturated solutions of nitrous eileenite and of this salt be mixed, a precipitate will appear; but,
8. Neither vitriolic acid, nor mild magnesia, will occasion any turbidity in its solution.
9. One hundred parts of this salt contain about 36 of real nitrous acid, 27 of magnesia earth, and 37 of water.

This earthy salt is a combination of magnesia earth, with the nitric acid. According to Bergman, it is found in the sea in greater plenty than any other salt except the sea-salt.

1. It has a very bitter taste: and being always mixed in the sea-water, it is the principal cause of its bitterness.
2. It is very deliquescent, and soluble in a small quantity of water.
3. All the alkalies, even the caustic volatile alkali and lime, decompose it by precipitating its basis.
4. The vitriolic, nitrous, and boracic acids expel the nitric acid from the base of this neutral salt.
5. Its solution does not trouble that of nitrous or marine eileenite; but,
6. It causes a cloud in the nitrous solution of silver.
7. The vitriolic acid throws down no soluble precipitate from the solution of this neutral salt.
8. It loses its acid in a red heat.

XII. Aerated magnesia.

Common magnesia, with an excess of aerial acid is a true neutral salt, like the aerated eileenite of p. 96, col. 1, and becomes soluble in cold water. Otherwise it is scarce soluble at all; and is then claffed among the earths.

This neutral salt is decomposable by fire, by which its water and its acid are expelled; and it may become phosporic.

When urged by fire, it agglutinates a little; and some pretended that it melts. But it must be in an impure flate to vitrify at all.

The three mineral acids, and the alkalies, dissolve this salt with effervescence, by expelling the aerial acid.

XIII. Argillaceous earth saturated with vitriolic acid.

Professor Bergman says, that the combinations of the argillaceous earth with the nitrous, nitric, and aerial acids, had not yet been found naturally formed as far as he knew. But Dr Withering affirms, that he found the vitriolic argill to exist in a considerable quantity, in the Nevil Holt water, when he analyzed that mineral water about the year 1777: and he adds, that it is probably contained also in the Ballycastle water in Ireland.

The greatest part of the clays contain a volatile alkali, which discovers itself in the distillation of the spirit of sea-salt, &c.

Order V. Metallic Salts.

The native salts belonging to this division may be distinguished by the phlogiﬁcated alkali, which precipitates them all. Those which have saline properties, according to the definition of salts formerly given, shall be mentioned here; referring the rest to the mineralized metals; as the tana e reverse, the saline quicksilver or nitric mercury, &c.
MINERALOGY.

Part II.

Metallic Neutral
Salts.

1. Vitriol of copper; blue vitriol. *Vitriolum veneris,
for Egyptian.*

This neutral metallic salt is a combination of the
vitreous acid with copper, and is found in all
sulfur waters, as they are called. Its colour is a
deep blue; and being long exposed to the air, it
degenerates into a rusty yellow blue. Urged by
the flame of the blow-pipe on a piece of charcoal,
it froths at first with noise, giving a green flame,
and the metallic particles are often reduced to a
shining globule of copper, leaving an irregularly
figured scoria. But with borax the scoria is
dissolved, and forms a green glass.

This salt rarely occurs crystallized; but is often
found naturally dissolved in water in Hungary,
Sweden, and Ireland: from this water a blue vi-
triol is generally prepared. These natural wa-
ters are called cementory or cementing ones.
According to Monet, this concrete salt, when found
naturally formed, only proceeds from the evapo-
ration of such waters. It is also occasionally ex-
tracted from sulphurated copper ores after torre-
faction. See Chemistry-Index, at vitriol.

II. Muratic copper, or marine salt of copper. *Caprum
faiLium.*

This salt has been found in Saxony, in the mine
of Johngenqestadt. 1. It is cf a greenish
colour, and foliated texture. 2. It is moderately
hard. 3. Sometimes it is transparent and crys-

tallized.

It has been taken for a kind of mica; but Pro-

fessor Bergman found it to consist of copper
and marine acid, with a little argillaceous earth.

Another specimen of a purer sort was deposited
in the museum of Upsal. This is of a bluish
green colour, and friable. It effervesced with ni-
trous acid, to which it gave a green colour: and
by adding a proper solution of silver, a luna cor-
nea was formed, by which the presence of the
muratic acid was ascertained. (Kirwan and Berg-
man.)

III. Martial vitriol; vitriol of iron. Common green
vitreous or copperas.

This is the common green vitriol, which is na-

turally found dissolved in water, and is produced
in abundance by decayed or calcined maresites.

This metallic neutral salt results from the com-
bination of the vitriolic acid with iron.
1. It is of a greenish colour when perfectly
and recently crystallized; but,
2. Effloresces by being exposed to the air, be-
comes yellowish, and is covered with a kind of
rutil. Sometimes it becomes white by long
standing.
3. It requires six times its weight of water, in
the temperature of 60 degrees, to be dissolved.
4. It has an astringent, harsh, and acridulous taste.
5. Exposed to a moderate heat, even to that of
the sunshine, it falls into a yellowish powder;
but,
6. On being exposed to a sudden heat, it melts;
and on cooling, assumes a whitish brown colour.
7. When strongly urged by fire, it loses its acid,
becomes of a dark red colour, and is then call-
ed colochar; a powder which is employed in
polishing metals, to which the artificers have
applied the improper name of crocus martius,
though this name only belongs to the yellow
preparations of the iron-calces, used in phar-
macy and in enamelling, &c.

8. Pure fixed alkali precipitates the iron from its
solution in deep green flakes; the mild alkali,
in a greenish white colour; pure volatile alka-
li, in a deep green, that it appears black;
but the mild volatile alkali precipitates it in a
greyish-green colour.

9. All vegetable astringents, as the tincture of tea,
quingua, gales, &c. precipitate the iron in a
black colour: hence they are used as tints to
discover its presence in chemical analyses;
and it is from this black precipitate that the
common writing ink is made, being diluted
in water, and there suffused by the Arabic or
Senegal gums.

10. One hundred parts of this salt, recently crys-
tallized, contain 20 of real vitriolic acid, 23 of
iron, and 55 of water.

11. Its acid is known by this, that its solu-
tion mixes without turbidity with the solu-
tions of other salts that contain vitriolic acid;
as Epsom, felenite, vitriolated tartar, &c.

12. And the basis of this metallic salt is known
by the black colour produced by the solution
of vegetable astringents.

83. On being urged by the flame thrown by the
blow-pipe, it offers the same phenomena as the
vitreol of copper, except that it does not colour
the flame.

Green vitriol is frequently found native, ei-
ther in coal mines or in the cavities of pyrita-
ceous mines, or adhering to their scaffolds in a
falselithic form. It is found also in small
round flakes, called ink-flakes, of a white, red,
grey, yellow, or black colour, which are almost
soluble in water, and contain a portion of copper
and zinc. Also sometimes in form of schilitus
or flaty pyritaceous flakes. But the greatest
part of that in use is prepared by art, from the
martial pyritis or mundus. See Chemistry,
nº 619.

IV. Aerated iron. *Ferrum aeratum.*

This metallic salt is a combination of the aeri-
al acid with iron; and is found in the light
chalybeate waters, where it is dissolved by an ex-
cess of this acid.

Mr Lane was the first who discovered in Eng-
land the action of the aerial acid on iron, when
the water is impregnated with that menstruum.
The late R. Rouelle demonstrated the same
phenomenon in France upon this and other met-
tals. But Professor Bergman seems to have pre-
ceded them both nearly about the same time,
thought neither had any knowledge of each other's
discoveries.

The great volatility of this acid is the cause why
this neutral salt is not often found. For the
mere evaporation of the ferruginous mineral wa-
ters, in order to analyze them, is sufficient to let
loose the aerial acid; so that the iron which was
there dissolved by its power falls down to the
bottom in the form of a light ore, which amounts
to nearly 1/5 of the weight of the water; and when,
Part II.

**MINERALOGY.**

V. Vitriol of cobalt, or vitriolated cobalt.

This metallic salt results from the combination of the vitriolic acid with cobalt.

1. When found native, it is always in an efflorescent state; whence it arises that, in this case,
2. Its colour is greenish, mixed with a grey tint; but,
3. It is of a rosy colour when artificially made;
4. Effloresces when exposed to the action of the atmosphere; and,
5. Takes then a greenish colour mixed with a pale purple, or a Lilac colour, as the French call it.
6. It is difficultly soluble in water; and,
7. Its solution is of a red colour.
8. The phlogilicated alkali precipitates the cobalt from the solution of this salt, which with borax gives an azure glaze.

By the above qualities, chiefly the rosy:

1. It requires little more than twice its weight of water to dissolve it in the temperature of 60 degrees of Fahrenheit's thermometer, and deposits a greyish yellow powder.
2. Its specific gravity is 2000.
3. Its taste is very rejecting.
4. It mixes uniformly with vitriolic neutral salts.
5. Precipitates nitrous or marine felenites from their solutions, by which its acid is ascertained.
6. It is precipitable in a whitish powder by alkalis and earths; but,
7. Neither iron, copper, nor zinc, precipitate it: by which circumstance its basis is sufficiently indicated.
8. If it contains any other metallic principle, this may be precipitated by adding more zinc to the solution; excepting iron, which will of itself precipitate by exposure to the air or boiling in an open vessel.
9. One hundred parts of this metallic salt contain 22 of vitriolic acid, 20 of zinc, and 58 of water.
10. Urged by fire, it loses a good part of its acid.
11. Treated with the blow-pipe it exhibits nearly the same phenomena as other metallic vitriols; except only that the flame is brilliant when the zinc is reduced, and gives out white flocks called flowers of zinc.

This neutral metallic salt is sometimes found native, mixed with vitriol of iron, and in the form of white hairy crystals; or in a vitriolic form in the mines of Hungary, or as an efflorescence on ores of zinc. It is also found dissolved in mineral waters, and generally with some proportion of vitriols of iron and copper. Bergman says it is sometimes produced by the decomposition of pseudoglaucan, or black jack; but this rarely happens, because this substance does not readily decompose spontaneously.

But that in common use is mostly prepared at Goslar, from an ore which contains zinc, copper, and lead, mineralised by sulphur and a little iron. The copper is first separated as much as possible: the remainder after torrefaction and distillation is thrown red-hot into water and lixiviated. It is never free from iron. (Kirwan, Mongez.)

VI. Vitriolated nickel, or vitriol of nickel.

This neutral metallic salt results from the combination of the vitriolic acid with nickel. It exhibits sometimes in consequence of the decomposition of the sulphureous ores of this semi-metal. It is found native, efflorescing on Kupfer-nickel; and generally mixed with vitriol of iron.—It is of a green colour, as well as its solution. It is precipitated by zinc; but when joined with iron, this last is not precipitated by the same.

Its origin is perhaps owing to the decomposition of the pyriticous and sulphureous ore of Kupfer-nickel, mentioned by Wallerius. This ore contains a great quantity of arsenic and sulphur, as well as cobalt, nickel, and iron. And if it comes to be decomposed in the bowels of the earth, it is natural to expect that the vitriolic acid of the sulphur will attack the nickel and the iron, with which it will form neutral metallic salts (Mongez, Kirwan.)

VII. Muriatic manganese. Manganeseum salis.

M. Helm is the only person who has as yet found this middle salt in some mineral waters of Sweden. It is composed by the combination of the regulus of Manganese with muriatic acid.

1. It is precipitated of a whitish yellow colour, by the Prussian (phlogilicated) alkali; and of a brownish yellow, by the mineral alkali. 2. It does not crystallise in any distinct form. 3. It abstracts the moisture of the air. 4. To obtain its basis free from iron, it must be precipitated by the mineral alkali; redissolved in nitrous acid; then calcined until this acid is expelled; and the residuum is to be treated with distilled vinegar, which will then take up only the manganate. (Kirwan.)

VIII. Muriatic manganese. Manganeseum salis.

Order. VI. TRIPLE SALTS.

The neutral salts hitherto enumerated are such as are composed of two ingredients only; but sometimes three or more are so united as not to be separated by crystallization. The vitriols that we are acquainted with are hardly ever pure; and two or three of them sometimes are joined together.

Sometimes likewise it happens that neutral salts join earthy salts, and earthy salts metallic ones. Bergman generally distinguishes compound salts according to the
矿物质

第I. 矿物碱，含微小量的碳酸钙

第II. 常见碱与镁

第III. 矿物碱与酸

第IV. 玻璃化镁与玻璃铁

第V. 玻璃化钴与玻璃铁

第VI. 矿物碱，含硫

第VII. 矿物碱与玻利维亚

第VIII. 玻璃铜与铁

第IX. 玻璃铜，锌

第X. 玻璃铜与锌

第XI. 玻璃铁与镍

第XII. 玻璃铁与镍

三. 化学火柴

这火柴属于所有可燃的酸性的，但不能在水中，它们排斥。
It is difficult to determine what constitutes the difference between the purer forts of this class, since they all must be tried by fire, in which they all yield the same product; but those in which the fire show their differences by containing different substances, are here considered as being mixed with heterogeneous bodies: that small quantity of earthy substance, which all phlogiston leave behind in the fire, is, however, not attended to.

I. Inflammable air; fire damp.

This aeriform substance is easily known by its property of inflaming when mixed with twice or thrice its bulk of common atmospheric air; and it is asserted to be the real phlogiston almost pure. See AERIOLOGY·Index and INFLAMMABLE AIR.

It admits considerable varieties, according to the nature of the substances from which it is produced, and often gives different residua upon combustion, some of which are of the acid kind. If it is produced from charcoal, it yields an acid or fixed air; from solutions of metallic substances in the vitriolic, nitrous, or marine acids, it yields these respective acids, as M. Lavoisier asserts.

Either, converted into vapour in a vacuum, gives a permanent elastic vapour, which is inflammable. The atmosphere, which floats round the fraxinella, is inflammable from the admixture of its vapours, which seem to be of the nature of an essential oil: so that on approaching the flame of a candle under this plant, in hot weather, it takes fire in an instant; although the essential oil, extracted from this plant by distillation, is not inflammable on account of the watery particles mixed with it, as M. Bomare asserts.

Mr Scheele is of opinion, that every inflammable air is composed of a very subtile oil. This coincides with the idea entertained by chemists of their phlogiston; and is confirmed by the fact, of its being naturally found in those springs from whence it flows petrol, whose exhalations are very inflammable.

The residuum, which remains in the atmosphere after the combustion of inflammable air, is extremely noxious to animals. Doctor Priestley takes it to be a combination of phlogiston with pure air, and on this account calls it phlogistated air. But M. Lavoisier, on the contrary, considers it to be a primitive substance of an unchangeable nature, and gives it the singular name of atmospheric nephritis.

II. Hepatic air.

This air seems to consist of sulphur, held in solution in vitriolic or marine air. It is inflammable when mixed with three quarters of its bulk of common air. Nitre will take up about half the bulk of this air; and when saturated with it, will turn silver black: but if strong dephlogistated nitrous acid be dropped into this water, the sulphur will be precipitated.

One hundred cubic inches of this air may hold eight grains of sulphur in solution in the temperature of 60°; and more if hotter.

Atmospheric air also decomposes hepatic air.

It is found in many mineral waters, and particularly in the hot baths of Aix-la-Chapelle. The cause and manner of their containing sulphur which was long a problem, has at last been happily explained by Mr Bergman.

It plentifully occurs in the neighbourhood of volcanoes and in several mines.

Hepatic air is easily obtained by art, from all sorts of liver of sulphur, whether the base be an alkali, an earth, or a metal, if any acid is poured upon it; and the better, if the be made of the marine acid, because it contains phlogiston enough, and does not so strongly attract that of the hepatic sulphur. For this reason the nitrous acid is not fit for this process, as it combines itself with the phlogiston, and produces nitrous air. It may also be produced, by distilling a mixture of sulphur and powdered charcoal, or of sulphur and oil, &c. See the detached article Hispanic Air, and AERIOLOGY·Index.

III. Phlogiston combined with aerial acid; black lead, or wadd. Plumbago. See the detached article Black-Lead.

It is found,

a. Of a feel-grained and dull texture. It is naturally black, but when rubbed it gives a dark lead colour.

b. Of a fine fizzly, and coarfe-grained texture; coarse black-lead.

IV. Mineral tallow. Serum mineral.

This was found in the sea on the coasts of Finland in the year 1736. Its specific gravity is 0.770: whereas that of tallow is 0.969. It burns with a blue flame, and a smell of grease, leaving a black viscid matter, which is with more difficulty consumed.

It is soluble in spirit of wine only when tarryfied; and even then leaves an insoluble residuum; but expressed oils diffuse it when boiling.

It is also found in some rocky parts of Persia, but seems mixed with petrol, and is there called sebenemad, stenpen, kowic. Dr Herman of Strafsburg mentions a spring in the neighbourhood of that city, which contains a substance of this sort diffused through it, which separates on ebullition, and may then be collected. (Kirwan).

V. Ambergris. Ambra grisea.

It is commonly supposed to belong to the mineral kingdom, although it is said to have doubtful marks of its origin (A).

(a) Ambergris, according to the assertion of M. Aublet (in his Histoire de la Guiane), is nothing more than the juice of a tree infallated by evaporation into a concrete form. This tree grows in Guyana, and is called...
Inflammable.

VI. Amber. 

This substance is dug out of the earth, and found on the sea-coalts. - According to the experiments of M. Bourdelin, it consists of an inflammable substance, united with the acid of common salt, which seems to have given it its hardness.

This accounts very well for the claws, beaks, bones, and feathers of birds, parts of vegetables, shells, and bones of fish, and particularly for the beaks of the cuttle fish or sepia ocellopodia, that are sometimes found in the mafs of this substance. Dr Swediar, however, attended only to these facts, though he had mentioned also the other substances in his paper inserted in the Philosophical Transactions for 1783; wherein he attempts to establish an opinion, that the amber is nothing else but a preternatural hardened dung, or feces, of the physter whale. Dr Withering and Mr Kirwan have embraced this notion; as did also, inadvertently, the editors of this Work. See Ambergris.

(a) Mr Aublet brought specimens of this gum-resin, which he collected on the spot, from the cuma tree at Guiana. It is of a whitish-brown colour with a yellowish shade, and melts and burns like wax on the fire. The singularity of this gum-resin is, that it imbibles very strongly the smell of the aromatic substances which surround it; and it is well known that perfumers avail themselves very conferably of this advantage. M. Rouelle examined very carefully this substance brought over by Mr Aublet, and found that it produced the very same results as in other good kinds of amber. Besides Mr Aublet's authority, which is decisive, as being grounded upon direct proofs of fact, Rumphius, quoted by Bergman, long since mentioned a tree called Nanarius, whose infalliated juice resembles amber. It cannot therefore at present be doubted that the origin of this phlogistic substance is the vegetable kingdom, although it may be often found and reputed as a produce of the fossil kind.

This substance being analysed by Meffrs Geoffroy and Newman, quoted M. Fourcroy, yielded them the same principles as the bitumens; viz. an acid spirit, a concrete acid salt, some oil, and a charry residuum; which evidently evinces, that all these fat and oily fossil substances have their origin from the other two kingdoms of nature.

(c) Ambergris is not only brought from the East Indies, but from the coasts of the Bahama Islands, Brazil, Madagascar, Africa, China, Japan, the Molucca islands, the coasts of Coromandel, Sumatra, &c. Dr Lippert, in a treatise he published at Vienna 1782, entitled Phlogiologia Mineralis, has copied chiefly from Wallerius what he afferts of this substance. He affirms that there are eight known species of amber; five of a single colour, viz. the white and the black from the island of Nicobar, in the gulf of Bengal, the alth-coloured, the yellow, and the blackish; and two variegated, viz. the grey coloured with black specks, and the grey with yellow specks. This last he afferts to be the most esteemed on account of its very fragrant smell, and to come from the South coast of Africa and Madagascar, as well as from Sumatra; and that the black dark coloured amber is often found in the bowels of cetaceous fishes. The same author adds also from Wallerius, that by distilling the oil of yellow amber (fuscum) with three parts and a half of fuming nitrous acid, a residuum remains like rosin, which emits a perfect smell of musk; whence some conclude, that the ambergris belongs to the fossil kind: the contrary, however, is evinced in the preceding note.
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A. Opaque.
   b. White.
   c. Blackish.
B. Translucent.
   a. Colourless.
   b. Yellow.

The greatest quantity of European amber is found in Prussia; but it is, besides, collected on the coast of the province of Skone, and at Biorko; in the lake Malaren in the province of Upland; and also in France and in Siberia. It is chiefly employed in medicine and for making varnishes.

VII. Rock-oil.

This is an inflammable mineral substance, or a thin bitumen, of a light brown colour, which cannot be decomposed; but is often rendered impure by heterogeneous admixtures. By length of time it hardens in the open air, and then resembles a vegetable resin; in this state it is of a black colour, whether pure or mixed with other bodies. It is found,

A. Liquid.
   1. Naphtha.
       This is of a very fragrant smell, transparent, extremely inflammable, and attracts gold. It is collected on the surface of the water in some wells in Persia. See Naphtha.
   2. Petrol.
       This smells like the oil of amber, though more agreeable; and likewise very readily takes fire. It is collected in the same manner as the Naphtha from some wells in Italy. See Petroleum.
B. Thick and pitchy; Petroleum tenax. Barbadoes-tar.
       This resembles soft pitch.
       It is found at the Dead Sea in the Holy Land; in Persia, in the chinks of rocks, and in strata of gypsum and limestone, or floating on water; also in Siberia, Germany, and Switzerland, in coal-pits; and in America; likewise in Colnebrookdale in England.
C. Elastic petrol.
       This is a very singular fossil, found of late in England.
       By its colour and consistence, it exactly resembles the Indian-rubber, or the gum-resin, from the north part of Brazil, called caoutchouc. It is of a dark brown colour, almost black; and some is found of a yellowish brown cast, like the same gum-resin.
       With respect to its elastic consistence, it hardly can be distinguished from it, except in the cohesion of its particles, which is weaker.
       It has the same property of rubbing off from paper the traces of black-lead pencils.
       It burns likewise with a smoky flame; and also melts into a thick oily fluid; but emits a disagreeable smell, like the fossil pitch, or Barbadoes-tar.

(n) Amber, says M. Fourcroy, is found in small detached pieces, for the most part under coloured sands, dispersed in beds of pyritaceous earth; and above it is found wood, charged with a blackish bituminous matter. Hence it is strongly supposing that it is a refrinous substance, which has been altered by the vitriolic acid of the pyrites, notwithstanding that we know that acids, when concentrated, always blacken and charry refrinous substancess. In fact, the chemical analysis of this substance rather confirms that supposition.

The singular opinion of Dr Girtanner, about the yellow amber being produced by a kind of ants, may be seen in Journal de Physique for March 1786, page 227. Or see the article Amber in this Dictionary.

The colour, texture, transparency, and opacity of this substance, have shown some other varieties besides those mentioned in the text. The principal ones are the following:

6. The yellow succinum,
7. The coloured green or blue by foreign matter,
8. The veined succinum,
9. The white,
10. The pale-yellow,
11. The citron-yellow,
12. The deep-red,

The golden yellow transparent amber, mentioned in the text, is what the ancients called chrystoesrum, and the white opake was called leucochrom.

But we must be cautious about the value of the specimens remarkable for their colour, size, transparency, and the well-preferred insects they contain internally; since there is a probability of deception, several persons possessing the art of rendering it transparent and coloured, and of softening its, so as to introduce foreign substances, &c. into it at pleasure.

M. Fourcroy says, that two pieces of this substance may be united, by applying them to one another, after being wet with oil of tartar and heated. And Wallerius mentions, that pieces of yellow amber may be softened, formed into one, and even dissolved by means of oil of turnip-seed, in a gentle heat; and that according to some authors, it may be rendered pure and transparent, by boiling it in rape-seed oil, linseed oil, salt-water, &c.

Mr Macquer says, that for the purpose of making varnishes, this substance must undergo beforehand a previous decomposition by torrefaction, in order to be dissolved by linseed-oil or essential oils. See Varnish.

Besides the making of varnishes, this substance was much employed formerly in making various pieces of ornament and jewellery. The best pieces were cut, turned, carved, or plained, to make wafes, heads of canes, collars, bracelets, snuff-boxes, beads, and other toys, small fine chests, &c. But after diamonds and beautiful hard stones were brought into use, these trinkets are little considereed in Europe; nevertheless, they are still sent to Peria, China, and to various other eastern nations, who esteem them still as great curiosities.
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It is found in Moffrugfan in Norberg, and in Grengierberget, both in the province of Westmanland; and also in other places.

The pišalphalm is of a mean confidence between the asphaltum and the common petroleum. It is the very bitumen which is collected in Auvergne in France in the well called de la Pege, near Clermont Ferrand.

VIII. Jet. Gages, Saccinum nigrum.

This is a very compact bitumen, harder than asphaltum, always black, and susceptible of a good polish. It becomes electrical when rubbed; attracts light bodies like the yellow amber; and it floats on water.

It seems to be nothing else than a black amber, or succinum; but specifically lighter, on account of the greater portion of bitumen that enters into its composition. When burned, it emits a bituminous smell. See the article Jet.

IX. Mineral phlogiston united with earths.

A. With calcareous earth.

1. With pure calcareous earth. This is the fesid or flate former described.

B. United with calcareous, argillaceous, pondeorous, and sileceous earth and vitriolic acid. Lithaenbraz. See the articles Coal and Pit-coal.

This is of a black colour, and of a shining texture; it burns with a flame, and is mostly consumed in the fire; but leaves, however, a small quantity of ashes.


2. Culm-coal, called kalm by the Swedes.

This has a greater quantity of argillaceous earth and vitriolic acid, and a moderate proportion of petrol.

It has the same appearance with the preceding one, though of a more dull texture; it burns with a flame; and yet is not consumed, but leaves behind a flag of the same bulk or volume as the coal was.

From England, and among the alum rocks at Moltorp and Billingen in the province of Weltergottland.

3. Slate-coal.

This coal contains abundance of argillaceous earth. It burns with a flame by itself; otherwise it looks like other flates.

It is found at Gullerfen in the parish of Rettwik, in the province of Dalanne, and also with the coals at Boierup in Skone.

This seems to be the same with the bituminous schilus, already described among the argillaceous earths.


Mr Kirwan has put together this variety of coal with that other called Kilkenny-coal, tho' they have some different properties.

The cannel-coal is of a dull black colour; breaks easily in any direction; and, in its fracture, presents a smooth conchoidal surface, if broken transversely.

It contains a considerable quantity of petrol, in
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in a less denfer state than other coals; and burns with a bright lively flame, but is very apt to fly in pieces in the fire. It is said, however, to be entirely deprived of this property, by being previously immersed in water for some hours.

Its specific gravity is about 1270; and being of an uniform hard texture may be easily turned in the lathe, and receive a good polish.

It is from this kind of coal that small vases, as ink-flasks, various trinkets, and other curiosities, are made in England, which appear as if made of the finest jet.


This contains the largest proportion of petroleum or asphaltum; burns with a lively flame and smoke, and more slowly, though intensely, than the cannel-coal.

The quantity of earth in this coal does not exceed one-twentieth of its weight. Its specific gravity is about 1400. It is frequently mixed with pyrites.

It is found in the county of Kilkenny, belonging to the province of Leinster in Ireland.

The quality of this coal burning almost without smoke, is mentioned in a proverb by which the good qualities of that country are expressed.


This consists of the former kinds of coal, mixed with a notable proportion of pyrites; hence it is apt to moulder and break when exposed to the air. It contains yellow spots that look like metal; and burns with a sulphureous smell, leaving either red ashes, or a flag, or both. Water acts upon it, after it has mouldered. Its specific gravity is 1500, or more.

Besides the above varieties, schistus, micaceous schistus, and gneiss, are frequently found in the neighbourhood of coal mines, so penetrated with petrol bitumen as to constitute an inferior species of coal; but the bitumen being burnt, they preserve their form, and in some measure their hardness. Also some grey flates, that are so soft as to be scraped with the nail, and are greasy to the touch, burn like coal.

All the differences of coal arise from a mixture of the varieties already mentioned; and it is observable, that wherever coals exist, flates are generally found near them. Salt or mineral springs are also often found in their neighbourhood. (Kirwan.)

7. Bovey coal. Xylanthrax.

This is of a brown, or brownish black colour, and of a yellow laminar texture. The laminæ are frequently flexible when first dug, though generally they harden when exposed to the air.

It consists of wood penetrated with petrol or bitumen; and frequently contains pyrites, alum, and vitriol. Its ashes afford a small quantity of fixed alkali, according to the German chemists; but according to Mr Mills, they contain none.

By distillation it yields an ill smelling liquor, mixed with a volatile alkali and oil, part of which is soluble in spirit of wine, and part insubstantial, being of a mineral nature.

It is found in England, France, Italy, Switzerland, Germany, Ireland, &c. (Kirwan.)


There are two sorts of inflammable substances known by this name, viz.

The first of a brown, yellowish brown, or black colour, found in moorish grounds; in Scotland, Holland, and Germany. When fresh, it is of a viscid consistency, but hardens by exposure to the air. It consists of hay mixed with calcareous earth and pyrites; and sometimes contains common salt. While hot, it is formed into oblong pieces for fuel, after the pyritaceous and stony matters are separated. When distilled, it affords water, acid, oil, and volatile alkali. Its ashes contain a small proportion of fixed alkali. They are either white or red, according as it contains more or less ochre or pyrites.

The second is found near Newbury in Berkshire. It contains but little earth; but consists chiefly of wood, branches, twigs, roots of trees, with leaves, grass, straw, and weeds. (Kirwan.)

9. Stone turf. Cronflede has ranged the turf among the foils of his appendix; but as that called in England by the name of stone-turf contains a considerable proportion of peat, it may be mentioned with propriety in this class.

Soon after it is dug out from the ground, where it keeps a soft consistence, it at first hardens; but afterwards it crumbles by long exposure to the air.

As to the other common turf, it only consists of mould interwoven with the roots of vegetables; but when these roots are of the bulbous kind, or in a large proportion, they form the worst kind of turf.

Although it may appear incredible, it is nevertheless a fact, that in England pit-turf is advantageously employed in Lancashire to smelt the iron-ore of that county. Mr Wilkinson, brother-in-law to Dr Priestley, and famous for his undertakings in the extensive ironworks, perhaps the greatest in Europe, makes use of pit-turf in his large smelting furnaces of that province.

Those foil substances, which furnish fuel for the various purposes of human life, are distinguished by the name of coal, on account of their being a succedaneum for wood and other vegetable productions, which when dry or of an elegant kind serve for the same uses. If these vegetable substances are deprived of their character by covering them after ignition, the half consumed remains, which is of a black colour, is called by the name of coal or charcoal; and from hence the foil which affords fuel has
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Inflammables.

Pit-coal and earth-coal are synonymous, and mean coals dug out of a pit or from the earth. But the lithanthrax denotes stone-coal, and more properly indicates the cannel-coal, which has the greatest similarity to a flinty substance, by the dull appearance of its fractures and by the uniform texture of its parts.

All these coals are in general a bituminous black or brown and dark substance: for the most part they have a lamellated texture, which breaks easily, and always with a shining surface.

The varieties of pit-coals above-mentioned are the most remarkable, by which they may be distinguished from one another. But they are far from being homogeneous in each kind; as the accidental qualities, and the various proportions of their component parts, produce a far greater number of properties, which render them more or less fit for different purposes; though these are generally overlooked, and confounded with the common one of affording fuel for making fire to warm our rooms, or for culinary operations.

This foliâ bitumen, as Fournecroy remarks, being heated in contact with a body in combustion, and a free access of air, kindles the more slowly, and with more difficulty, as it is more weighty and compact. When once kindled, it emits a brisk and very durable heat, and burns for a long time before it is consumed. If extinguished at a proper time, the remaining cinders may serve several times for a new firing with a small addition of fresh coals. The matter that is burned, and produces the flame, appears very dense, as if united to another substance which retards its destruction. Upon burning, it emits a particular strong smell, which is not at all sulphurous when the earth-coal is pure, and contains no pyrites.

When the combustible, oily, and most volatile parts, contained in the earth-coal, are distilled and let on fire by the first application of heat; if the combustion is stopped, the bitumen retains only the most fixed and least inflammable part of its oil, and is reduced to a true charry state, in combination with the earthy and fixed base. Pit-coals in this charry state are called coaks, which are capable of exciting the most intense heat; and are employed all over Britain in the smelting of iron, copper, and other metallic ores, to the greatest advantage. See Coaks, Coal, Coals, and Pit-coal (x).

The coal-metals, or stone strata enclosing coals, are very numerous. Mr Williams† gives the following general account of those in Scotland.

The sandstones. Of these there is a great variety, distinguishable by colour, texture, and degrees of hardness, generally disposed into thick, midddling, and thin strata. The only species our author takes notice of is the regular broad-bedded free-stone of a laminated texture. This commonly rises in thin or middling strata; appearing at the edges of a feation, when broken or cut, to be composed of thin lamina or layers of sand, equally laid on the whole breadth of the stone, and well cemented together. A great deal of both red and white free-stone rise in layers of five or six inches, and so upwards, with regular strata of a fifth or sixth part of an inch appearing the whole length of the stone, when the edge of a flab is polished, as if so many gentle waves of water had formed the layer. The regularity of the structure of this stone corresponds exactly with the regularity of its layers; and our author is of opinion, that the flaggy grey-strata of free stone, with many of the black and grey-strata of coal metals, the grey flate, as well as many other thin strata of the coal metals, may be ranked with this free-stone for perfect and regular stratification.

Along with these he classes some of the thin argillaceous strata. "Many of the grey regularly stratified mountain limestone" (says he) are also streaked or striped; and the streaks in these appear more conspicuous when broken than the streaked free stones. Some of the hard regularly stratified mountain rocks are also stratified; and in all these three kinds of stones, the streaks are regularly and exactly parallel to the bed of the stone."

Another remarkable instance of regularity of strata is met with in the grey flaggy strata of Caithness.—Throughout all the low country of Caithness, a square of about 10 or 15 miles, there are bluish argillaceous strata, with generally a small quantity of lime in the composition of the stone, which is indurated to a greater degree than is usual in such thin strata. The stone is strong and tough, every where disposed in thin broad-bedded, regular strata; and in several parts of the country the flags are so thin and regular, and are raised so high and broad, that they are used for covering houses; and three or four of them will cover the side of a small one. Our author mentions a gentleman who has an estate on the south side of the Pentland firth, and who in a bay there raises flags of any size and thickness he pleases; and so truly flat and smooth, that he has only to square the edges to make of them good loft-floors, partitions, chests, mangers, roofs of houses; in fact, he does everything with them. The face of these flags are as smooth and true a plane, as if artificially finisht by the best workman."

In moss coal fields there are a great variety of strata of different kinds accompanying and lying between the seams of coal, of all sorts of colours, consistencies, and dimensions; all of them blended together without any certain order or regularity; so that if there be 20 seams of coal, it is possible that there may be as many different rocks; that is, the stratum which is the immediate roof of one seam of coal, shall differ from that of another seam in quality, thickness, and colour, so that perhaps no two of the twenty shall be in any respect alike.

The various kinds of coal-ribs (a) commonly met with are the following.

(a) The stratum which is placed immediately above a seam of coal, is called the roof of the coal, and that which is placed immediately below the seam, is called the pavement of the coal: which three, viz. the stratum of coal, and its roof and pavement, with the other connectant strata lying above and below them, always preserve their stations and parallelism; that is, are all stretched out and spread one above another upon the same inclining plane, and have the same line of bearing and declivity.
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X. The mineral phlogiston or bitumen, united with the vitriolic acid: sulphur or brimstone. See the article Sulphur.

This is very common in the earth, and discovers itself in many and various forms. It is found,

A. Native. Sulphur nativum.

In this the two constituent parts are mixed in due proportion in regard to each other, according to the rules of that attraction which is between them. It is easily known,

1. By its inflammability, and by its flame.
2. By its smell when burnt; and,

O 2 3. By

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Part II.

1. Basaltes. This is very common in Scotland, where it is frequently called whin rock; and at Borrowstounness there are several thin sheets of it between the seams of coal. One of them being the immediate roof of a seam of coal there at Hillhousie lime quarry, there is a thin seam of coal beneath a beautiful bed of columnar basaltes. In the Bathgate hills to the southward of Linlithgow, also, there are several strata of coal blended with those of basaltes. These basaltic strata are always very hard, frequently very thick, and generally of a black or blackish grey colour. “There are but few people (says Mr Williams) sufficiently versed in natural history, to know that they are basaltes, as this kind of rock, both in England and Scotland, goes by the name of whin rock. In the north of Scotland it is called shurdy; and among the miners in Cornwall it has the name of cockle (b).”

2. Strata of limestone of various thicknesses are met with in different coal-fields. Sometimes the lime is the immediate roof; but sometimes there is an argillaceous stratum of about the thickness of a foot between the coal stratum and that of lime. In the coal-fields at Gilmerton, near Edinburgh, are several beds of limestone, some of them very good, and of considerable thickness. At Blackburn in Weald Lothian, also, there is a stratum of limestone five or seven feet thick, which is the immediate roof of a seam of coal about five or six feet thick. At Carlops and Spittalhaugh in Tweeddale, they have a seam of coal immediately below their lime quarries, which they work for burning their lime.

3. Psphlstone, a kind of thick and solid stratum of free stone, is one of the roofs of coal, generally without the intervention of any argillaceous stratum, though sometimes a stratum of this kind is interposed. Frequently this kind of stone is rendered very hard by a mixture of iron or pyrites. In most coal fields, thinner strata of free stone are met with as the roofs of coal seams.

4. Dogger-band, as it is called by the Scots colliers, is frequently met with as the roof of coal seams. This name is applied to various substances. Sometimes they call strata of iron-stone dogger bands; sometimes the name is restricted to the ball iron-stone; sometimes to pyrites; and sometimes the dogger band is a kind of imperfect stone, composed of several heterogeneous mixtures, among which pyrites bears a considerable proportion, and by which the whole is so strongly bound together, that it is frequently very difficult to break through it.

5. Whin-stones, properly so called, not of a basaltic nature. These roofs are always very hard, and of various colours, as black, blackish grey, brown, red, &c. sometimes not above two or three feet in thickness, but sometimes much more.

6. Psphlstone, of a softer nature than that already mentioned. This has no mixture of ferruginous matter.

7. Regular strata of free-stone, of various colours, textures, and thicknesses, but not sufficiently thick to deserve the name of psphlstone, which our author thinks they do not, unless they are above three or four feet. These thin strata of free stone are very numerous in coal fields, and very frequently form the roofs of coal seams. Some of them are three or four feet thick, while others do not exceed three or four inches. They make good roofs, easily cut through, and may be readily quarried out for other purposes.

8. Grey-bands, or grey-coloured free-stone, frequently form the roofs of coal seams. A great number of them are generally arranged in one place, lying immediately above one another; and they are frequently found of all degrees of thickness from one to twenty inches, though the most common dimensions are from two to five. By the Scots colliers these are called grey shales as well as grey bands. Frequently they are found of moderate hardness, and sufficiently strong to make good flags and covers for fewers. These roofs are strong and safe when the stone partakes of the nature of the coal, and has a black or blackish grey colour; but when they have a mixture of tarry or argillaceous matter, they are more friable.

9. Blaes, when hard, strong, and well stratified, are reckoned tolerably good coal-roads. These are always of a bluish-black or black-grey colour, and are of great variety in respect to hardness and strength. Some of the strongest and hardest are either entirely black or greyish black; while some of the different blazes of black are pretty thick, and others are but thin. The thickest, however, are not above 18 inches, and the thinnesstwo or three inches or less. The medium thickness is from one foot to three or four inches. Some of them are sufficiently hard to make a good and safe coal-roof; but they seldom acquire such a degree of hardness as to give any considerable obstruction in fucking. All of them seem to have a considerable quantity of black argillaceous matter in their composition, and the strong blaes have also a considerable quantity of sand; often also containing a large portion of empyreumatic oil, and sometimes have a considerable mixture of coaly matter. There is a great variety both in the thickness and quantity of these blaes found above seams of coal. In some places the thinnest strata make the immediate roof; in others, the thickest. Sometimes we find only five or six inches of blaes upon the coal; in others as many fathoms, or even much more; and it is common to find them of all the intermediate thicknesses.

(b) We must observe, however, that according to Bergman and other eminent mineralogists, the cockles or shires ought not to be confounded with basaltes; which last name does not at all fit their substances. See Volcanic Products in the Appendix to this article.
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3. By its producing a liver of sulphur, when mixed with a fixed alkali, like that made from artificial sulphur. It is found,
   a. Felucid, of a deep yellow colour.
   b. Opaque, white, and greyish.
   These are found in Siberia, at Bievix in Switzerland, and at Solferato near Naples.
   c. Crystallised in oeoedral prisms, with blunted points.
   d. Transparent. Mr Davila had been informed that this was brought from Normandy in France. (Brun.)

10. Whitish and off-coloured argillaceous strata, of middling strength, are frequently found to be the immediate roofs of coal. Some of these are of middling thickness, others thin. They are commonly found from two inches to two feet in thickness. A great many of these roofs are very dangerous on account of their fragility; while others are quite safe, owing to the more perfect formation of their strata, or to some ingredient in their composition.

11. streaked roofs. These are of two sorts: 1. Such as are composed chiefly of sand, with a very small mixture of clay and blaes; and, 2. Those composed principally of clay or blaes with a small quantity of sand. Some of these have large, others small, streaks or ribs. Mr Williams says that he has seen them so beautifully streaked as to resemble the finest striped cotton stuffs. These stripes or streaks always lie exactly parallel to one another, as well as to the bed of the stone, and are always spread out the whole breadth of the stratum. Their colours are various in different strata, some of the stripes being nearly black and white, others white and red, and others yellow and red. In some the stripes appear of a lighter and darker grey colour. Some of the finely streaked stones have their streaks about a quarter of an inch in diameter; sometimes less: and it is common to see stripes from a quarter to three quarters of an inch broad; but in the finely streaked stones it is rare to find them a full inch thick without some different shade on one side or other of the stripe. The second kind of these streaked roofs, viz. such as are composed of blaes, with a smaller mixture of sand, differ but little from the former; only the colours are not always so bright, nor the stripes so fine; neither is the roof quite so hard.

12. The soft blue roofs sometimes consist of pretty thick strata; others of such as are thin or of middling thickness. There are likewise arrangements or clays of regularly stratified blaes, found immediately above seams of coal, from three or four inches to several fathoms in thickness, though some are even met with little exceeding one inch in thickness; though in the same place there might be a considerable thickness of blaes above the coal, taking in all the different strata, thick and thin, which lay above it. Some of these roofs have an oily appearance on the outside, and through all the figures and joints of the strata; that is, they appear smooth and glossy, and are very slippery to the touch. Others have no appearance of this kind; but all of them are tender, weak, and fragile, so that they make a very indifferent and dangerous roof.

13. Another kind of coal roof consists likewise of blaes, but such as are imperfectly stratified. It is altogether the same in quality and colour as the last, the only difference that can be distinguished being in the different degrees of stratification. The beds of this kind are not perfect, but unequal; whence it is a bad and dangerous roof, as great pieces of it are frequently apt to fall down by reason of the inequality and different joints of the strata. Some of these blaes appear in thick, and others in thin or middling thick beds: while some have an oily smoothness, called by the Scots colliers creasty (greatly) blaes. It is owing to this oiliness particularly that these kinds of roofs are so dangerous; for the oil pervades the joints, and, rendering them slippery, makes the pieces more apt to fall out as soon as the coal is worked away from below them. Some of these have such a quantity of natural oil, that they will flame a little in the fire; and in some places there are hard blaes which will burn when fire is set to them, though they will not consume. At Pitfrran in Fife there is a species of these blaes so inflammable, that when fire is set to one corner of a hillock it will burn throughout the whole; nevertheless it is not reduced in bulk by this combustion, nor does it produce any ashes. Instead of this it becomes considerably harder than before, and acquires a pale red colour. By reason of its hardness, it is proper for being laid upon horse and foot paths, but is not so for roads over which heavy wheel-carriges pass.

14. Soft blaes not stratified at all. Of these there is no more than one bed from two or three inches to several fathoms in thickness, without any others either above or below it. They are as common as any above the coal seams; but their subidence is not always uniform throughout the whole stratum. Some of them are found divided into small angular masses, and others into larger ones; but whether these are uniform or not, they always make a bad and dangerous roof. These argillaceous strata are sometimes called beds of till; the uniform part are called dawk, and the glibous kind sgoy blaes, by the Scots colliers. Both the uniform and glibous soft blaes generally contain a quantity of ball iron-flone, though some of it contains none at all. The regular continuous strata of iron-flone are commonly found in stratified soft blaes. There is a variety of soft coal roofs of a grey colour, and of which some are regularly stratified, and some not.

Part II. Infammerables.

1. Native sulphur is found in different forms, viz. either in solid pieces of indeterminate figure, running in veins through rocks; or in small lumps, in gypsum and limestone; in consideralable quantities at Solferato, and in the neighbourhood of volcanoes; or crystallised in pale, transparent, or semi-transparent, octagonal, or rhomboidal crystals, in the cavities of quartz; and particularly in the matrices of ores; or in the form of small needles over hot springs, or near volcanoes (Kirwan). Some
Part II. MINERALOGY.

Sometimes it is formed in old privies: of this Mr Magellan saw some lumps that were found in a very old one at Paris.

2. United with clay in the aluminous ore of La Tolfa, and also at Tarnowitz in Styria. This last resembles a light grey earth: when dry, bursts or cracks in the water like marle; and possesses a strong peculiar smell like camphor. If distilled, the sulphur sublimes. One hundred parts of this earth afford eight of sulphur, besides gypsum and a quantity of iron.

3. Mixed with clay, iron, and felenite. This compound is of a grey, brown, or black colour, found near Rome, Auvergne, Spain, and Iceland.

4. With limewater in the form of a calcareous hepar. This is found at Tivoli, near Rome, and elsewhere in Italy. It is sometimes dissolved in mineral waters, three pounds of which contain as much as 25 grains of sulphur. It often forms incrustations on the brinks of these springs.

5. In the form of an alkaline hepar. This is said to be found in some waters in Russia; as will be hereafter noticed.

6. United to iron and clay of pyrites, &c. of which hereafter.

7. United to metallic substances, as hereafter specified.

B. Saturated with metals (f).

1. With iron. Pyrites, or copperas-iron; Pyrites.

15. Regularly soft grey coal-roofs.—Of these there are several sorts. Some have a considerable quantity of sand in the composition of the strata; and many of these are as regularly stratified as any coal-metals whatever. Numbers are found very thin, and others of middling thickneas; though in all cases they are too tender and friable, that they make very bad and dangerous roofs. Some of them indeed look pretty well at first; but when they soon crumble and come down, especially when they have been exposed to the air. This, in the opinion of Mr Williams, is owing partly to their having too much clay in their composition, and partly to the want of a sufficient quantity of natural cement to connect the several particles of the roof together.

16. Soft grey regular strata, or grey bands of an argillaceous kind; and of these there is likewise a considerable variety. Some are of a dark, others of a lighter grey; some thick, others thin; they are very numerous in coal-fields, and are frequently to be found as the immediate roofs of coal. These, as well as the black kinds, are found in all quantities or degrees of thicknees above different coals, from a few inches up to several fathoms; but whether they be in great or small quantity, the roof they compose is generally very frail and tender.

17. Soft grey argillaceous beds, imperfectly stratified. These differ little or nothing in substance from the former; the only difference is in the stratification. Many of the strata of the former are of a middling thicknees, or rather thin, finely and regularly spread out, and every part of each stratum of an equal thicknees. But this sort, though it has the appearance of strata, is clumsy and irregular; that is, the several beds are unequal, and divided by many irregular joints into unequal misshapen masses, which makes this a very bad roof; the masses being apt to separate at the joints, and to fall down when the coal is worked out from below them.

18. Soft grey argillaceous beds of metal or coal roofs not stratified at all. These are of two kinds, viz. 1. such as are found broken or formed in the stratum into glebes or masses; and, 2. such as are found in one uniform mass throughout the whole bed, without any division into masses or strata. These grey soft roofs are of all degrees of thicknees, from a few inches up to many fathoms, as well as the black; and there is but very little difference between them in any respect excepting the colour. But in this, as well as in the black unstratified blues, and that both in the glebes and uniform beds, ball or glebes iron-iron is frequently found; and strata of iron-iron are also found in the stratified soft grey blues.

19. White and afo-coloured soft argillaceous coal roiefs; and of these there is also a great variety. Some of this kind are regularly stratified, others imperfectly, and some not at all. Some of the whitish argillaceous roofs are compounded of gritty sand and clay; others appear to be chiefly composed of pure clay; and some of a loamy clay. Those which are regularly stratified and mixed with sand, either coarse or fine, are of great variety with regard to thicknees and the arrangements of the strata; but all of them are tender and fragile, and thus make very troublesome and dangerous roofs.

20. White argillaceous roofs, stratified, and of a homogeneous quality, or not mixed with sand. Some of these are finely and perfectly stratified, and are of different degrees of hardnees; but in general, make but a weak roof. Some of them are found in irregular strata, with all the other varieties and imperfections already mentioned.

21. White and afo-coloured argillaceous coal-roofs, not stratified at all. Sometimes these are found in very thick beds in the coal-fields; and some of these, as well as of the black soft roofs, rise in glebes and masses of different sizes; while others are homogeneous throughout the whole bed, however thick, from two or three inches to several fathoms. Some of these beds of white argillaceous marle-like matter are found to be a sandy or loamy clay; others a pure homogeneous clay, which does not feel gritty between the fingers nor in the mouth. The shades and varieties of this kind are as numerous as those of any of the foregoing; and all of them, by the Scots colliers, are called dauf, whatever be their colour. Mr Williams informs us, that he has frequently taken some of these fine white clays to wash his hands, and has found them answer almost as well as soap.

(f) Sulphur is the most common mineraliser of metals; and therefore most of its combinations with those substances fall to be ranked hereafter among the metallic ores.
Class IV. Metallic Substances.

Metals are those minerals which, with respect to their volume, are the heaviest of all known bodies. Some of them are malleable; and some may be compounded; and, in a melting heat (o), be brought back again to their former state by the addition of the phlogiston they had lost in their decomposition. See Metalurgy, Part I. Sect. 1. and Chemistry-Index at Metallic Cales and Metals.

All the metallic substances contain phlogiston; and when, to a certain degree, deprived of it, fall into a powder like an earth; but their attractions for phlogiston are different.

Most of them, when melted in a common way, and exposed to the air, have an earthy crust formed upon the surface, which cannot again be reduced to metal without the addition of some inflammable matter. The base metals have this property.

But the noble metals, viz. platina, gold, and silver, are so firmly united to the phlogiston, that they never calcine under fusion, however long continued; and, after being changed into a calx in the liquid way, when melted in the fire, they realume their metallic form without any other phlogiston than what is contained in the matter of heat.
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**MINERALOGY.**

Quick silver holds a kind of middle place; for, like the base metals, it may be calcined, though not readily; and, like the noble ones, it may be reduced by heat alone.

We may therefore reckon four noble or perfect metals; viz. gold, platinum, silver, and mercury; because, when calcined, they recover their phlogiston without the addition of any phlogistic substance.

But as tin, lead, copper, and iron, cannot be reduced without such addition, these are called ignoble and imperfect or base metals. Kirwan's Mineralogy.

However, all those eight metals (even mercury, when solid) are malleable to a considerable degree, and are called **entire metals.** But bismuth, zinc, antimony, arsenic, cobalt, nickel, manganese, molybdena, and wolfram, are scarce at all malleable, and hence they are called **femimetals.** Neverthe less, zinc and purified nickel are more malleable than any of the other semimetals; so that we have four perfect or noble metals, four imperfect or base, eight entire, and nine semimetals.

<table>
<thead>
<tr>
<th>METALS</th>
<th>SPECIFIC GRAVITY</th>
<th>MELTING HEAT</th>
<th>SATURATING PHLOGISTON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>19.640</td>
<td>1361</td>
<td>5337</td>
</tr>
<tr>
<td>Platinum</td>
<td>21.000</td>
<td>1361</td>
<td>756</td>
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<tr>
<td>Silver</td>
<td>10.552</td>
<td>1000</td>
<td>4717</td>
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<tr>
<td>Quicksilver</td>
<td>14.110</td>
<td>-40</td>
<td>-40</td>
</tr>
<tr>
<td>Lead</td>
<td>11.352</td>
<td>595</td>
<td>43</td>
</tr>
<tr>
<td>Copper</td>
<td>8.876</td>
<td>1450</td>
<td>3312</td>
</tr>
<tr>
<td>Iron</td>
<td>7.860</td>
<td>1601</td>
<td>17977</td>
</tr>
<tr>
<td>Tin</td>
<td>7.264</td>
<td>415</td>
<td>114</td>
</tr>
<tr>
<td>Nickel {common}</td>
<td>9,000</td>
<td>1301</td>
<td>136</td>
</tr>
<tr>
<td>Arsenic {common}</td>
<td>8,308</td>
<td>1601</td>
<td>109</td>
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Order

<table>
<thead>
<tr>
<th>ATTRACTION TO SATURATING PHLOGISTON</th>
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<tbody>
<tr>
<td>1 or 2</td>
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<td>3</td>
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<td>12</td>
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</table>

**N. B.** By saturating phlogiston, Professor Bergman means to express the proportionate quantities taken away from each metallic substance, when dissolved by means of acids, and of course reduced to a calciform state. The last column only expresses their attraction to this part of their phlogiston, not to that which still remains united to them in a calciform state. Withering.

(h) Mr Mongez remarks, that the following are the general properties of metals, when considered as physical bodies; viz. their opacity, great specific gravity, ductility, tenacity, crystallization, flavour, and even smell, at least in some of them.

It is from their density that their gravity and opacity proceed; this last being such, that, even reduced to the thinnest plates, no rays of light can pass through their particles, unless there remains an interstice or pore quite free from the metallic substance. Gold leaf must, however, be excepted, which exhibits a fine green by transmitted light.

As to their crystallization, it has been found to take place whenever they are pure, and left to cool very slowly by themselves, after having been perfectly fused. (See Journal de Physique for July 1781, p. 74) The flavour and smell above-mentioned are very perceptible in the reguline substances of arsenic and antimony, as well as in lead, copper, and iron.

All metals are conductors of electricity; and more perfectly so than any other bodies during their union with phlogiston.

They
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6. When melted, it reflects a bluish-green colour from its surface.
7. It dissolves in aqua-regia, in the dephlogified marine acid, and also (according to Cretz) in an acid obtained by distilling vitriolic acid from off manganate.
8. When mixed with a volatile alkali and a little of the acid of nitre, by means of precipitation out of aqua-regia, it burns off quickly, in the least degree of heat, with a strong fulmination.
9. It is dissolved, in forma feta, by the liver of sulphur, and also somewhat by the glafs of bismuth (1).
10. It is not carried away by the antimony during the volatilization of that semi-metal, and is therefore conveniently separated from other metals by the help of crude antimony; in which proceeds the other metals are partly made volatile, and fly off with the antimony, and partly unite with the sulphur, to which the gold has no attraction, unless by means of some uniting body, or by a long digestion (x).

11. The

They are soluble either in nitrous acid and in dephlogificated marine acid, or in aqua-regia; and are precipitable in some degree by caustic alkalies; and except platina by the Prussian alkali.

When dephlogificated, they communicate a tinge to borax and to microcosmic salt, or at least render them opaque.

They assume a convex surface when melted, and even a globular form, if in a small quantity; and though they mix for the most part with one another whilst fused, yet they refuse to unite with unmetallic substances, even their own calces, iron only excepted, which does to its own calx slightly dephlogificated and to plumbago. Nickel also, and some others, may contain sulphur in their reguline flate.

Metals, when calcined, are capable of uniting with other calces and salts.

Three of the metallic calces have been found to be of an acid nature; viz., the arsenical, molybdenic, and tungstenic; from which, by analogy, the nature of other calces may be conjectured.

The phlogiston contained in metals is in a pure flate; viz., without water and aerial acid, with which it is invariably accompanied in all other compounds except acid airs and sulphur.

When metallic substances are naturally found in the earth united to their full share of phlogiston, and consequently possessing their peculiar properties, they are called native.

But when they are found more or less deprived of their phlogiston and of their properties, combined with other substances, they are then called mineralized. This is the most common state of the mineral kingdom. The substance so combined with them is called the mineralifer, and the whole is called ore; by which name are also distinguished these earths and stones in which metallic substances are contained.

But if both metallic substances are mixed together in their metallic or reguline form, without the loss of phlogiston, they are then said to be alloyed.

When the mineralifer is of a faline nature, and renders the metallic combination soluble in less than 20 times its weight of water, the compound is ranked among salts. Thus the vitriols of iron, copper, and zinc, are rather classed with salts than with ores.

The most common mineralifers are, sulphur, arsenic, and fixed air or aerial acid. The least common are the vitriolic and the marine acids. The phosphoric has been found only in two instances; viz., united to lead, discovered by Gahn; and to iron, in the siderite, as Mr. Meyer believes.

These metallic substances, mineralized by aerial acid, are called calciform ores.

M. Magellan observes, that if the new doctrine of the French chemists, who assert, that calces of metals are a compound of dephlogificated or vital air with the metallic substance, were just, all calciform ores should produce this vital air instead of aerial acid, when they are reduced to their metallic form; which is not the case; neither should all the base metals and semimetalts absolutely require the mixture of some phlogistic substance in order to their being reduced from the state of calces to their metallic form, which otherwise would be quite useless, if their reduction simply consisted in their separation from the vital or dephlogificated air.

(1) Neither sulphur nor fixed alkali, has any action on gold; but the liver of sulphur, which is a compound of both, can diffuse it in the dry way; for when a proper quantity of gold-leaves be put in a crucible together with liver of sulphur, and it be melted in a brisk fire, the gold is thoroughly diffolved; and if the whole be diluted in water, the gold will be kept in the solution, and even pass through the filter along with it.

(x) Antimony is used also to refine gold from its alloy, as it attenuates and carries off all other metallic substances.
MINERALOGY.

1. Mineralized with sulphur by means of iron. Marcatiological gold-ore; Pyrites aurum.
2. By means of quicksilver. It is found in Hungary.
3. By means of zinc and iron, or silver. The Scheinmizt blende.

See other varieties of mineralized gold ores under the detached article Gold, already referred to.

II. Silver: Argentum, Luna. See the article Silver. See also Chemistry-Index; and Metallurgy, Part II. sect. iii. and Part III. sect. iii.

This metal is,

a. Of a white shining colour.

b. Its specific gravity to water is, according to Cronstedt, as 11.091 to 1000; according to Bergman, = 10.552; and according to Kirwan, 11.095.

c. It is very tough or ductile, so that a grain of it may be fretched out to three yards in length and two inches in breadth.

d. It is unalterable in air, water, and fire.

e. It dissolves in the acid of nitre, and also by boiling in the acid of vitriol.

f. If precipitated out of the acid nitre with the common salt, or with its acid, it unites so strongly with this last acid, that it does not part from it, even in the fire itself, but melts with it into a mass like glass, which is called luna cornes (v).

Part II.

11. The phosphorus is said to have ingress into gold (t). 

12. If mixed with a less portion of silver, platina, copper, iron, and zinc, it prefers tolerably well its ductility. But,

13. When mixed with tin, it becomes very brittle; and it attracts likewise the smoke of that metal, so as to be spoiled if melted on an hearth where tin has been lately melted (m).

14. It requires a strong heat before it melts, nearly as much or a little more than copper.

15. It mixes or amalgamates readily with quicksilver. See Metallurgy, Part II. sect. i. (n).

16. It is not dissolved by the glafs of lead, and therefore remains on the cupel.

A. Native gold. With respect to the figure or the quantity in which gold is found in one place, it is by miners divided into,

1. Thin superficial plated or leaved gold; which consists of very thin plates or leaves, like paper.

2. Solid or massive, is found in form of thick pieces. 

3. Crystalized, consists of an angular figure.

4. Wash gold, or gold dust, is washed out of sands, where it lies in form of loose grains and lumps (o). See other distinctions of form under the article Gold.

B. Mineralized gold. This is an ore in which the gold is far mineralized, or fo entangled in other bodies, as not to be dissolved by the aqua-regia.

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Substances mixed with it, without excepting the silver; whilft lead leaves this last behind, and even adds some of its own to the gold. Pauilot, p. 659.

(t) Gold, reduced into thin leaves, is not acted upon by the phosphoric acid in the humid way, though the fire be urged till luminous decrepidations take place; but when it passes that point which separates the humid from the dry way, Mr Margraaf observed that some purple protons were formed, which is an indication that this concrete acid had partly calcined the gold during its fusion. Elements de Chimie de Dijon, Vol. III. p. 131.

Besides this, a drop of the phosphoric acid on the solution of gold by aqua-regia precipitates the metal in its refined state, as asserted by the academicians of Dijon. Magellan.

(n) The fumes of a single grain of tin are capable of rendering hard eight ounces of gold; but it easily recovers its malleability by being melted on the fire. (Wallerus and Bomare's Mineralogy.) But when gold is mixed with arsenic, cobalt, nickel, bismuth, or with the regulus of antimony, it only loses great part of its malleability; and when in a certain proportion, it may be calcined and vitrified with them.—(Frabori.)

(m) Bergman doubts if ever gold has been found perfectly pure; and Mr Kirwan says that it is very seldom found so, being generally alloyed with silver, copper, or iron, or all three. As to the gold commonly used in toys and other objects of luxury, every one knows that it is purposely debased by the artists with copper or other metals; and of late it has been employed in various pieces of jewellery, to form ornaments of various colours: thus a great alloy of silver (viz. one-third part), gives it a shade of a green colour; a similar quantity of copper, a reddish one; a mixture of arsenic, or filings of steel, in the proportion of one-fourth part, gives it a bluish cast; so that having the yellow naturally in the pure gold, and the white in pure silver, the jewellers have almost all the colours to diversify their work. Even in the currency of money, there is none coined out of pure gold, but by common agreement, is called gold of 24 carats. The gold coin of England, France, and Portugal, only contains 22 parts of pure gold, and two of alloy, viz. it is only 22 carats, in the common saying: that of Spain is but of 21½ carats: but the ducats of Holland is of 23½ carats; and the zecchino of Venice, of 23½ carats: which last therefore, it would seem, is the purest coin of Europe. (Pauilot's Metropolis.)

(o) M. Daubenton, in his Methodical Tables of Minerals, enumerates eight forts of native gold, viz.

1. In powder; 2. In grains; 3. In small spangles; 4. In maites or lumps; 5. In filaments; 6. In branches like vegetables; 7. In lamella; and 8. In octahedral crystals.—He observes also, that gold, in its reguline state, is formed, either, 1. Into angular crystals, composed of yellow octahedres; or, 2. Into irregular yellow maites, which, being broken, show a granular substance.

(v) The marine acid attracts the calx of silver, but cannot remove its phosphited; and therefore cannot dissolve
MINERALOGY.

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Annaberg, described by Mr Jufti; (Brumich.)

11. Sandy silver-ore, without any metallic fining.

12. Silver-ore in a red-brown felicitus, described by Lehman: it is composed of argillaceous earth, micaceous hematites, sulphur, calcareous spar, fluor minerals, lead, and silver. It contains about seven or eight ounces of silver on the hundred weight.

13. Soft silver-ore. It is found among the marls and argillaceous earths; and is of various colours, either finely or mixed.

C. Dissolved and mineralized.

(1.) With sulphur alone. Glass silver-ore.

This is ductile, and of the same colour as lead; but, however, becomes blacker in the air. It has therefore, though very improperly, got the name of 'gafi-ore'; for that name rather belongs to the mineral argent cornez, or born silver-ore, if indeed any silver-ore can be considered as glassy.

It is found,

1. In crusts, plates, or leaves.

2. Grown into
   a. Snaggs, and
   b. Crystalline figures.

   It is generally either of a lamellar or a grained texture.

The glass silver-ore is the richest of all silver ores; since the sulphur, which is united with the silver in this ore, makes but a very small quantity of its weight.

(2.) Arsenico-martial silver-ore, Weill arto, Germ.

This ore contains silver and iron mineralized by arsenic; the arsenic in a larger proportion than the iron. This is the Pyrites argentee of Henckel.

1. It is a hard substance, of a white fining appearance, and of a compact, lamellar, or fibrous texture. (Kirwan, p. 7.)

2. Of a yellowish white colour, and of a striated structure, resembling blinmuth, but much harder. (Kirwan, p. 3.)—It is found near Guadalen canal in Spain.

3. Near the fame place is found also another ore of the fame kind, which is very soft and easily cut; and when cut, has a brilliant metallic appearance. It consists of conchoildal lamina. The quintal contains only from four to six ounces of silver; but it is easily reduced by evaporating the arsenic, which then leaves the silver slightly contaminated with iron. (Kirwan, p. 4.)

(3.) With

Silver is found,

a. Native or pure; which most generally is nearly of 16 carats standard. (a.)

1. Thin, superficial, plated or leaved.

2. In form,
   a. Of faggs, and coarse fibres.
   b. Of fine fibres. Capillary silver.
   c. Arborecent.
   d. Crystaline or figured. This is very rare:

   It has distinct fibres, with fining surfaces.

B. Mixed or alloyed with other metals.

The following are the known influences of these mixtures:

1. United to gold, (Bergman's Scizographia, § 154.)

2. Mixed with copper; (Berg. Sc. § 155.)

3. United to gold and copper; (Berg. Sc. § 156.)

4. Amalgamated with mercury, found in the mines of Salberg; (Poffer's notes to Brunich.)

5. United to iron; (Berg. Sc. § 157.)

6. United to lead, sometimes in such quantities as to be worth the expenses attending the separation.

7. United to arsenic; (Journal de Physique, 1778, p. 55.)

8. United to antimony; (Berg. Sc. § 159.)

9. Joined to the regulus of arsenic and iron; (Berg. Sc. § 160.)

10. Mixed with the alkaline limestone from

It does not unite with the semi-metal nickel, during the fusion.

b. It amalgamates easily with quicksilver.

c. It is in the dry way dissolved by the liver of sulphur.

d. It has a strong attraction to sulphur, so as readily to take a reddish yellow or black colour when it is exposed to liver vapours.

e. It has no attraction to arsenic; whence, when the red arsenical silver ore, or rothgulden erza of the Germans, is put into the fire, the arsenic flies off, and leaves the sulphur (which in this compound was the medium unius), behind, united with the silver in form of the glass silver-ore, or glasses etz.

m. It is not dissolved by the glasses of lead, and consequently it remains on the cupel.

m. It is exhaled or carried off by volatile metals and acids; as by the vapours of antimony, zinc, lead, the acid of common salt.

a. According to Cronstedt, it melts more easily than copper; and this was a general opinion. But the contrary, as Mr Magellan remarks, has been proved by means of the nice thermometer lately invented by Wedgewood.—See Thermometer.

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9. Joined to the regulus of arsenic and iron; (Berg. Sc. § 160.)

10. Mixed with the alkaline limestone from

The vitriolic acid being distilled also over the manganese, dissolves silver, gold, and mercury, as Dr Crell afferts, (Journal de Physique, Oct. 1785, p. 297.)

Silver is precipitated from the vitriolic and nitrous acids by the marine; and from the nitrous, in great measure, by the vitriolic, (Kirwan.)

(a.) Wallerus distinguishes seven species of silver: (see the article Silver). Daubenton reckons eight varieties of native white silver, arising from their peculiar forms.
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(3.) With sulphur and arsenic. The red or ruby-like silver ore. The *rothgulden* of the Germans.

The colour of this ore varies as the proportion of the ingredients varies in the mixture, viz. from dark grey to deep red; but when it is rubbed or pounded, it always gives a red colour.

a. Grey arsenical silver ore.
   1. Plated, crusted, or leaved.
   2. Solid.

b. The red arsenical silver ore:
   1. Plated crusted, or leaved;
   2. Solid or scaly;
   3. Crystalised (a.)

   In this last form it shows the most beautiful red colour, and is often semi-transparent. It contains about 60 per cent. in silver.

(4.) With sulphur, little arsenic, and iron. — *Schwartz erz, Schwartz gulden, Silber und Silbermalm, German.*

This is a friable, weathered, decayed ore.

a. Of a black or footy colour; and is therefore called by the Germans *federerz,* or *raffiger-erz.*

(5.) With sulphurated arsenic and copper. The *weissgulden* of the Germans.

This, in its solid form, is of a light grey colour, and of a dull and feeled-grained texture. Its proportion of silver is from 10 to 20 per cent.

(6.) With sulphurated arsenic and iron. The *weigerz,* or white silver ore of the Germans.

This is an arsenicous pyrites, which contains Silver; it occurs in the faxon mines, and so exactly resembles the common arsentic pyrites, as not to be distinguished from it by sight alone, or without other means.

(7.) With sulphurated antimony.

a. Of a dark grey and somewhat brownish colour; the *obererz* of the Germans.

b. Of a blackish blue colour:
   1. In form of capillary crystals. *Federcrterz,* or plumose silver ore.

(8.) With iron, arsenic, and cobalt, mineralised by sulphur.

This ore looks like the *weissgulden* described above; but is distinguished by the rufh coloured particles of cobalt, dispersed through dark brown, blackish, or grey, and sometimes shining solid masses. It is to this species of ores that the silver goose dung ore belongs.

(9.) With sulphurated copper and antimony. — The Dal *fablerz.*

This resembles both in colour and texture the dark-coloured weissgulden. When rubbed, it gives a red powder.

a. Solid.

b. Crystalised.

(10.) With sulphurated zinc. The *geechlende* of the Germans.

This is a zinc ore, mock lead, or blende, which contains silver, and is found among rich silver and gold ores.

a. Of a metallic changeable colour.
   1. Solid and with fine scales;
   2. In form of balls. The *kugelriet,* or ball ore.

b. Black mock lead, or blende, found in Saxony. This is also found,
   1. Solid and with fine scales;
   2. And in form of balls.

(11.) With sulphurated lead; potters ore. *Galena; kleiglaze.*

(12.) With sulphurated lead and antimony, called *fireperm.*

(13.) With sulphurated iron. *Silberhalitgier kies; marcasite holding silver.*

(14.) With sulphurated and arsenical cobalt; dendrites being sometimes found in the stone. These kinds keep well in water; but generally wither in the air, and lose the silver they contain.

(15.) Mineralised by sulphur, with regulus of antimony and barytes. The butter-milk ore. This is found in the form of thin particles, on granular *spar,* (*Kirwan,* p. 13.)

(16.) Combustible silver ore.

This is a black and brittle substance, and leaves about 6 per cent. of silver in its ashes. It is in fact a coal in which silver is found. (*Kirwan,* p. 14.)

(17.) With the acid of common salt. *Minera argenti cornes.* *Hornetz,* or horn-silver ore.

This is the scarcef t colour, changeable or varying on the surface, semi-transparent, and somewhat dudile both when crude and when melted. It cannot be decomposed without some admixture of such substances as attract the acid of sea-salt.

III. Platina del Pinto; *Juan blanca.*

This metal is a recent discovery of our times; and is described with great accuracy by Scheffer, in the Acts of the Royal Academy of Sciences at Stockholm for the year 1752; as also by Dr Lewis, in the Philosophical Transactions for the year 1754, vol. xlvii. and by many other writers. By these descriptions we are convinced of the resemblance this metal bears to gold; and therefore we must allow it to be called *white gold.* It has, however, a variety of distinguishing qualities.

(a) Walelius mentions the fix following varieties of this notable ore in his *Specie 588,* viz. 1. The red opaque, like cinnabar, from Andreaeburg in the Hartz, and from Salberg in Weimannia: 2. The bluish, from Freiberg and Annaberg: 3. The grey, from Freiberg and Andreaeberg: 4. The red transparent amorphous, of the garnet colour, from Potosi and Ioachimthal: 5. The red transparent, crystalised into prismatic decaedres, or dodecaedres, from Hungary, Allace, and the Duchy of Deux Ponts: 6. The only superficially red ore, from Salberg and Ebenfriderichsdorf.
M I N E R A L O G Y.

Perfect Metals. Quicksilver.

Ities besides its colour, which afferits its peculiar nature: All which, with its history, ues, &c. are particularly described under the detached article PLATINA. See also CHEMISTRY-INDEX; and METALLURGY, Part II. Sect. ii.

1. It is of a white colour.
2. It is fo refractory in the fire, that there is no degree of heat yet found by which it can be brought into fusion by it, the burning-glass excepted. But, when mixed with other metals and semimetals, it melts very easily, and especially with arsenic, both in its metallic form and in form of a calx or glafs.

IV. Quicksilver, mercury. Hydrazyrum, Argentum vi­num, Mercurius. See the article QUICKSILVER; CHEMISTRY-INDEX, at Mercury; and METALLURGY, Part II. sect. VIII.

Mercury distinguishes itself from all metals by the following qualities (s).

a. Its colour is white and shining, little darker than that of silver.
b. It is fluid in the cold, and divisible by the least force; but, as it only sticks to a few bodies to which it has an attraction, it is said that it does not wet.
c. It is volatile in the fire.
d. It attracts the other semimetals and metals: and unites with them all except cobalt and nickel, with which it cannot by any means yet known be made to mix. This union is called amalgamation. This amalgamation, or mixture of metallic bodies, according to the residuums with which they unite or mix, is in the following progression, viz. gold, silver, lead, tin, zinc, bifimth, copper, iron, and the regularus of antimony; the three latter, however, do not very readily amalgamate. The iron requires a solution of the vitriol of iron, as a medium to promote the union.
e. It dissolves in spirit of nitre, out of which it is precipitated by a volatile alkali, and common salt, in the form of white powder; but if a fixed alkali is used, a yellow powder or calx is obtained (r).

(s) It were almost superfluous, fays Mr Kirwan, to mention any other character of quicksilver than its liquidity, to distinguish it from other metals. In regard to this property, Bergman observes, that mercury constitutes one extremity among the metals, and platina the other; since it requires to be melted only such a degree of heat as is rarely wanting in our atmosphere, and boils at the 660 degrees nearly after lead melts. See the table at p. 111. Note. But when the cold is increased to the temperature denoted by 40 degrees below 0 both of Fahrenheit's and of the Swedish thermometer, which both coincide in that point (since 212—32, or 180 : 100:: 32 : 40, or 72 : 40), this metal concretes like any other metal, and becomes quite solid; (see Philosophical Transactions for 1783, p. 303.) Mercury in its common state, therefore, according to Bergman (Tract of Elæis. Atrack.), is to be considered as a metal in fusion; and since in its solid state it is nearly as malleable as lead, by no means ought to be placed among the semimetals, otherwise every other entire metal should be considered as brittle, for none is malleable when in fusion.

(r) 1. Mercury is dissolved with great rapidity by nitrous acid: the liquor is of a greenish-blue colour, but loses it afterwards and becomes limpid. This solution, when made without heat, is used as a test for the analysis of mineral waters, and has different properties from that made with the help of heat. In the first case, fays Bergman, very little phlogiston is left, and the falt easily crystallizes, being white and scarcely acrid. It is not precipitated by diluted water; but by caustic vegetable alkali, it is precipitated of a yellowish colour; by mild alkali, the precipitation is white; by mineral alkali, it is yellow, but it soon grows also white; by volatile alkali, it turns to a greyish-black colour; by Glanoper's falt or by pure vitriolic acid, the precipitation is white, granulated, and in a small quantity; nor, if this precipitant has been sparingly used, does this colour appear in less than an hour; by mutriatic acid, or common salt, the precipitation is also white, but in a large quantity, and in curdles.

2. But if the mercurial solution be put over a sand-heat, it may be charged with a quantity of mercury equal almost to its weight. According to the chemists of Dijon, 10 ounces of nitrous acid may dissolve eight ounces of mercury. The action of the solvent becomes stronger with the heat; emits great quantity of vapours; and if not taken from the fire, will be too far evaporated. Diluted water will precipitate from this solution a white calx, because it is more dephtoglitzated, and the solvent is overcharged with it; and the water changing the density of the liquor, diminishes the adhesion of the calx, as Fourcroy remarks. This white calx will turn yellow, if boiling water be poured on it. The vegetable alkali precipitates it of a brownish yellow, which by degrees assumes a pale yellow tinge: the mild vegetable, and the mineral alkalies, produce nearly the same colour; though when this last is employed, the colour turns afterwards to white. The precipitation by volatile alkali is quite white also; that by the vitriolic acid is yellow; and finally, a copious, white mucilaginous matter is the precipitate by the marine acid.

3. This solution by nitrous acid is very caustic; corrodes and destroys animal substances; when it falls on the skin, scalds it of a deep purple brown colour, which appears black: the pains do not go off before the separation of the epidermis, which falls away in scales or a kind of hairs. It is used in surgery as a powerful escharotic, and is called mercurial water.

4. The same solution, by cooling, is susceptible of forming crystals, which vary from one another according to circumstances: for the most part they are like needles; are very caustic; reddens the skin; and detonates when put on burning coals, provided they be dry. They are called mercurial niter, which fuses when heated in a crucible; exhales reddish fumes; assumes a deep yellow colour, which afterwards turns to orange, and...
MINERALOGY.

Part II. Perfect Metals. QuickSilver.

6. But it requires a boiling heat to dissolve it in oil of vitriol (v).

8. It is not affected by the acid of common salt, unless it be previously dissolved by other acids (v); in which case only they both unite with one another, and may be sublimed together; this sublimate is a strong poison.

b. It unites with sulphur by grinding; and then produces a black powder called athiops mineralius (w), which sublimes into a red fritted body called filidius cinnabar.

i. The sulphur is again separated from the quicksilver, by adding iron or lime, to which the sulphur attaches itself, leaving the quicksilver to be distilled over in a metallic form; but if a fixed alkali be used, some part of the quicksilver will remain distilled in the residuum, which is a liver of sulphur.

QuickSilver is found,

A. Native, or in a metallic state. Mercurium nativus, or virgineus.

This is found in the quicksilver mines at Idra in Friuli, or the Lower Austria, in clay, or in a black flaty lapis ollarius, out of which it runs, either spontaneously, or by being warmed even in the hands.

B. Untied in gold or silver. Hydrargyrum argentum vel aurum adunatum.

Mr Kirwan affirms, on the authorities of Monet and Lin, Von Gemlin, that in Sweden and Germany mercury has been found united to silver in the form of a somewhat hard and brittle amalgam.

Romé de l’Ife had a specimen of this natural amalgam from Germany, which is imbedded in a quartzose mass, and mixed with cinnabar, as Mr Mongez affirms; and he adds, that in the royal cabinet, at the king’s garden at Paris, is deposited another fine specimen of this mercurial ore, which was found crystallized in the mine called Carolina at Munchel-lansberg in the duky of Deux Ponts. M. de l’Ife speaks also very positively of a specimen of native gold from Hungary, which seems to be a natural amalgam of gold and mercury. It is composed of quadrangular prisms, of a greyish yellow colour, and of a brittle texture. This specimen is also in the king’s cabinet at the royal garden at Paris.

Mr Kirwan, speaking of the method of examining the purity of gold by the moil way, supposes, with Sir Torbern Bergman, that there are natural amalgamations of mercury with gold and silver; and Neumann observes, that sometimes a mineral, containing gold or silver, is met with among mercurial ores, although this is a great rarity.

It is evident, therefore, that there naturally exist and at last to a brilliant red: in this state it is called red precipitate, or corannum corallinum. It must be made in a muffle with a gentle heat, if it is designed to be corrosive for chirurgical purposes.

(v) 1. The vitriolic acid, concentrated and boiling hot, seizes on mercury, and presently reduces it if urged by heat to a kind of white powder, which turns yellow by the aflfusion of hot water, but does not dissolve in it: this is called turbid mineral: but if cold water, instead of hot, was poured in the white mass, the powder would not change its white colour into yellow as was said above about the nitrous solution.

2. If Mercury be rarefied by heat into vapours, and these meet with those of marine acid in the same state, a corrosive sublimate will be formed. This metallic salt breathes into crystals pointed like daggers, which are the strongest of all poisons. But there are various other processes found in chemical authors to make this salt with more or less trouble. See Chemistry, n° 814—818.

3. If corrosive sublimate be mixed with tin and distilled, a very smoking liquor is produced, called by the name of its inventor the smoking liquor of Libavius. See Chemistry, n° 816.

The muriatic acid in the sublimate is not saturated, and from hence proceeds its great corrosive power; for if a fresh quantity of mercury be added to it, and sublimed a second or third time, a sweet, or mixed sublimate, called mercius dulcis, is produced, which is not poisonous, and is given internally as a purgative, or an emetic, according to the dose. See Chemistry, n° 819.

(w) The academicians of Dijon say, that the true proportion to make this athiops is, that of one part of brimstone with four of mercury. Fourcroy directs only one of mercury, with three of flowers of sulphur, to be triturated, till the mercury is extinguished. A black powder is then produced, which is the athiops mineral. The combination is better effected when the mercury is mixed with the fused sulphur: by agitating this mixture, it becomes black, and easily takes fire; it should be then taken from the fire, and the flame should be extinguished a little after, stirring the mass till it becomes into solid clots. If this sublimate be exposed to a great degree of heat, it takes fire, the sulphur is consumed, and a sublimate remains which is of a violet colour when pulverized. This powder being put into matrasses, till their bottom become red by the force of fire, is sublimed after some hours, and artificial cinnabar is found in the top of the vessels crystallized into brown red needles.

Mercury, divided by means of a rapid and continual motion, as that of a mill-wheel, gradually changes itself into a very fine black powder, which is called athiops fer fiz, on account of its colour; in order to distinguish it from this athiops mineralius mentioned in the text.
it various ores of quicksilver, amalgamated with silver, gold, and other minerals, although they be but seldom met with.

C. Mineralized.

[1.] With sulphur.

a. Pure cinnabar, Cinnabaris natae.

b. Indurated or solid cinnabar. It is of a deep red colour; and, with respect to its texture, is either,

1. Steel-grained;
2. Radiated;
3. Composed of small cubes, or fealy; or
4. Crystalized, in a cubical form; it is transparent, and deep red like a ruby.

b. Impure cinnabars.

(1.) A mercurial ore is found in Idria, says Gellert, where the mercury lies in an earth or stone, as if it were in a dead form; and has the appearance of a red-brown iron-stone; but it is much heavier than that. It contains from three quarters to seven eighths of the purest mercury; leaves, after distillation, a very black earth behind; and gives some marks of cinnabar.

(2.) Liver ore, which is most common in Idria, and has its name from its colour.—Outwardly it resembles an indurated iron-clay; but its weight discovers that its contents are metallic. It yields sometimes 80 pounds of quicksilver per hundred weight.

3. Burning ore; branderz in German. This ore may be lighted at the candle; and yields from nine to 10 pounds of quicksilver per hundred weight. Brunnich.


Sir Torbern Bergman inferred this ore in the 177th section of his Scigraphia, and seems doubtful whether this be a different species from the cinnabar; as the iron is perhaps, says he, only mechanically diffused therein. Mr Mongez remarks, that there are but a few instances of cinnabar in which iron is not found in its calcined form; though, in the act of the ore being reduced, it passes to its metallic state, and becomes capable of being acted on by the loadstone.

Another pyriticous ore of cinnabar was found at Meniet; near St Lo in Lower Normandy. It consists in grains of different sizes, of a red brown colour; they had a vitriolic taste, and sulphureous smell. Found also at Almaden in Spain, and at Stahberg in the Pa

MINERALOGY.

Part II.

IMPERFECT METALS.

Tin.

This seems to be a native precipitate per se, or calx of mercury. It is said to have been lately found in Idria, in hard compact masses of a brownish-red colour; see Journal de Physique for January 1784, p. 61. If this account can be relied upon, it will prove, that quicksilver, even in a calciform state is naturally found mineralized with silver by means of sulphur.

[4.] With sulphur and copper.

This ore is blackish grey, of a glaffy texture, and brittle; crackles and splits excessively in the fire; and when the quicksilver and sulphur are evaporated, the copper is discovered by its common opaque red colour in the glass of borax, which, when farther forced in the fire, or diluted, becomes green and transparent. It is found at Mufchlanberg in the duchy of Deux Ponts.

[5.] Mineralized by the marine and vitriolic acids.

Mineralogy owes the discovery of this ore to Mr Woulfe, who published an account of it in the Philosophical Transactions for 1776. It was found in the duchy of Deux Ponts, at the mine distinguished by the name of Obermoehel. It had a spar-like appearance. This ore is either bright and white, or yellow or black. It was mixed with cinnabar in a fliny matrix; and being well mixed with one-third of its weight of vegetable alkali, afforded cubic and octagonal crystals; that is, salt of Sylvius and vitriolated tartar.

The marine salt of this mercury is in the state of sublimate corrosive.

Order II. IMPERFECT OR BASE METALS.

I. Tin. Stannum; Jupiter. (See the detached article Tin; Allo Chemistry-Index; and Metallurgy, Part II. sect. vi. and Part III. sect. vi.)

This is distinguished from the other metals by the following characters and qualities. It is,

a. Of a white colour, which verges more to the blue than that of silver.

b. It is the most fusible of all metals; and,

c. The least ductile; that is, it cannot be extended or hammered out so much as the others (x).

d. In

(x) Tin is sufficiently ductile to be beaten into very thin leaves. But ductility and extensibility are two different properties, let's connected with one another than is generally imagined. Iron and steel are drawn into exquisite fine wire, but cannot be beat into very thin leaves. Tin, on the other hand, is beat into fine leaves, and may be extended between rollers to a considerable surface. The tin-sheet used in various arts, is commonly about 1/2 th part of an inch; but may be extended twice as much in its dimensions without difficulty. Notwithstanding this extensibility, tin cannot be drawn into wire, on account of the weak cohesion of its particles. A tin wire, however, of one tenth of an inch diameter, is able to support a weight of 40½ pounds, according to Fourcroy. Gold and silver possess both properties of ductility and extensibility the most eminentiy of all metallic bodies; whilst lead, notwithstanding its flexibility and softness, cannot be made either into leaves or wire of any fineness.
Mineralogy.

d. In breaking or bending, it makes a crackling noise.

e. It has a smell particular to itself, and which cannot be described.

f. In the fire it is easily calcined to white ashes, which are 25 per cent. heavier than the metal itself. During this operation, the philogiton is seen to burn off in form of small sparkles among the ashes or calx.

g. This calx is very refractory; but may, however, with a very strong degree of heat be brought to a glass of the colour of colophony. But this calx is easily mixed in glass compositions, and makes with them the white enameled.

b. It unites with all metals and femimetals; but renders most of them very brittle, except lead, bismuth, and zinc.

t. It amalgamates easily with quicksilver.

i. It dissolves in aqua-regia, the spirit of fea-salt, and the vitriolic acid; but is only corroded into a white powder by the spirit of nitre. The vegetable acid, soaps, and pure alkaline solutions, which with them the white calx, or rather in an hard malleable tin, in a granular form, and also in a masy form, without any determinate figure. Tin-fione. It resembles a garnet of a blackish brown colour, but is much heavier; and has been considered at the English tin-mines as a fione containing no metal, until some years ago it began to be melted to great advantage.

b. Crystallized.

a. Tin fpar, or white tin ore. This is generally of a white, or grey colour; sometimes it is yellowish, semi-transparent, and crystallized, either of a pyramidal form, or irregularly.

b. Tin-grains. This ore, like the garnets, is of a spherical polygonal figure; but seems more unctuous on its surface.

1. In large grains.

B. Mixed with metals.

1. With the calx of iron, as in the garnet.

2. With manganèse. See the Semimetals.

C. Mineralized.

1. With sulphur and iron.

2. With sulphur. Aurum mufivum.

This was discovered by Professor Bergman, among some minerals which he received from Siberia. He observed two sorts of it, analogous to the two artificial combinations of tin with sulphur.

1. One nearly of the colour of zinc, and of a fibrous texture, which contained about 20 per cent. of sulphur, and the remainder tin.

2. The other enveloped the former like a crust; resembled aurum mufivum; and contained about 40 per cent. of sulphur, a small proportion of copper, and the remainder tin. Mem.Stockb.for.1721.p.328.

At Huel Rock, in St Agnes in Cornwall, there has been found a metallic vein, nine feet wide, at 20 yards beneath the surface. Mr Rafpe was the first who discovered this to be a sulphurated tin-ore: it is very compact, of a bluish white colour, approaching to grey steel, and similar to the colour of grey copper ore: it is lamellar in its texture, and very brittle. It contains of sulphur, tin, copper, and some iron. Mr Rafpe proposes to call it bell metal ore.

According to Mr Klaproth's analysis of this ore, 119 grains contain 30 of pure sulphur; 41 of tin; 43 of copper; two of iron; and three grains of the flory matrix. In another specimen of the same sulphurated tin-ore from Cornwall, there were in the hundred 25 parts of sulphur, 34 of tin, 36 of copper, three of iron, and two of the flory matrix.
The properties of lead are as follows.

a. It is of a bluish white colour when fresh broke, but soon dulls or fullies in the air.

b. It is very heavy; viz. to water as 11,325 to 1000.

c. It is the softest metal next to gold; but it has no great tenacity, and is not in the least fomentous.

d. It is easily calcined; and by a certain art in managing the degrees of the fire, its calx becomes white, yellow, and red.

e. This calx melts easier than any other metallic calx to a glass, which becomes of a yellow colour, and fomentansparent. This glass brings other bodies, and the imperfect metals, into fusion with it.

f. It dissolves, 1st, in the spirit of nitre; 2dly, in a diluted oil of vitriol, by way of digestion; 3dly, in the vegetable acid; 4thly, in alkaline solutions; and 5thly, in expressed oils, both in the form of metal and of calx.

g. It gives a sweet taste to all solutions.

h. It amalgamates with quicksilver.

i. With the spirit of sea-salt it has the same effect as silver, whereby is produced a *saturatus cornus*.

k. It does not unite with iron, when it is alone added to it in the fire.

l. It works on the cupel, which signifies that its glafs enters into certain porous bodies, defilts of phlogiston and alkaline fals.

m. It melts in the fire before it is made red-hot, almost as easily as the tin.

n. Its calx or glass may be reduced to its metallic state by pot-ashes.

[1.] Native Lead.

For proofs of lead being naturally found in its metallic state, see the article Lead.—It may be here added, that Henckel likewise affirms its existence, in his *Flora Saturni*; (See Kirwan's *Elements of Mineralogy*, p. 297, 298.) Wallerius affirms, that it has been so found in Poland, a specime of which was kept in the collection of Richer; and adds, that a similar one found at Schneberg, was seen in the collection of Spener. (*Mineralogy*, vol. ii. p. 301.)

Dr Lawson, in his English edition of Cramer's *Art of Assaying Metals*, says, that some pure native malleable lead had been lately found in New England; (p. 147.) And lately, Professor Bergman did not hesitate to infer, by itself alone, the *plumbum nativum*, in Sect. 180. of his *Stiographia*.

[2.] Calciform Lead.

Lead is found,

A. In the form of a calx.

a. Pure.

b. Indurated lead ipar, or ipasoe lead ore.

i. White, from Mendip-hills, in England.

ii. Crystallized in a prismatic figure.

i. White, from Norrgrufva in Westmanland.

2. Yellowish green, from Zchopau in Saxony.


i. With the calx of arsenic, arsenical lead ipar.

ii. Indurated.

a. White. Mr Cronfledt has tried such an ore from an unknown place in Germany, and found that no metallic lead could be melted from it by means of the blow-pipe, as can be done out of other lead ipars; but it must be performed in a crucible. (See the article Lead, par. iii.)

3. With a calcareous earth.

This ore effervesces with aqua-fortis, and contains 40 per cent. of lead; on which account it is placed here rather than among the calcareous earths.

B. Mineralized.

i. With sulphur alone: the *bley-skweiff*, or *bleyglans*, of the Germans.

a. Steel-grained lead ore.

b. Radiated, or antimonated lead ore.

c. Tefellated, or potter's lead-ore.

At Villach in Austria there is said to be found a potter's lead-ore, which contains not the least portion of silver.

ii. Mineralized by the vitriolic acid.

This ore was discovered by Mr Monnet. It occurs sometimes, though rarely, in the form of a white ponderous calx; and seems to originate from the spontaneous decomposition of the sulphurated lead-ores abovementioned.

iii. By the acid of phosphorus.

This ore was lately discovered by Ghan; and is of a greenish colour, by reason of a mixture of iron. See the article Lead, par. 6.

iv. With sulphurated silver. *Gahlena*; also called *bleyglans* by the Germans. Potter's ore.

a. Steel-grained.

b. With small scales.

c. Fine-grained.

d. Of a fine cubical texture; and,

e. Of coarse cubes. These two varieties are found in all the Swedish silver-mines.

f. Crystallized.

The steel-grained and fealy ores are of a dim and dull appearance when they are broken, and their particles have no determined angular figure: they are therefore in Swedish commonly called *bley-skweief*; in opposition to the cubical ores, which are called *bleyglans*. The most part of the ores called *bleyglans* contain silver, even to 24 ounces per cent. of which we have influences in the mines of Salberg, where it has been observed, that the coarse cubical lead ores are generally the richest in silver, contrary to what is commonly taught in books; the reason of which may perhaps be, that, in making the assays on those two ores, the coarse cubical can be chosen purer or freer.
MINERALS.

Part II.

1. Imperfect Metals.

Lead.

I. Cuprum, Venus, &c. (See the article Copper; Also Chemistry-Index; and Metallurgy, Part II. sect. iv. and Part III. sect. iv.)

This metal is,

a. Of a red colour.

b. It is pretty soft and tough.

c. The calx of copper being dissolved by acids becomes green, and by alkalies blue.

d. It is easily calcined in the fire into a blackish blue sub stance, which, when rubbed to a fine powder, is red; when melted together with glass, it tinges it first reddish brown, and afterwards of a transparent green or sea-green colour.

e. It dissolves in all the acids, and likewise in alkaline solutions. It is easier dissolved when in form of a calx than in a metallic state, especially by the acids of vitriol and sea-salt, and the vegetable acid.

f. Vitriol of copper is of a deep blue colour; but the vegetable acid produces with the copper a green salt, which is verdigris.

g. It can be precipitated out of the solutions in a metallic state; and this is the origin of the precipitated copper of the mines called Ziment copper.

h. It is not easily amalgamated with quicksilver; but requires for this purpose a very strong triation, or the admixture of the acid of nitre.

i. It becomes yellow when mixed with zinc, which

has a strong attraction to it, and makes brass, pinchbeck, &c.

k. When the metal is exposed to the fire, it gives a green colour to the flame in the moment it begins to melt, and continues to do so afterwards, without losing any thing considerable of its weight.

[1.] Native copper.

Copper found naturally in a metallic state, is called virgin or native copper. It is met with,

1. Solid.

2. Friable, in form of small, and somewhat coherent grains. Precipitated or ziment copper.

[2.] Calciform.

Copper, in form of a calx, is found,

1. Pure.

a. Loose or friable; Oedo venus.

1. Blue; Cuprum montanum. Very seldom found perfectly free from a calcareous sub stance.

2. Green; Viride montanum. Both this and the former colour depend on meniria, which often are edulcorated or washed away.

3. Red. This is an effulorescence of the glass copper ore.

b. Indurated. Glas copper-ore.

a. Red. This is sometimes as red as sealing wax, and sometimes of a more liver brown colour.

It is always found along with native copper, and seems to have lost its phlogiston by way of effulorescence, and to be changed into this form. It is likewise found with the sulphurated copper, improperly called glas copper ore.


a. Loose or friable; Oedo venus friabilis impura.

1. Mixed with a calcareous substance; Cuprum montanum. In this state copper-blue is mostly found. It ferments during the solution in aqua fortis.

2. Mixed with iron. Black. It is the decomposition of the Fahlun copper ore.

b. Indurated.

1. Mixed with gypsum, or plaster. Green.


3. Mixed with lime. a. Blue. This is the Lapis Armentus, according to the accounts given of it by authors.

3.) Cupreous stones.

Analogous to the calciform copper ores, are,

1. The lapis armentus. See the detached article.

2. The turquoise. Icile Copper, no 7.

[3.] Dissolved and mineralised; Cuprum mineralisatum.

a. With sulphur alone. Grey copper-ore; also called, improperly, glas copper-ore.

a. Solid, without any certain texture, and very soft, so that it can be cut with a knife almost as easily as black lead.

b. Fine cubical. In Smoland this is sometimes
Copper.

1. With sulphurated iron. *Minera cupri pyriticæa*; yellow copper ore. Marcasital copper ore; *Pyrites cupri*. This is various both in regard to colour and in regard to the different proportion of each of the contained metals; for in

instance,

a. Blackish grey, inclining a little to yellow; *Pyrites cupri griseus*. When decayed or weathered, it is of a black colour; is the richest of all the varieties of this kind of copper ore, yielding between 50 and 60 per cent. and is found in Spain and Germany.

b. Reddish yellow, or liver brown, with a blue coat on the surface; *Minera cupri lasserae*. This ore yields between 40 and 50 per cent. of copper, and is commonly said to be blue, though it is as red, when fresh broken, as a red copper regular.

c. Yellowish green; *Pyrites cupri flavo viridefens*. This is the most common in the north part of Europe: and is, in regard to its texture, found,

1. Solid, and of a shining texture.
2. Steel grained, of a dim texture.
3. Coarse-grained, of an uneven and shining texture.
4. Crystallised marcasital copper ore.

a. Of long octahedral crystals.

d. Pale yellow. This cannot be described but as a marcasite, though an experienced eye will easily discover some difference between them. It yields 22 per cent. of copper.

e. Liver-coloured.

f. With sulphurated silver, arsenic, and some iron, yellow copper-ore; which contains only a few ounces of silver. This ore is found in Hungary and Germany, where it is called black copper ore.

g. With sulphurated arsenic and iron. White copper ore.

h. Pyriticus copper, with arsenic and zinc. According to Mr Monnet, this ore is found at Catharineberg in Bohemia. It is of a brown colour; of a hard, solid, compact, granular texture; and contains from 18 to 30 per cent. of copper.

i. Disolved by the vitriolic acid; *Vitriolum venetius*. See the article copper, n° xiii.

j. With phlogiston. Copper coal ore, consisting of the calces of copper, mixed with a bituminous earth.

k. Mineralized by the muriatic acid. This ore was found in Saxony, and had been generally mistaken for a micaceous sub Lazith, which in fact it greatly resembles. It has not yet been found in large masses, but only in a superficial form, like a crust over other ores. It is moderately hard and friable; of a fine green colour; and sometimes of a bluish green, crystallised in a cubic form, or with a foliated texture, or in little scales resembling green mica or talc. This ore is easily dissolved by nitrous acid: the solution takes a green colour; and the metal may be precipitated on a polished plate of iron. If some drops of a nitrous solution of silver be mixed with it, a white powder of *luna cornea* will be precipitated, which discovers the presence of the muriatic acid in this ore.

The uses of copper are very numerous, although not thoroughly known to every one. Several of these have been mentioned under the detached article, and in *Chemistry*. Others of great importance may be here added. Its great ductility, lightness, strength, and durability, render it of very extensive utility. Blocks, or bars of copper, are reduced into flat sheets of any thickness, by being first heated by the reverberation of the flame, in a low vaulted furnace, properly constructed for the purpose; and then immediately applied between large rollers of steel, or rather of case-hardened iron, turned by a water-wheel or by the strength of horses, so that the hot metal is there quickly squeezed; and the operation is repeated, bringing the rollers every time nearer to one another, till the metallic sheet acquires the intended thickness.

These copper sheets are very advantageously employed in sheathing the bottoms of men of war and other vessels, which by this means are prevented from being attacked by the sea worms, and are kept clean from various marine concretions, so as to fail with considerably greater swiftness. Copper sheets are also employed to cover the tops of buildings instead of tiles or earthen tiles, as is used in Sweden; and some architects have begun to introduce the use of copper covering into Great Britain, which is much lighter, and may be used with great advantage, although it must be much dearer in prime cost.

Sundry preparations of copper are employed in painting, staining, and for colouring glasses and enamels. See *Glass and Enamel*.

The solution of copper in aqua-fortis stains marble and other stones of a green colour; when precipitated with chalk or whiting, it yields the green and the blue verditer of the painters. According to Lewis, a solution of the same metal in volatile spirits stains ivory and bones: when macerated for some time in the liquor, they become of a fine blue colour, which, however, tarnishes by exposure to the air, and becomes green afterwards.

The same author prepared elegant blue glusses, by melting common glasse, or powdered flint and fixed alkaline salt, with blue vitriol, and with an amalgam of copper; fine green ones were made with green verditer, and with blue verditer, as well as with the precipitate of copper made by fixed alkalis, and with a precipitate by zinc; and a reddish glass was produced by the caux and fcoria of copper made by fire alone. Even in this vitreous state, it seems as if a continuance of fire had the same effect in regard to colour, as air has upon copper in other forms; as some of the most beautiful blue glasses, by continued fusion, have changed.
Part II. MINERALOGY.

changed to a green colour. See farther the article Brass in the Glass-trade.

Verdigris is a preparation of copper dissolved by the vegetable acids, which act on this metal, dissolving it very slowly, but in considerable quantities. It produces a fine green pigment for painting both in oil and water colours, inclining more or less to the bluish according to circumstances.

So great is the tenacity of copper, that a wire of a tenth of an inch in diameter is capable of supporting 299.5 pounds weight before it breaks. Copper may be drawn into very fine wire, and beaten into extremely thin plates. The German artists, chiefly those of Nuremburg and Aulburg, are said to possess the best method for giving to these thin plates of copper a fine yellow colour like that of gold. See the articles Brass-Colour and Brass-Leaf.

The parings or shreds of these very thin leaves of yellow copper being well ground on a marble plate, are reduced to a powder similar to gold, which ferves to cover, by means of some gum-water, or other adhesive fluid, the surface of various moulding or other pieces of curious workmanship, giving them the appearance of real bronze, and even of fine gold; at a very trifling expense; because the gold colour of this metallic powder may be easily raised and improved by firing it on a wide earthen bafon over a slow fire.

In some of its states, copper is as difficultly extended under the hammer as iron, but proves fouter to the file, and never can be made hard enough to strike a spark with flint or other stones; from whence proceeds the use that is made of this metal for chisels, hammers, hoops, &c. in the gun-powder works.

The vitriolic acid does not act on copper unless concentrated and boiling; during this solution a great quantity of sulphurous gas flies off; afterwards a brown thickish matter is found, which contains the calx of the metal partly combined with the acid. By solution and filtration, a blue solution is obtained, which being evaporated to a certain degree, produces after cooling long rhombohedral crystals of a beautiful blue colour, called vitriol of copper; but if this solution be merely exposed a long time to the air, it affords crystals, and a green calx is precipitated, a colour which all calces of this metal assume when dried by the air. Blue vitriol, however, is seldom formed by dissolving the metal directly in the vitriolic acid. That fold in the shops is mostly obtained from copper pyrites. It may also be made by stratifying copper-plates with sulphur, and cementing them together for some time; because the vitriolic acid of the sulphur being disengaged, attacks and corrodes the metal, forming a metallic salt, which by affusion of water yields perfect crystals of blue vitriol. See Vitriol.

The nitrous acid, on the contrary, dissolves copper when cold with great rapidity; and a great quantity of smothering air or gas flies off, which, on being received in a pneumatic apparatus, and mixed in a glass tube with atmospheric air, shows its good or bad quality for the respiration of living animals, according as the common bulk is more or less diminished. This is one of the most important of Dr Priestley’s discoveries; and various instruments known by the name of calomel have been since invented for making these experiments with ease and satisfaction. See Eudiometer.

But the most common use of copper is to make allsorts of large stills, boilers, pots, funnels, and other vessels employed by distillers, dyers, chemists, and various other manufacturers, who make use of large quantities of hot liquors in their various operations.

Although copper when pure is extremely valuable, on account of its ductility, lightness, and strength, it is, however, less useful on many occasions from the difficulty of forming large masses of work; as it is not an easy matter to cast copper solid, so as to retain all its properties entire. For if the heat be not sufficiently great, the metal proves deficient in toughness when cold; and if the heat be raised too high, or continued for a length of time, the copper blisters on the surface when cast in the moulds; so that the limits of its fusion are very contracted. And from these circumstances pure copper is rendered less applicable to several purposes.

We find, however, that the addition of a certain proportion of zinc removes almost all these inconveniences, and furnishes a mixed metal more fusible than copper, very ductile and tenacious when cold, which does not so readily scorify in a moderate heat, and which is less apt to rust from the action of air and moisture.

Copper is the basis of sundry compound metals for a great number of mechanical and economical uses of life, such as brafs (v), prince’s-metal, tombac, bell-metal, white copper, &c. See Chemistry, n° 1154, &c.

If the mixture is made of four to fix parts of copper, with one part of zinc, it is called Prince’s-metal. If more of the copper is taken, the mixture will be of a deeper yellow, and then goes by the name of tombac.

(v) Brafs is frequently made by cementing plates of copper with calamine, where the copper imbibes one-fourth or one-fifth its weight of the zinc which rises from the calamine. The process consists in mixing three parts of the calamine and two of copper with charcoal dust in a crucible, which is exposed to a red heat for some hours, and then brought to fusion. The vapours of the calamine penetrate the heated plates of copper, and add thereby to its fusibility. It is of great consequence for the success of this process to have the copper cut into small pieces, and intimately blended with the calamine. See Chemistry, n° 1154.

In most foreign founderies the copper is broken small by mechanical means with a great deal of labour; but
Bell-metal is a mixture of copper and tin, forming a compound extremely hard and fono rous, and is less subject to alterations by exposure to the air than any other cheap metal. On this account it is advantageously employed in the fabrication of various utensils and articles, as cannons, bells, flat-trees, &c. in the composition of which, however, other metals are mixed in various proportions, according to the fancy and experience of the artist.

White-copper is prepared with arsenic and nitre, as mentioned under Chemistry, n° 1157.

But the principal kind of white-copper is that with which speculums of reflecting telescopes are made. See the article Speculum.

VII. Iron; Ferrum, Mart. This metal is, a. Of a blackish blue shining colour. b. It becomes dudle by repeated heating between coals and hammering. c. It is attracted by the leadstone, which is an iron ore; and the metal itself may also be rendered magnetic. d. Its specific gravity to water is as 7.645, or 8.000: 1000. e. It calcines easily to a black fealy calx, which, when pounded, is of a deep red colour. f. When this calx is melted in great quantity with glass compositions, it gives a blackish brown colour to the glass; but in a small quantity a greenish colour, which at last vanishes if forced by a strong degree of heat.

at Bristol the workmen employ an easier method. A pit is dug in the ground of the manufacture about four feet deep, the sides of which are lined with wood. The bottom is made of copper or brafs, and is moveable by means of a chain. The top is made of brafs with a space near the centre, perforated with small holes, which are luted with clay; through them the melted copper is poured, which runs in a number of fireams into the and this is perpetually renewed by a fresh stream of melted copper produces when thrown into cold water; which end is obtained by calamine.

It is a wonderful thing, says Cramer, that zinc itself, being simply melted with copper, robs it of all its malleability; but if it be applied in form of vapour from the calamine, the sublimates, or the flowers, it does not cause the metal to become brittle.

The method mentioned by Cramer to make brafs from copper, by the volatile emanations of zinc, seems to be preferable to any other process, as the metal is then preferred from the heterogeneous parts contained in the zinc itself, or in its ore. It consists in mixing the calamine and charcoal with moistened clay, and ramming the mixture to the bottom of the melting pot, on which the copper, mixed also with charcoal, is to be placed above the rammed matter. When the proper degree of heat is applied, the metallic vapour of the zinc contained in the calamine will tranpire through the clay, and attach itself to the copper, leaving the iron and the lead which were in the calamine retained in the clay, without mixing with the upper metal. Dr Watfon says that a very good metallurgist of Bristol, named John Champion, has obtained a patent for making brafs by combining zinc in the vapours form with heated copper plates; and that the brafs from this manufacture is reported to be of the finest kind: but he knows not whether the method there employed is the same with that mentioned by Cramer.

Brafs is sometimes made in another way, by mixing the two metals directly; but the heat requisite to melt the copper makes the zinc burn and flame out, by which the copper is defrauded of the due proportion of zinc. If the copper be melted separately, and the melted zinc poured into it, a considerable and dangerous explosion ensues; but if the zinc is only heated and plunged into the copper, it is quickly imbibed and retained. The union, however, of these two metals succeds better if the flux composed of inflammable substanaces be first fused in the crucible, and the copper and zinc be poured into it. As soon as they appear thoroughly melted, they are to be well tilled, and expeditiously poured out, or else the zinc will be inflamed, and leave the red copper behind.
Part II.

MINERALOGY.

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a. In lumps of an indeterminate figure. All these are of a blackish brown, or a light brown colour.

b. Indurated. The blood-foane; Hematites.

1. Of an iron colour; Hematites carbonifera.

This is of a bluish grey colour; it is not attracted by the lodestone, yields a red powder when rubbed, and is hard.

a. Solid, and of a dim appearance when broken.

b. Cubical, and of a shining appearance when broken.

c. Fibrous, is the most common terrillon of Sweden.


1. Black.

2. Bluish grey. When this is found along with marcasite, it is not only attracted by the lodestone, but is of itself really a lodestone.

e. Crystallized.

1. In octaedrical crystals.

2. In polyedrical crystals.

3. In a cellular form.

These varieties are the most common in Sweden, and are very seldom blended with marcasite or any other heterogeneous substance except their different beds. It is remarkable, that these ores are found along with marcasite, those particles which have lain nearest to the marcasite are attracted by the lodestone, although they yield a red or reddish brown powder, like those which are not attracted by the lodestone: it is likewise worth observation, that they generally contain a little sulphur, if they are imbedded in a limestone rock.

2. Blackish brown blood-foane; Hematites nigroscura. Kidney ore. This yields a red or brown powder when it is rubbed; it is very hard, and is attracted by the lodestone.

a. Solid, with a glaftif texture.

b. Radiated.

c. Crystallized.

1. In form of cones, from Siberia.

2. In form of concentric balls, with a faceted surface. These are very common in Germany, but very scarce in Sweden.


a. Solid, and dim in its texture.

b. Scaly. The eifernam of the Germans. This is commonly found along with the iron-coloured iron glimmer, and linear the hands.

c. Crystallized, in concentric balls, with a flat or faceted surface.

4. Yellow blood-foane; Hematites flavus.

a. Solid.

b. Fibrous.

The varieties of the colours in the blood-foane are the same with those produced in the calces of iron made by dry or liquid men-

furia and afterwards exposed to different degrees of heat.

B. Mixed with heterogeneous substances.


b. With a siliceous earth. The martial jasper of Sinople.

c. With a garnet earth. Garnet and cockle or fliril.

d. With an argillaceous earth. The bole.

e. With a micaceous earth. Mica.

f. With manganese.


h. With an unknown earth, which hardens in water. Tarras; Cementum.

1. Loofe or granulated; Terra Ponzolana.

This is of a reddish brown colour, is rich in iron, and is pretty fusible.

2. Indurated; Cementum induratum. This is of a whitifh yellow colour, contains likewise a great deal of iron, and has the fame quality with the former to harden soon in water when mixed with mortar. This quality cannot be owing to the iron alone, but rather to some particular modification of it occasioned by some accidental causes, because these varieties rarely happen at any other places except where volcanoes have been, or are yet, in the neighbourhood.

[3.] Dissolved or mineralized.

A. With sulphur alone.

1. Perfectly saturated; Ferrum sulphure satureatum. Marcasite.


This is either attracted by the lodestone, or is a lodestone itself attracting iron; it resembles iron, and yields a black powder when rubbed.

1.) Magnetic iron ore. The lodestone, Magnæ.

a. Steel-grained, of a dim texture, from Hogberget in the parish of Gagneoil in Dalane: it is found at that place almost to the day, and is of as great strength as any natural lodestones were ever commonly found.

b. Fine grained, from Saxony.

c. Coarse-grained, from Spetalgrufvan at Norberg, and Kiergrufvan, both in the province of Weilmanland. This lores very soon its magnetic virtue.

3. With coarse scales, found at Sandfddf in Norway. This yields a red powder when rubbed.

2.) Refractory iron ore. This in its crude state is attracted by the lodestone.

a. Giving a black powder when rubbed; Tritura atræ. Of this kind are,

1. Steel-grained.

2. Fine grained.

3. Coarse.
MINERALOGY.

3. Coarse grained.

This kind is found in great quantities in all the Swedish iron mines, and of this moft part of the fufible ores confifl, because it is commonly found in fuch kinds of rocks as are very fufible: and it is as feldom met with in quartz as the hematites is met with in limestone.

4. Fine-grained. Emery. This is imported from the Levant: it is mixed with mica, is strongly attracted by the lodestone, and smells of sulphur when put to the fire.

5. Of large shining cubes.

6. Coarse grained.

Iron is the moft common metal in nature, and at the fame time the moft ufeful in common life; notwithstanding which, its qualities are perhaps very little known.

Iron has a particular and very fefible smell when strongly rubbed or heated; and a fypbic taste, which it communicates to the water in which it is extinguifhed after ignition. Its tenacity, ductility, and malleability, are very great. It exceeds every other metal in elâficity and hardness, when properly tempered. An iron wire of one-tenth of an inch thick is able to fupport 450 pounds weight without breaking, as Wallerius afferts.

Iron drawn into wire as fliender as the finest hairs.

It is more easily malleable when ignited than when cold; whereas other metals, though duftile when cold, become quite brittle by heat.

It grows red-hot sooner than other metals; nevelherhefs it melts the moft difliculty of all, platinum and manganeffe excepted. It does not tinge the flame of burning matters into blufht or greenifh colours, like other imperfect metals, but brightens and whitens it; hence the filings of iron are used in compositions of fire-works, to produce what is called white-fire.

Iron, or rather fleet, expands the leaf of all hard metals by the action of heat; but brafs expands the moft: and on this account these two metals are employed in the contruction of compound pendulums for the best fort of regulating clocks for astronomical purpofes.

Iron, in the act of fufion, inleat of continuing to expand, like the other metals, shrinks, as Dr. Lewis observes; and thus becomes fo much more dense as to throw up fhuch part as is unmelted to the surface; whilst pieces of gold, silver, copper, lead, and tin, put in the refpeotive metals in fusion, fink quickly to the bottom. But in its return to a confiftent state, instead of shrinking, like other metals, it expands; fentibly rising in the veffel, and affuming a convex furface, whilst the others fubfide, and appear concave.

This property of iron was firft taken notice of by Ramor, and excellently fits it for receiving impressions from the moulds into which it is caft, being forced into their minutest cavities. Even when poured thick into the mould, it takes, nevertheless, a perfect impression; and it is obferved, that cast iron is fomewhat larger than the dimensions of the mould, whilst cast figures of other metals are generally smaller.

The vitriolic acid difolves iron readily, and forms green vitriol.

This acid requires to be diluted with 304 times its quantity of water, to enable it effeotually to difsolve iron; and, during the difsolution; a strong aerial fluid aries, called inflammable air, which, on being mixed with atmofpheric air, takes fire at the approach of the flame of a candle. A glafs philal, of about two ounces measure, with one third of inflammable air, and the reft of common air, produces a very loud report if opened in the fame circumference; and if it be filled with two-thirds of inflammable air, mixed with one of dephlogifotated air, the report will be as loud as the explosion of a piftol with gunpowder.

Dilute nitrous acid difolves iron; but this fialine combination is incapable of cryfallisfing. Strong nitrous acid corrodes and dephlogifotates a confiderable quantity of iron, which falls to the bottom.

Marine acid likewise difolves iron, and this folution is also incryfallisfable.

The Pruflian acid precipitates iron from its folutions in the form of Pruflian blue.

This metal is likewife fentiufly acted upon by alkaline and neutral liquors, and corroded even by thofe which have no perceptible fialine impregnation; the oils themfelves, with which iron utenfils are ufually rubbed to prevent their rusting, often promote this effect in fome meafeure, unlefs the oils have been previously boiled with latharge or calcas of lead.

Galls, and other aftringent vegetables, precipitate iron from its folutions, of a deep blue or purple colour, of fo intense a fhade as to appear black. It is owing to this property of iron that the common writing ink is made. The infufion of galls, and alfo the Pruflian alkalies, are teats of the preience of iron by the colours they produce on any fluid. Acids, however, difolve the coloured precipitates by theformer; and hence it arihes that the marine acid is fuccefsfully applied to take off ink spots and iron stains from white linens. Alkalies, however, convert thefe iron precipitates into a brown ochre.

Iron has a frong affinity with sulphur. If a bar of iron be ftrongly ignited, and a roll of brimstone be applied to the heated end, it will combine
bine with the iron, and form a fusible mass, which will drop down. A vessel of water ought to be placed beneath for the purpose of receiving and extinguishing it, as the fumes would otherwise be very inconvenient to the operator.

A mixture of iron filings and bismuth in powder, moistened with water, and pressed so as to form a paste, will in a few hours swell, become hot, fume, and even burst into flame, if the quantity is large. The reductum furnishes martial vitriol. This process is similar to the decomposition of martial pyrites; from which some philosophers account for hot spring-waters and spontaneous fires. The mixture of water in this paste seems to be unnecessary to enable the vitriolic acid of the sulphur to act on the iron.

For other chemical properties of this metal, see Chemistry-Index; for its electrical and magnetic properties, see Electricity and Magnetism. For a more particular account of its nature and uses, and the methods of making and manufacturing it, see the articles Iron and Steel; also Metallurgy, Part II. sect. vii. and Part III. sect. v.

Order III. Semimetals.

I. Bismuth; tin-glaafs. Vijnutum, Bijmutum, Marcasita officinalis. It is,
a. Of a whitish yellow colour.
b. Of a laminated texture, soft under the hammer, and nevertheless very brittle.
c. It is very fusible; calcines and scorifies like lead, if not rather easier; and therefore it works on the cuppel. It is pretty volatile in the fire.
d. Its glafs or flag becomes yellowish brown, and has the quality of retaining some part of the gold, if that metal has been melted, calcined, and vitrified with it.
e. It may be mixed with the other metals, except cobalt and zinc, making them white and brittle.
f. It dissolves in aqua-fortis, without imparting to it any colour; but to the aqua-regia it gives a red colour, and may be precipitated out of both these solutions with pure water into a white powder, which is called Spanish white. It is also precipitated by the acid of sea-felt; which last unites with it, and makes the Vijnutum corneum.
g. It amalgamates easily with quicksilver. Other metals are so far attenuated by the bismuth, when mixed with it, as to be strained or forced along with the quicksilver through skins or leather.

Bismuth is found in the earth.
A. Native. This resembles a regulus of bismuth, but consists of smaller scales or plates.
1. Superficial, or in crusts.
2. Solid, and composed of small cubes.
B. In form of calxes.

1. Powdery or friable; Ochra vijmuti. This is of a whitish yellow colour; it is found in form of an effucrecence.

It has been customary to give the name of flowers of bismuth to the pale red calx of cobalt, but it is wrong; because neither the calx of bismuth, nor its solutions, become red, this being a quality belonging to the cobalt.

C. Mineralized bismuth. This is, with respect to colour and appearance, like the coarse teffelated potter's lead ore; but it consists of very thin square plates or flakes, from which it receives a radiated appearance when broken crosswise.

1. With sulphur.
a. With large plates or flakes.
b. With fine or small scales.
2. With sulphurated iron.
a. Of coarse wedge-like scales.

This mineralized bismuth ore yields a fine radiated regulus; for which reason it has been ranked among the antimonial ores by those who have not taken proper care to melt a pure regulus ore deficient of sulphur from it; while others, who make no difference between regulus and pure metals, have still more positively asserted it to be only an antimonial ore.

3. With sulphur and arsene.
a. Of a whitish yellow or ash colour. It has a shining appearance; and is composed of small scales or plates, intermixed very small yellow flakes: It is of a hard and solid texture: Sometimes strikes fire with hard feel: Has a disagreeable smell, when rubbed: Does not effervesce with aqua-fortis; but is partially dissolved by the fame acid (a).
b. Grey, of a striated form; found at Helsingland in Sweden, and at Annaberg in Saxony.
c. With variegated colours of red, blue, and yellow grey; found at Schneeburg in Saxony.
d. With green fibres like an amianthus; at Mifnia in Germany, and at Gillebeck in Norway.
e. With yellow red shining particles, called mines de bismuth Tigrées in French, at Georgeinstadt in Germany, and at Annaberg in Saxony.
f. The mineræ bismuthi arenacea, mentioned by Wallerius and Bomare, belongs also to the same kind of the arseneated ores.

4. By vitriolic acid. This ore is called vijmutum blut by the Germans. It is said to be of a yellowish, reddish, or variegated colour; and to be found mixed with the calx of bismuth, intercrusting other ores. Kirwan, p. 334.

Ufer, &c. of Bismuth. See the article Bismuth. Also Chemistry-Index; and Metallurgy, Part II. sect. x. and Part III. sect. viii.

II.
M I N E R A L O G Y.

a. Its colour comes nearest to that of lead, but it does not so easily tarnish.
b. It shows a texture when it is broken, as if it were compounded of flat pyramids (a).
c. Its specific gravity to water is as 6900 or 7000 to 1000.
d. It melts in the fire before it has acquired a glowing heat; but when it has gained that degree of heat, it burns with a flame of a changeable colour, between blue and yellow. If in an open fire, the calx rifes in form of soft white flowers; but if in a covered vessel, with the addition of some inflammable, it is distilled in a metallic form: in which operation, however, part of it is sometimes found vitrified.
e. It unites with all the metals (b) except bliflemuth and nickel, and makes them volatile. It is, however, not easy to unite it with iron without the addition of sulphur. It has the strongest attraction to gold and copper, and this last metal acquires a yellow colour by it; which has occasioned many experiments to be made to produce new metallic compositions.
f. It is dissolvd by all the acids: of these the vitriolic acid has the strongest attraction to it; yet it does not dissolve it, if it is not previously diluted with much water.
g. Quicksilver amalgamates easier with zinc than with copper, by which means it is separated from compositions made with copper.
h. It seems to become electrical by friction.
Zinc is found,
A. Native.
Zinc has been met with native, though rarely, in the form of thin and flexible filaments, of a grey colour, which were easily inflamed when applied to a fire. And Bomare affirms that he has seen many small pieces of native zinc among the calamine-mines in the duchy of Limbourg and in the zinc-mines at Goslar, where this semimetal was always surrounded by a kind of ferruginous yellow earth, or ochraceous substances. See the detached article Zinc.
B. In form of calx.

(a) It cannot be reduced into power under the hammer like other semimetals. When it is wanted very much divided, it must be granulated, by pouring it while fused into cold water; or filed, which is very tedious, as it fluffs and fills the teeth of the file. But if heated the most possible without fusing it, Macquer afferts, that it becomes so brittle as to be pulverized in a mortar.

(b) It brightens the colour of iron almost into a silver hue; changes that of copper to a yellow or gold colour, but greatly debases the colour of gold and destroys its malleability. It improves the colour and lustre of lead and tin, rendering them firmer, and confequently fitter for sundry mechanic uses. Lead will bear an equal weight of zinc, without losing too much of its malleability.—The process for giving the yellow colour to copper, by the mixture of zinc, and of its ore called calamine, has been described above under the Use of Copper.

(c) The varieties of pseude-galena, or black-jack, are in general of a lamellar or scaly texture, and frequently of a quadrangular form, resembling galena. They all lose much of their weight when heated, and burn with a blue flame; but their specific gravity is considerably inferior to that of true galena. Almost all contain a mixture of lead-ore. Most of them exhale a sulphureous smell when scraped, or at least when vitriolic or marine acid is dropped on them.
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III. Antimony; Antimonium Sibinium. This femimetal is,

a. Of a white colour almost like silver.

b. Brittle; and in regard to its texture, it conflicts Vol. XII.

d. Blackish-brown.

c. Whitish-yellow.

b. Brittle; and in regard to its texture, it consists

c. Reddish-brown.

of shining planes of greater length than breadth.

d. In the fire it is volatile, and volatilizes part of

the other metals along with it, except gold and

platina. It may, however, in a moderate fire,

be calcined into a light-grey calx, which is pretty

refractory in the fire; but melts at last to a glass

of a reddish-brown colour.

e. It dissolves in spirit of fea-salt and aqua-regia,

but is only corroded by the spirit of nitre into

a white calx; it is precipitated out of the aqua­

regia by water.

c. It has an emetic quality when its calx, glafs, or

metal, is dissolved in an acid, except when in the

spirit of nitre, which has not this effect.

f. It amalgamates with quicksilver, if the regulus,

when fused, is put to it; but the quicksilver ought

for this purpose to be covered with warm water:

it amalgamates with it likewise, if the regulus of

antimony be previously melted with an addition

of lime.

Antimony is found in the earth.

A. Native. Regulus antimonii nativus.

This is of a silver colour, and its texture is

compofed of pretty large shining planes.

This kind was found in Carls Ort, in the

mine of Salberg, about the end of the last cen­
tury; and specimens thereof have been preferved

in collections under the name of an arle­nicial

pyrites, until the mine-master Mr Von Swab dis­
covered its real nature, in a treatife he com­
municated to the Royal Academy of Sciences at

Stockholm in the year 1748. Among other re­
markable observations in this treatife, it is said,

first, That this native antimony easily amalga­
mated with quicksilver; doublets, because it was

imbided in limetone; fine, according to Mr

Pott's experiments, an artificial regulus of antio­

mony may, by means of lime, be dipofed to an

amalgamation: Secondly, That when brought

in form of a calx, is shot into cryftals during the

cooling.

B. Mineralized antimony.

(1) With sulphur.

This is commonly of a radiated texture,

compofed of long wedge-like flakes or plates;

it is nearly of a lead-colour, and rough to the

touch.

a. Of coarse fibres.

b. Of small fibres.

c. Steel-grained, from Saxony and Hungary.

d. Cryftallized, from Hungary.

1. Of prismatical, or of a pointed pyramidal

figure, in which last circumference the

points are concentrical.

Cronstedt mentions a specimen of this,
in which the cryftals were covered with

very miniture cryftals or quartz, except at the

extremities, where there was always

a little hole; this specimen was given for

a fio ferri lapar.

(2.) With sulphur and arfenic. Red antimony

ore; Antimonium falace.

This is of a red colour, and has the same

texture with the preceding, though its fibres

are not fo coarse.

R. 

a. With
3. With small fibres.
4. With abrupt broken fibres, from Braunfdorlf in Saxony, and from Hungary.

All antimonial ores are somewhat arsenical, but this is more so than the preceding kinds.

(3.) With sulphurated silver. Plumose silver-ore, or federerz of the Germans.
(4.) With sulphurated silver, copper, and arsene; the dal fabberts of the Germans.
(5.) With sulphurated lead; radiated lead-ore.
(6.) By the aerial acid.

This ore was lately discovered by Mongez, among those of native antimony from the mine of Chalanges in Dauphiny. It consists of a group of white crystallized filaments of a needle-form appearance, diverging from a common centre, like zeolite. They are infoluble in nitrous acid; and, on being urged by the flame of a blow-pipe, upon a piece of charcoal, they are dissipated into white fumes, or antimonial flowers, without any smell of arsene; from whence it follows, that these needle-formed crystals are a pure calx of antimony, formed by its combination with, or mineralized by, the aerial acid. See Kirwan, p. 325, and Journal de Physique for July 1787, p. 67.

Uses, &c. By the name of antimony is commonly understood the crude antimony (which is composed of the metallic part and sulphur) as it is melted out of the ore; and by the name of regulus, the pure semimetal.

1. Though the regulus of antimony is a metallic sublimate, of a considerably bright white colour, and has the splendor, opacity, and gravity of a metal, yet it is quite unmeltable, and falls into powder instead of yielding or expanding under the hammer; on which account it is classed among the semimetals.

2. Regulus of antimony is used in various metallic mixtures, as for printing types, metallic speculums, &c. and it enters into the best sort of pewter ware.

3. It mixes with, and dissolves various metals; in particular it affects iron the most powerfully; and what is very remarkable, when mixed together, the iron is prevented from being attacked by the loadstone.

4. It affects copper next, then tin, lead, and silver; promoting their fusion, and rendering them all brittle and unmeltable; but it will neither unite with gold nor mercury; though it may be made to combine with this last by the interpolation of sulphur. In this case it resembles the common Ethiops, and is hence called antimonial Ethiops.

5. Regulus of antimony readily unites with sulphur and forms a compound of a very faint metallic splendor: it assumes the form of long needles adhering together laterally; it usually forms naturally in this shape. This is called crude antimony.

6. But though antimony has a considerable affinity to sulphur; yet all the metals, except gold and mercury, have a greater affinity to that com-

pound. If therefore iron, copper, lead, silver, or tin, be melted with antimony, the sulphur will unite with the metal, and be separated from the regulus, which, however, takes up some part of the metal, for which reason it is called marial regulus, regulus venum, &c.

7. When gold is mixed, or fatted by the mixture of other metals, it may be fatted with antimony; for the sulphur combines with the base metals, which, being the lighter, rise up into clouds, while the regulus remains united at the bottom with the gold; which being urged by a stronger degree of heat, is freed from the semimetal, which is very volatile. This method of refining gold is the safest of all.

8. But the most numerous purposes to which this metal has been applied are those of the chemical and pharmaceutical preparations. Lemery, in his Treatise on Antimony, describes no less than 200 processes and formulæ; among which there are many good and many useless ones. The following deserve to be mentioned on account of their utility.

9. Antimony melts as soon as it is moderately red hot, but cannot sustain a violent degree of fire, as it is thereby dissipated into smoke and white vapours, which adhere to such cold bodies as they meet with, and are collected into a kind of farina or powder, called flowers of antimony.

10. If it be only moderately heated, in very small pieces, so as not to melt, it becomes calcined into a greyish powder defiluted of all splendor, called calx of antimony. This calx is capable of enduring the most violent fire; but at last it will run into a glass of a reddish-yellow colour, similar to that of the hyacinth. The infusion made of this coloured antimonial glass, in acidulous wine (such as that of Bourdeaux) for the space of 5 or 6 hours, is a very violent emetic.

11. If equal parts of nitre and regulus of antimony be debarculated over the fire, the grey calx which remains is called liver of antimony.

12. If regulus of antimony be melted with two parts of fixed alkali, a mass of a reddish-yellow colour is produced, which being dissolved in water, and any acid being afterwards added, a precipitate is formed of the same colour, called golden sulphur of antimony.

13. Fixed nitre, viz. the alkaline salt that remains after the debarcation of nitre, being boiled with small pieces of regulus of antimony, the solution becomes reddish; and, on cooling, deposits the antimony in the form of a red powder, called mineral kermes.

14. Equal parts of the glass, and of the liver of antimony, well pulverized and mixed with an equal quantity of pulverized cream of tartar, being put into as much water as will dissolve the cream of tartar, and boiled for 12 hours, adding now and then some hot water to replace what is evaporated, the whole is to be filtered while hot; then being evaporated to dryness, the saline matter that remains is the emetic tartar.

15. The regulus of antimony being pulverized, and distilled
distilled with corrosive sublimate of mercury; a thick white matter is produced, which is extremely corrosive, and is called butter of antimony. This thick sub stance may be rendered limpid and fluid by repeated distillations.

16. On mixing the nitrous acid with this butter of antimony, a kind of aqua regia is distilled, called bselforic spirit of nitre.

17. The white matter that remains from this last distillation may be redistilled with fresh nitrous acid; and the remainder being washed with water, is called bowsar mineral, which is neither volatile nor caustic as the antimonial butter. This butter being mixed with water, a precipitate falls to the bottom, which is very improperly called mercu rius vitae, for it is in fact a very violent emetic.

18. But if, instead of the regular, crude antimony be employed, and the same operation be performed, the reguline part separates from the sulphur, unites to the mercury, and produces the substance which is called cinna bar of antimony.

19. Crude antimony being projected in a crucible, in which an equal quantity of nitre is fused, detonates; is calcined, and forms a compound called by the French fondant de Retrou, or antimoine diaphoretique non lavé. This being distilled in hot water, falls to the bottom after it is cold; and after decantation is known, when dry, by the name of diaphoretic antimony. This preparation excites animal perspiration, and is a good sudorific. The same preparation may be more expeditiously made by one part of antimony with two and a half of nitre, mixed together and deflagrated: the residue of which is the mere calx of antimony, void of all emetic power.

20. And if the detonation be performed in a tubed retort, having a large receiver, containing some water adapted to it, both a cyphus of antimony and the antimonial flowers may be obtained at the same time, as Neumann afferts.

21. When nitre is deflagrated with antimony over the fire, the alkaline basis of the nitre unites with the calx of the femimetal, which may be separated by an acid, and is called materia perliata. See farther the article Antimony; also Metallurgy, Part II. sect. ix.

IV. Arfenic. In its metallic form, is,

a. Nearly of the same colour as lead, but brittle, and changes sooner its shining colour in the air, first to yellow, and afterwards to black.

b. It appears laminated in its fractures, or where broken.

c. Is very volatile in the fire, burns with a small flame, and gives a very disagreeable smell like garlic.

d. It is, by reason of its volatility, very difficult to be reduced, unless it is mixed with other metals: However, a regulus may be got from the white arfenic, if it is quickly melted with equal parts of pot ash and soap; but this regulus contains generally some cobalt, most of the white arsenic being produced from the cobalt ores during their calcination. The white arsenic, mixed with a phlogiston, sublimes likewise into octahedral crystals of a metallic appearance, whose specific gravity is 8,308.

e. The calx of arfenic, which always, on account of its volatility, must be got as a sublimation, is white, and easily melts to a glass, whose specific gravity is 5,000. When sulphur is blended in this calx, it becomes of a yellow, orange, or red colour; and according to the degrees of colour it is called orpiment or yellow arsenic; sandarach, re algar, or red arsenic; and also rubius arsenic.

f. This calx and glass are dissoluble in water, and in all liquids; though not in all with the same facility. In this circumstance arsenic resembles the metals: for which reason it also might be ranked in that class.

g. The regulus of arsenic dissolves in spirit of nitre; but as it is very difficult to have it perfectly free from other metals, it is yet very little examined in various menstrua.

h. It is poisonous, especially in form of a pure calx or glass: But probably it is less dangerous when mixed with sulphur, since it is proved by experience, that the men at mineral works are not so much affected by the smoke of this mixture as by the smoke of lead, and that some nations make use of the red arsentic in small doses as a medicine.

i. It unites with all metals, and is likewise much used by nature itself to dissolve, or, as we term it, to mineralize, the metals, to which its volatility and dissolubility in water much greatly contribute. It is likewise most generally mixed with sulphur.

j. It absorbs or expels the phlogiston, which has coloured glasses, if mixed with them in the fire.

Arsenic is found,

[1.] Native; called Scherboen cobalt and Flügelstein by the Germans. It is of a lead colour when fresh broken, and may be cut with a knife, like black lead, but soon blackens in the air. It burns with a small flame, and goes off in smoke.

A. Solid and teffaceous; Scherboen cobalt.

B. Scaly.

C. Friable and porous; Flügelstein.

(1.) With shining figures. This is by some called Spigel cobalt.

[2.] In form of a calx.

A. Pure, or free from heterogeneous substances.

1. Loose or powdery.

2. Indurated, or hardened. This is found in form of white semi-transparent crystals.

B. Mixed.

A. With sulphur.

1. Hardened.

a. Yellow. Orpiment; Auripigmentum.

b. Red. Native realgar, or sandarach.

c. With the calx of tin, in the tin-grains.

d. With sulphur and silver; in the rothgulden or red silver ore.

e. With calx of lead, in the lead-spar.

f. With calx of cobalt, in the efflorescence of cobalt.
Cobalt.

This femimetal is, in a metallic form.

A. With sulphur and iron. Arsenical pyrites or marcasite. These kinds in Cornwall are called silver or white marcasite and plate marcasite.

This alone produces red arsenic when calcined. It is of a deeper colour than the following.

B. With iron only. This differs with regard to its particles; being,

1. Steel-grained.
2. Coarse-grained.
3. Crystalised.

a. In an octahedral figure. This is the most common kind.

b. Prismatical. The sulphurous marcasite is added to this kind when red arsenic is to be made; but in Sweden it is scarcer than the sulphurous arsenical pyrites.

C. With cobalt, almost in all cobalt ores.

D. With silver.

E. With copper.

F. With antimony. See under Silver, Copper, and Antimony, p. 442.

For the Uses of Arsenic, see the detached article on Arsenic, and Chemistry-Index; also Metallurgy, Part II. sect. xii. and Part III. sect. viii.

V. Cobalt.

This femimetal is,

a. Of a whitish grey colour, nearly as fine-tempered steel.

b. Is hard and brittle, and of a fine-grained texture; hence it is of a dully, or not shining appearance.

c. Its specific gravity to water is 6000 to 1000.

d. It is fixed in the fire, and becomes black by calcination; it then gives to glasses a blue colour, inclining a little to violet, which colour, of all others, is the most fixed in fire.

e. The concentrated oil of vitriol, aquafortis, and the spirit of sea salt.

f. When united with the calx of arsenic in a flow (not a brilk) calcining heat, it assumes a red colour: the same colour is naturally produced by way of efflorescence; and is then called the bloom or flowers of cobalt. When cobalt and arsenic are melted together in an open fire, they produce a blue flame.

g. It does not amalgamate with quicksilver by any means hitherto known.

h. Nor does it mix with bismuth, when melted with it, without addition of some medium to promote their union.

[1.] Native cobalt. Cobalt with arsenic and iron in a metallic form.

Pure native cobalt has not yet been found; that which passes for such, according to Kirwan, is mineralised by arsenic. Bergman, however, in his Scagriplia, has entered this present ore under the denomination of native cobalt; and certain it is, that among all the cobaltic ores, this is the nearest to the native state of this femimetal. It always contains a small quantity of iron, besides the arsenic, by which it is mineralised.

This is of a dim colour when broken, and not unlike steel. It is found,

a. Steel-grained, from Loos in the parish of Farila in the province of Helfingeland, and Schneeberg in Saxony.

b. Fine-grained, from Loos.

c. Coarse-grained.

d. Crystalised:

1. In a dendritical or arboreous form.

2. Polyhedral, with shining surfaces.

3. In radiated nodules.

[2.] Calciform cobalt. Cobalt is most commonly found in the earth mixed with iron.

A. In form of a calx.

1.) With iron without arsenic.

a. Loose or friable; cobalt ochre. This is black, and resembles the artificial zaffire.

b. Indurated: Mineral cobalt vitrea. The schlacken or flag cobalt. This is like-wise of a black colour, but of a glassy texture, and seems to have lost that sub stance which mineralised it, by being decayed or weathered.

1.) With arsenical acid; cobalt-blut, Germ. Ochra cobalti rubra; bloom, flowers, or efflorescence of cobalt.

a. Loose or friable. This is often found of a red colour like other earths, spread very thin on the cobalt ores; and is, when of a pale colour, erroneously called flowers of bismuth.

b. Indurated. This is commonly crystallised in form of deep red semitransparent rays or radiations: It is found at Schneeberg in Saxony.

B. Mineralised.

1.) With sulphurated iron.

This ore is of a light colour, nearly resembling tin or silver. It is found crystallised in a polygonal form.

a. Of a flaky texture.

b. Coarse-grained.

This ore is found in Baffngraufa at Raddarhytten in Westmanland, and discovers not the least mark of arsenic. The coarse-grained becomes flimy in the fire, and sticks to the fliring hook during the calcination in the same manner as many regulo do: It is a kind of regule prepared by nature. Both these give a beautiful colour.

2.) With sulphur, arsenic, and iron. This resembles the arseniated cobalt ore, being only rather of a whiter or lighter colour. It is found.

a. Coarse-grained.

b. Crystalised:

1. In a polygonal figure, with shining surfaces, or glanze cobolt. It is partly of a white or light colour, and partly of a somewhat reddish yellow.
M I N E R A L G O Y.

It is very heavy, and of a liver colour, that is, dark red. When pulverized and roasted under a muffle, it forms green excrescences, and smokes; but its smoke has no particular smell: and no sublimate, whether fulphureous or arsenical, can be caught. It is soluble in acids, and the solution is green; but a polished iron plate discovers no copper.

B. In form of a calx. Nickel ochre, acerated nickel.
1. Mixed with the calx of iron. This is green, and is found in form of flowers on kupfernickel.

C. Mineralised.
1. With sulphurated and arsenicated iron and cobalt; kupfernickel. This is of a reddish yellow colour; and is found,
a. Of a flaggy texture.
b. Fine-grained; and
c. Scaly. These two are often from their colour confounded with the liver-coloured marmosite.
2. With the acid of vitriol. This is of a beautiful green colour, and may be extracted out of the nickel ochre, or efflorescence of the Kupfernickel.

For a full account of this semimetal, see the article, Nickel, and Chemistry-Index.

VII. Manganese. Manganesium.
The ores of this kind are in Swedish called brunfen; in Latin sideracum, or magnesia nigra, in order to distinguish them from the magnesia alba officinalis; and in French mangané, &c.
1. Manganese consists of a substance which gives a colour both to glasses and to the solutions of fats, or, which is the same thing, both to dry and to liquid menthias, viz.
a. Borax, which has dissolved manganese in the fire, becomes transparent, of a reddish brown or hyacinth colour.
b. The microcosmic salt becomes transparent with it, of a crimson colour, and moulders in the air.
c. With the fixed alkali, in compositions of glasses, it becomes violet; but if a great quantity of manganese is added, the glass is in thick lumps, and looks black.
d. When scorified with lead, the glass obtains a reddish brown colour.
e. The lixivium of deflagrated manganese is of a deep red colour.
2. It deflagrates with nitre, which is a proof that it contains some phlogiston.
3. When reckoned to be light, it weighs as much as an iron ore of the same texture.
4. When melted together with vitreous compositions, it ferments during the solution: but it ferments in a still greater degree when it is melted with the microcosmic salt.
5. It does not excite any effervescence with the nitrous acid: aqua-regia, however, extracts the colour out of the black manganese, and dissolves likewise a great portion of it, which by means of an alkali is precipitated to a white powder.
6. Such
M I N E R A L O G Y.

6. Such colours as are communicated to glasses by manganese, are easily destroyed by the calx of arsenic or tin: they also vanish of themselves in the fire.

7. It is commonly of a loose texture, so as to colour the fingers like foot, though it is of a metallic appearance when broken.

Manganese is found,

[1.] Native; of the discovery and qualities of which, an account is given under the article Manganese in its alphabetical order. See also Chemistry-Index.

[2.] Calciiform.

A. Loose and friable.

a. Black; which seems to be weathered or decayed particles of the indurated kind.

B. Indurated.

1.) Pure, in form of balls, whose texture consists of concentric fibres. Pura sphærica radiis concentricis.

a. White; very scarce.

2.) Mixed with a small quantity of iron.

a. Black manganese, with a metallic brightness. This is the most common kind, and is employed at the glass-houses and by the potters. It is found,

1. Solid, of a flaggy texture.
2. Steel-grained.
3. Radiated.
4. Crystallised, in form of coherent hemispheres.

VIII. Molybdena.

A. Lamellar and shining, its colour similar to that of the potter's lead ore.

This substance resembles plumbago or blacklead; and has long been confounded with it, even by Crofiedt. But it possesses very different properties; in particular,

1. Its laminae are larger, brighter; and, when thin, slightly flexible. They are of an hexagonal figure.
2. It is of a lead colour, and does not strike fire with hard steel.
3. Its specific gravity is 4.569, according to Kirwan; and 4.785, according to Briffon.
4. When rubbed on white paper, it leaves traces of a dark brown or bluish colour, as the plumbago or black lead does; but they are rather of an argentine gloss; by which circumstance the molybdena, according to Dr d'Arcet, may be easily distinguished from black-lead, as the traces made by this last are of a less brilliant, and of a deeper tinge.
5. In an open fire, it is almost entirely volatile and infufible. Microscopic falt or borax scarcely affect it; but it is acted upon with much effervescence by mineral alkali, and forms with it a reddish mass, which smells of sulphur.
6. It consists of an acid of peculiar nature (see Chemistry-Index) united to sulphur. A small proportion of iron is commonly found in it, but this seems merely fortuitous: 100 parts of molybdena contain about 45 of this acid and 55 of sulphur.

7. It is decomposed either by detention with nitre, or by solution in nitrous acid.

8. This acid is soluble in 570 times its weight of water in the temperature of 60; the solution reddens that of litmus, precipitates sulphur from the solution of liver of sulphur, &c. The specific gravity of the dry acid is 3.450.

9. This acid is precipitable from its solution in water by the Prussian alkali, and also by tincture of galls: the precipitate is reddish brown.

10. If this acid be distilled with three times its weight of sulphur, it reproduces molybdena.

11. The solution of this acid in water unites to fixed alkalies, and forms crystallisable salts; as it also does with calcareous earth, magnesia, and argil: these last combinations are difficultly soluble. It acts also on the base metals, and with them assumes a bluish colour.

12. This solution precipitates silver, mercury, or lead, from the nitrous acid, and lead from the marine, but not mercury.

13. It also precipitates barytes from the nitrous and marine acids, but no other earth. Molybdenous barofelenite is soluble in cold water.

14. This acid is itself soluble in the vitriolic acid by the assistance of heat; and the solution is blue when cold, though colourless while hot; it is also soluble in the marine acid, but not in the nitrous.

15. Molybdena tartar and ammoniac precipitate all metals from their solutions by a double affinity. Gold, sublimate corrosive, zinc, and manganese, are precipitated white; iron or tin, from the marine acid, brown; cobalt, red; copper, blue; alum and calcareous earth, white.

16. This acid has been lately reduced by Mr Hielm; but the properties of the regulus thus obtained are not yet published.

17. Mr Pelletier obtained also the regulus or molybdena, by mixing its powder with oil into a paste, and exposing it with powdered charcoal in a crucible to a very violent fire for two hours. See Chemistry-Index, n. 14, p. 97.

18. This fémimetal being urged by a strong fire for an hour, produces a kind of silvery flowers, like those of antimony.

19. Molybdena is said to be soluble in melted sulphur; which seems highly probable, as sulphur is one of its component parts.

See farther the article Molybdena, and Chemistry-Index.

IX. Wolfram. Wolfrænum, Spuma Lupis, Lat. See the detached article Wolfram.

This mineral has the appearance of manganese, blended with a small quantity of iron and tin.

1. With coarse fibres.

a. Of an iron colour, from Altenberg in Saxony. This gives to the glass compositions, and also to borax and the micrococmic salt, an opaque whitish yellow colour, which at last vanishes.

X. Siderite. See those words in the order of the XI. Saturnite. See also page 12.
THOUGH the Saxa, and fossils commonly called
Petifications, cannot, in all respects, be ranked in a
mineral system, for the reasons formerly given ; yet
as these bodies, especially the latter, occupy a con­
siderable place in most mineral collections, and the
former must necessarily be taken notice of by the miners
in the observations they make in subterranean
generally, it appeared proper to subjoin them in such an
order as might answer the purpose for which they are
regarded by miners and mineralogists.

Order I. Saxa. Petre.

These may be divided into two kinds.
1. Compound Saxa, are stones whose particles, con­
stituting of different substances, are so exactly fitted and
joined together, that no empty space, or even cement,
can be perceived between them ; which seems to indi­
cate, that some, if not all, of these substances have
been soft at the infant of their union.
2. Conglutinated stones, are stones whose particles
have been united by some cementitious substance,
which, however, is seldom perceivable, and which of­
ten has not been sufficient to fill every space between
the particles; in this case the particles seem to have
been hard, worn off, and in loose, single, unfigured
pieces, before they were united.

I. Compound Saxa.

A. Ophites. Scaly limestone with kernels or
bits of ferpentine in it.
1. Kolmord marble. It is white and green.
2. Serpentine antic, is white, with round pieces
of black fleatties in it. This must not be
confounded with the serpentine verde antico.
3. The Haraldji marble. White, with qua­
drangular pieces of a black fleatties.
4. The marmor pinnæ volu di Genova. Dark
green marble, with white veins. This kind
receives its fine polish and appearance from
the serpentine flock.
B. Steiffen or gejtefein. Granitello.
1. Of ditinct particles. In some of these the
quartzose particles predominate, and in others
the micaueous ; in the last case it is com­monly flat, and easy to split.
2. Of particles which are wrappt up in one an­other.
a. Whitish grey.
b. Greenish.
c. Reddish.

(p) Great part of the hill of Bineves in Lochaber is compos'd of a kind of porphyry. It is remarkably fine,
beautiful, and of an elegant reddish colour; "in which (says Mr Williams) the pale rose, the blufh, and the
yellowish white colours, are finely blended and shaded through the body of the flock ; which is of a jelly like
texture, and is undoubtedly one of the finest and most elegant stones in the world. On this hill allo is found a
kind of porphyry of a greenish colour, with a tinge of brownish red. It is smooth, compact, and heavy ; of
a close uniform texture, but has no brightness when broken. It has angular specks in it of a white quartzy
substance."
MINERALOGY.

Part II.

Appendix, Siga.

The name of porfido, the Italians applying the same name also to the black kind.

G. The trap of the Swedes. Saxum compositum jaftide mariali mollis, seu argilla mariali idurata. See the article TRAPP.

This kind of stone sometimes constitutes or forms whole mountains; as, for example, the mountain called Hunnberg in the province of Westergotland, and at Drammen in Norway; but it is often found in form of veins in mountains of another kind, running commonly in a serpentine manner, contrary or across to the direction of the rock itself. It is not homogeneous, as may be plainly seen at those places where it is not prefixed close together; but where it is prefixed close it seems to be perfectly free from heterogeneous substances. When this kind is very coarse, it is interspersed with felsfpat; but it is not known if the finer parts likewise contain any of it. Besides this, there are also some fomes particles in it, and something that resembles a calcareous spar; this, however, does not ferment with acids, but melts as easy as the stone itself, which becomes a black solid glass in the fire. By calcination it becomes red, and yields in affrays 12 or more per cent. of iron. No other fort of ore is to be found in it, unless now and then somewhat merely superficial lies in its fissures; for this stone is commonly, even to a great depth in the rock, cracked in acute angles, or in form of large rhomboidal dice. It is employed at the glass houses, and added to the composition of which bottles are made. In the air it decays a little, leaving a powder of a brown colour; it cracks commonly in the fire, and becomes reddish brown if made red-hot. It is found,

1. Of coarse chaffy particles.
   a. Dark grey.
   b. Black.

2. Coarse-grained.
   a. Dark grey.
   b. Reddish.

3. Of fine imperceptible particles.
   a. Black. The touchstone; Leop hydria.
   b. Bluish.
   c. Grey.
   d. Reddish.

The black variety (3. a.) is sometimes found so compact and hard, as to take a polish like the black agate; it melts, however, in the fire to a black glass; and is, when calcined, attracted by the load-ore.

H. Amphibolite. The carpolithi or fruit-stone rocks of the Germans.

It is a martial Jasper, in which elliptical kernels of calcareous spar and serpentine stone are included.

a. Red, with kernels of white limestone, and of a green fritulites. This is of a particular appearance, and when calcined is attracted by the loadstone; it decays pretty much in the air, and has some affinity with the trap, and also with the porphyry. There are sometimes found pieces of native copper in this stone.

1. The groffen of the Swedes.

Its base is hornblende, interspersed with mica. It is of a dark green colour, and in Smoland is employed in the iron furnaces as a flux to the bog-ore.

K. The granite. Saxum compositum felsfpat, mica et quartzo, quibus accidentaliter interdum horneblenne fitiatun, granatun et bifulatun immixti sunt. Its principal constituent parts are felsfpat, or rhombic quartz, mica, and quartz. See the article GRANITE.

It is found,

1. Loose or friable. This is used at the Swedish brass-works to cast the brass in, and comes from France.

2. Hard and compact.
   a. Red.
      1. Fine-grained.
      2. Coarse-grained.
   b. Grey, with many and various colours (e).

II. Con-

(e) Mr Wiegley has analyzed a species of green granite found in Saxony. The crystals are heaped together, and form very compact layers; the colour sometimes an olive green, sometimes resembling a pear, and sometimes of a reddish brown; some of them being perfectly transparent, and others nearly so. According to Mr Warren, they contain 25 per cent. of iron; whence they have been called green ore of iron. An ounce of these crystals heated red hot in a crucible lost two grains in weight, and became of the colour of honey. The remainder was put into a retort, and distilled with marine acid, with which it evidently effervesced. The residuum was lixiviated with distilled water, fresh muriatic acid added, and the distillation and lixiviation repeated. The iron precipitated from this lixivium, and reduced partly to its metallic state, weighed two drachms. M. Wiegley concludes, that the specimen contained two drams 26 grains of iron. From further experiments he concludes, that 100 parts of the substance contained 30.2 grains of siliceous earth; lime 30.8; iron 28.7; and water and fixed air 4.0.

Scotland is remarkable for a great number of excellent granites, little or nothing inferior to porphyry. Of these the following kinds are mentioned by Mr Williams.

1. The grey granite, or moor-stone as it is called in Cornwall, is very common in this country. In some places it shows no marks of strata; and in others it is disposed in thick unwieldy irregular beds, which are commonly broken transversely into huge masses or blocks of various sizes and shapes. There is a great variety in this kind of stones; some of them differing but little in appearance from basaltes; others are composed of almost equal parts of black and white grains, about the size of small peas, whence it is called peaty oakin by the
II. Conglutinated S mutually.

A. Of larger or broken pieces of stones of the same kind conglutinated together. Brecia.
1. Of limestone cemented by lime.
a. Calcareous breccia; the marni brecciatì of the Italians.
When these kinds have fine colours, they are polished and employed for ornaments in architecture and other economical uses.
b. The lunachèla of the Italians, or shell marbles. These are a compound of shells and coral, which are petrified or changed into lime, and conglutinated with a calcareous substance. When they have many colours, they

the common people. In Galloway and other places it frequently has a longitudinal grain, as if the component parts had been all moved one way by a gentle flow of water. When this kind of granite begins to undergo a spontaneous decomposition by exposure to the atmosphere, we observe that it is composed of pretty large grains of the figures of cubes, rhomboids, &c. Some of them so large as to deserve the name of fragments; and the largest of these are always of quartz or feldspath, and talc.

2. Reddish granite, of a gelatinous texture, which, Mr Williams says, is one of the finest and most elegant stones in the world. The mountains of Binevenus, he says, are principally composed of this stone; and it is found in great abundance in many other parts of Scotland, but he never saw it exhibit any marks of stratification.

3. The fine reddish granite, in which several fine shades of colour are blended together, not spread out in tints as in the former. Neither this nor the former are stratified: "On the contrary (says our author), both exhibit such a degree of uniform regularity, that in some places there is no difference between a stone and a mountain, excepting only in magnitude; as many mountains of granite are nothing more than one regularly uniform mass throughout, in which not the least mark of a bed is to be seen, nor hardly a crack or fissure, unless it be at the edge of some precipice or declivity. These two varieties of elegant red granite are met with in the Highlands and Lowlands of Scotland, in Galloway, and many other places. We often find masses of talc so large in this second variety, that some of them may be called fragments, not disposed in any order, but higgledy-piggledy through the body of the stone.

4. Stratified reddish granite, resembling the third in colour and quality, but not always quite so pure or free from admixture of other fomy matter of a different quality. This variety frequently contains larger and smaller fragments of fine laminated talc. Mr Williams, however, has seen this kind of granite disposed in pretty regular strata in the shires of Moray and Nairn, and other parts of Scotland.

5. Granite of a white and whitish colour, generally of a granulated texture, containing a great quantity of mica, or small-leaved talc, and the grains of quartz sometimes large and angular. This variety is subject to spontaneous decomposition; part frequently dissolves and falls into lakes, in such an exceedingly fine and attenuated state, that it does not sink in the water. "I have found (says Mr Williams) this substance in many places where water had been accidentally drained off, resembling fine shell marble, only much lighter. When thoroughly dry, it is the lightest fossil substance I ever handled; and, when bleached with rain, it is as white as snow. This variety of granite is either not stratified, or exhibits thick irregular beds. It frequently contains a considerable quantity of talc, in masses and scales too large to be called mica.

Our author is of opinion, that this fine white substance found from the decomposition of the granite, is the true kaolin of the Chinese, one of the component parts of porcelain ware. "The authors of the History of China (says he) informs us, that the fine porcelain ware is composed of two different fossil substances, called by them petuntfe and kaolin. We are further told, that the petuntfe is a fine white vitreous stone, compact and ponderous, and of considerable brightness in the inside when broken, which they grind to a fine powder; and that the kaolin is not a stone, but a fine white earthy substance, not vitrifiable, at least not in the heat of a common potter's furnace; that they mix the kaolin and the flour of the petuntfe together, and form a paste of this mixture, which they mould into all sorts of porcelain vessels. Now, from the best accounts of this matter which I have been able to obtain, after a good deal of search and inquiry, it appears to me, that the sediment which I have mentioned above is the true kaolin; and that as the fine white glassy quartz, which is found in irregular masses, and in irregular discontinuous veins or ribs, in some of the rocks of schistus, is the true petuntfe; and if this observation is really true, it deserves to be remarked, that Scotland is as well furnished with the best materials for making fine porcelain as most countries in the world. The species of quartz which I suppose to be petuntfe is of a pure fine uniform glassy texture, semitransparent, and of a pure snowy whiteness. A broken piece of this stone, and a newly broken piece of fine porcelain, are very like one another. There is a great quantity of petuntfe, or pure white quarts, in many places of Scotland, particularly in the north and Highlands. There is a considerable quantity of it upon the shore and washed by the tide between Banff and Cullen, generally in pretty large masses in rocks of blue schistus; and to the best of my memory it is very fine of the kind. There is also a considerable quantity of it in discontinuous ribs and masses, in rocks of blue schistus, about three or four miles north of Callendar in Montrose, upon the side of the high road which runs parallel to Lochleven, which I think also very fine. In some places this sort of quartz is tinged with a flesh colour from the neighbourhood of iron, which renders it unfit for porcelain; but there is plenty to be found of a pure white in almost all parts of Scotland, without any mineral tinge whatever. The petuntfe is perhaps a plentiful in Scotland as the petuntfe, there being many extensive lakes easily drained, which contain a considerable depth of it; and moreover, it is to be found in many places that have been lakes, which are now laid dry by accident. There is a quantity of kaolin about Vol. XII.
they are called marbles, and employed for the same purposes as the preceding (r).


Of this kind specimens from Italy are seen in collections. A coarse jasper breccia is said to be found not far from Frejus in Provence in France.

3. Of siliceous pebbles, cemented by a jaspery substance.

Of one another at first; but they are easily distinguished by trying them with acids, the marle readily effervescing of the kind commonly called potter's ore; and it is likewise remarkable, that there is no other granite in that neighbourhood but this single stratum, all the stones in this neighbourhood but this single stratum, all the stratites in it, it was found not to be marle but kaolin. These substances may easily be mistaken for one another at first; but they are easily distinguished by trying them with acids, the marle readily effervescing with the weakest, and the kaolin not at all with the strongest acid liquors.

6. Grey composite granite is a very beautiful stone, and when broken looks as if composed of small fragments of various sizes and shapes, not unlike calf's-head jelly. When polished, the fragments appear as if set or inlaid in a fine pellucid or water coloured matter. There is a single stratum of very curious composite granite, a little to the west of Lofcithemouth, in the county of Moray, in Scotland, of about six or eight feet thick. It is composed chiefly of grains and fragments of various bright and elegant colours, most of which are as large as peas, and more or less pellucid; all fine, hard, and semi-pellucid; there is about an eighth part of good lead ore in the composition of this stone, of the kind commonly called potter's ore; and it is likewise remarkable, that there is no other granite in that neighbourhood but this single stratum, all the stratites in it, it was found not to be marle but kaolin. These substances may easily be mistaken for one another at first; but they are easily distinguished by trying them with acids, the marle readily effervescing with the weakest, and the kaolin not at all with the strongest acid liquors.

7. Granite of a loose friable texture, subject to spontaneous decomposition, and reduction to granite gravel. There is a remarkable rock of this kind near the Queen's-ferry in Scotland, on the road to Edinburgh, which appears in prodigious thick irregular strata. This rock seems to be composed chiefly of quartz, chert, and fome iron; and produces excellent materials for the high roads.

8. In many parts of the north of Scotland, in the Highlands, and in Galloway, there is found an excellent species of grey granite, composed chiefly of red and black coloured grains. This is a fine and very durable stone, very fit for all kinds of architecture.

In speaking of these stones, Mr Williams observes, that the finer and most elegant red granites, and the finest granite-like porphyries, so much resemble one another, that he does not attempt to distinguish them; and Scotland is remarkable for a great number and variety of them. "The elegant reddish granite of Bineves, near Fort William (says he), is perhaps the best and most beautiful in the world; and there is enough of it to serve all the kingdoms on earth, though they were all as fond of granite as ancient Egypt. There are extensive rocks of red granite upon the sea-shore to the west of the ferry of Ballachulish in Appin, and likewise at Strontian, as well as many other parts of Argyleshire. I have seen beautiful red granite by the road-side, near Dingwall, and in several other parts of the north of Scotland, which had been blown to pieces with gunpowder, and turned off the fields. There are extensive rocks of reddish granite about Peterhead and Sains, and both of red and grey granite in the neighbourhood of Aberdeen. The hill of Cruftell in Galloway, and several lower hills and extensive rocks in that neighbourhood, are of red and grey granite, where there are great varieties of that stone, and many of them excellent. Upon the sea-shore near Kinnedore, west of Lofcithemouth, in Moray, there is a bed of stone about eight feet thick, which I think should be called a composite granite. It is composed of large grains, or rather small pieces of bright and beautiful stones of many different colours; and all the fonsf parts are exceedingly hard, and fit to receive the highest polish. About a sixth or eighth part of it also consists of lead ore, of that species called potter's ore. The separate fonsf parts composing this stratum are all hard, fine, solid, and capable of the most brilliant polish; and if solid blocks can be raised free from all cracks and blemishes, I imagine, from the beauty and variety of colours of the fonsf part, and the quantity of bright lead ore which is blended through the composition and body of the stone, that this would be a very curious and beautiful stone when polished."

(r) The stones called Ludis Helmontii or Paracelsi, have some similarity in their form to the breccia, a. b., for they are composed of various lumps of a marly whitish-brown matter, separated into a great number of polygonous compartments, of various sizes, of a whitish-yellow crust of a red calcareous spar, sometimes...
times pyritous, which often rise a little above the external surface, and inclose each of them on the in side. According to Bomare, the ludas helmontii, found in the county of Kent, is covered with a kind of shelled felinite resembling the zeolite. The rock is for the most part of a globose figure, seldom flat, but often convex on the outside; and sometimes with a concave surface.

According to Wallerius, the ludus helmontii loses by calcination about half of its weight; and, on being urged by fire, is melted into a black glassy flag. It effervesces strongly with aqua-fortis, and this solution is of a yellow colour. But what seems very extraordinary, by adding to it some oil of tartar par deliquium, bubbles are produced, from which a great number of flender black threads or filaments are produced, sticking like a cobweb to the sides and bottom of the vessel.

These stones are found quite separate by themselves, as well as various stalagmites and crustaceous bodies, in the strata of argillaceous earth, in various parts of Europe, chiefly in Lorraine, Italy, England (in the counties of Middlesex and Kent), and elsewhere.

Wallerius ranges the ludus helmontii among the tophi, in the Spec. 425. of his system of Mineralogy. Paracelsus had attributed to these stones a lithontriptic power, and Dr Grew says that they are diuretic; but there is not the least proof of their really possessing such qualities.

(c) The breccia stratatum, or plum pudding-rock, exhibits a singular appearance as it lies in the ground; being composed of water-rounded stones of all qualities and of all sizes, from small gravel up to large rounded stones of several hundreds weight each; the interstices being filled up with lime and sand. It frequently also contains lime and iron. Sometimes it exhibits a grotesque and formidable appearance, containing many large bullets of various sizes and shapes, without any marks of regular stratification, but looking like one vast mass of bullets of unequal thickness; and in this manner frequently swelled to the size of a considerable mountain. It is frequently cemented very strongly together; so that parts of the hills composed of it will frequently overhang in dreadful precipices, less apt to break off than other rocks in the same situation; one reason for which, besides the strength of the cement, is, that the breccia, when composed of bullets, is less subject to fissures and cutters than other rocks; being frequently found in one solid mass of great extent and thickness. Some of the plum pudding-rocks are made up of smaller parts, coming near to the size of coarse gravel. It is evident however, that all the parts of the breccia, whether coarse or fine, have been rounded by agitation in water, as the rocks differ nothing in appearance from the coarser and finer gravel found upon the beach of the sea, excepting only that the parts are strongly cemented together in the rocks, and are loose upon the shores of the ocean.

Some of the breccia is composed of finely rounded stones of various and beautiful colours, about the size of plums or nuts, all very hard and fine. Were this species fawed and polished, it would appear as beautiful and elegant as any stone in Europe; much resembling mosaic work in small patterns.

In general, the breccia is regularly stratified or not according to the size of the component parts of the stone. Such rocks as are composed of round gravel and small bullets are generally very regular in their stratification, while those which contain bullets somewhat larger in size are commonly disposed in thick and coarse beds, and such rocks as are made up of the largest kind of bullets seldom show any marks of stratification at all.

Among many other places in Scotland, where breccia or pudding-stome abounds, there are extensive rocks and high cliffs of it upon the south shore at the west end of the Pentland Frith, to the westward of Thurso in Caithness, which stretch quite across the country of Caithness into Sutherland; and in Sutherland as well as Caithness, this rock is of a rough contexture, and appears in pretty high hills, deep glens, overhanging rocks, and frightful precipices, to the west of Brora, Dunrobin, and Dornoch, which gives it a grotesque and formidable appearance in that country. This range of breccia stretches also quite through Sutherland, and likewise through Ross-shire, the west side of Fardonald, and Dingwall, where it exhibits the very same phenomena as in Sutherland and in Caithness. It continues the same longitudinal line of bearing, which is nearly from north-east to south-west, quite through the highland counties of Inverness and Perthshire; and it forms considerable hills, and very high and rugged rocks, upon both sides of that beautiful piece of fresh water Lochns.

Much of the stone here as well as in other places in this range, is composed of large bullets; the rock is very hard and strong, and it hangs in frightful precipices upon both sides of the lake, through which rock...
far, since their particles are so big and plain as to be easily known from one another. These stones are a proof both of the subversions which the mountains in many centuries have undergone, and of some hidden means which nature makes use of in thus cementing different kinds of stones together. Any certain signs for the kernels or lumps in such compounds, before they deserve the name of breccia, cannot be determined, because that depends on a comparison which every one is at liberty to imagine. In some places, the kernels of porphyry have a diameter of six feet, while in others they are no bigger than walnuts. Sometimes they have a progressive size down to that of a sandstone. Most of this kind of stone is fit for ornaments, though the workmanship is very difficult and costly.

B. Conglutinated stones of granules or sands of different kinds. Sandstone; Lapis arenaceus.

In this division are reckoned those which consist of such minute particles, that all of them cannot easily be discovered by the naked eye. The greatest part, however, consist of quartz and mica; which substances are the most fit to be granulated, without being brought to a powder.

1. Cemented by clay.
   a. With an appyry or refractory clay. This is of a loose texture; but hardens, and is very refractory in the fire.
   b. With common clay.

2. With lime; resembles mortar made with coarse sand.
   a. Consisting of transparent and greenish grains of quartz and white limestone.
   b. Of no visible particles. This is of a loose texture, and hardens in the air.

3. With an unknown cement.
   a. Loose.
   b. Harder.
   c. Compact.
   d. Very hard.

4. Cemented by the rust or ochre of iron. Is found in form of loose stones at several places, and ought perhaps to be reckoned among the Mineraria or sand ores; at least when the martial ochre makes any considerable portion of the whole.

5. Grit-stone. This is of greater or less hardness, mostly of a grey, and sometimes of a yellowish colour; composed of a siliceous and micaceous sand, and rarely of a sparry kind, with greater or lesser particles closely compacted and united by an argillaceous cement. It gives some spark with steel, is indissoluble for the most part in acids, and vitrifiable in a strong fire.

N. B. The argillaceous grit has been before described, p. 89. col. 1.

6. Elastic. A singular species of sandstone, of which a specimen was shown some years ago to the Royal Academy of Sciences at Paris by the Baron de Dietrich. It is flexible and elastic; and consists of small grains of hard quartz, that strike fire with tempered steel, together with some micaceous mixture. The elasticity seems to depend on the micaceous part, and softness of the natural gluten between both. It is said, that this elastic stone was found in Brazil, and brought to Germany by his excellency the Marquis de Lavradio.

There are also two tables of white marble, kept in the palace Borghese at Rome, which have the same property. But the sparry particles of their substanse, though transparent, are rather soft; may be easily separated with the nail, and effervesce with aqua-fortis; and there is also in it a little mixture of small particles of talc or mica. See Journ. de Phys. for 1784, p. 275. See also the article Marble (Elastic.)

C. Stones and ores cemented together; Mineraria arenacea.

1. Of larger fragments.
   a. Mountain green, or viride montanum cupri, and pebbles cemented together, from Siberia.
   b. Potters lead-ore, with limestone, flate-kernels, and shells.
   c. Yellow or marcasital copper ore, with small pebbles.

2. Of smaller pieces.
   a. Potter's lead-ore with a quartzofe sand.
   b. Mountain green with sand from Siberia.
   c. Cobalt ore with sand.
   d. Martial ochre with sand.

Order II. Mineral changes, or Petrifactions.

These are mineral bodies in the form of animals or vegetables, and for this reason no others belong to this order as such as have been really changed from the subjects of the other two kingdoms of nature.

I. Earthy changes; Terra larvata.

A. Extraneous bodies changed into a lime substanse, or calcareous changes; Larva calcarea.

(1.) Loose or friable. Chalky changes; Cretae larvata.
Part II.

MINERALOGY.

Appendix.

Part -1-

a. In form of vegetables.

1. Calcined or mouldered shells; Humus calcareaus.

(2.) Indurated; Petrifia calcaria.

a. Changed and filled with solid limeflone.

1. In form of animals.

b. Changed into a calcarous spar; Petrifia calcaria spar.

1. In form of vegetables.

2. In form of vegetables.

B. Extraneous bodies changed into a flinty substance.

Siliceous changes; Larve siliceae. These are, like the flint,

1. Indurated.

a. Changed into flints.

1. Carnelians in form of shells, from the river Tomm in Siberia.

2. Agat in form of wood. Such a piece is said to be in the collection of Count Toffin.

3. Coraloids of white flint, (Millepora.)


C. Extraneous bodies changed into clay. Argillaceous changes; Larve argilactae.

A. Loose and friable.

1. In form of vegetables.

a. In form of vegetables.

A piece of white porcelain clay from Japan, with all the marks of the root of a tree, has been observed in a certain collection.

b. Changed into a clayy substance, (Millepora.)

2. In form of vegetables.

C. Extraneous bodies changed into a clayy substance.

Argillaceous changes; Larve argilactae.

A. Loose and friable.

1. In an unknown clay.

a. In form of vegetables. Ophiocolla. It is said to be changed roots of the poplar tree, and not to consist of any calcareous substance.

A sort of fofifile ivory is said to be found, which has the properties of a clay; but it is doubtful if it has been rightly examined.

II. Saline extraneous bodies, or such as are penetrated by mineral salts. Corpora peregrina infalata. Larve infalata.

A. With the vitriol of iron.

1. Animals.

a. Human bodies have been twice found in the mine at Falun in Dalarm; the last was kept a good many years in a glass-cape, but began at last to moulder and fall to pieces.

b. In form of vegetables.

These are found in water strongly impregnated with vitriol. They do not burn with a flame, but only like coal in a strong fire; neither do they decay in the air.

B. Extraneous bodies penetrated by mineral inflammable substancess, or mineral phlogiston.

A. Penetrated by the substance of pit-coals.

1. Vegetables, which commonly have been woods, or appertaining to them.

C. Penetrated by sulphur which has dissolved iron, or by marcasite and pyrites. Pyrite impregnata. Petrifia pyritacea.

1. Animals.

a. Human.

b. Bivalves.

c. Univalves.

d. Insects.

IV. Metals in form of extraneous bodies; Larve metalliferae.

A. Silver; Larve argentifera.

(1.) Native.

a. On the surfaces of shells.

(2.) Mineralized with copper and sulphur.

a. Fablertz, or grey silver ore in form of ears of corn, &c. and supposed to be vegetables, are found in argillaceous flake at Frankenberg and Tahlitteren in Heisc.

B. Copper; Larve cuprifera.

(1.) Copper in form of calx.

a. In form of animals, or of parts belonging to them.

1. Ivory and other bones of the elephant.

The Turcois or Turquoise; which is of a bluish green colour, and much valued in the east.

At Simore in Languedoc bones of animals are dug, which during the calcination assume a blue colour; but it is not probable that the blue colour is owing to copper.

(2.) Mineralized copper, which impregnates extraneous bodies; Cuprum mineralifatum corpora peregrina infalata.

a. With sulphur and iron. The yellow or marcasitical copper ore that impregnates.

1. Animals.

a. Shells.

b. In form of fish.

c. With sulphur and silver. Grey silver ore or fablertz, like ears of corn, from the slate- quarries in Heisc.

C. Changes into iron; Larve ferrifera.

(1.) Iron in form of calx, which has assumed the place or the shape of extraneous bodies; Ferrum calciforme corpora peregrina infalata.

a. Loose; Larve ochracea.

1. Of vegetables.

Roots of trees, from the lake Langelma in Finland. See the acts of the Swedifh Academy of Sciences for the year 1742.

b. Indu-
Appendix.  
VOLCANIC PRODUCTS.  

IV. Slags; Scoriae vulcanarum.  
Slags are found in great abundance in many places of the world, not only where volcanoes yet exist, but likewise where no subterraneous fire is now known: Yet, in Mr. Cronstedt's opinion, they cannot be produced but by means of fire. These are not properly to be called natural, since they have marks of violence, and of the last change that mineral bodies can suffer without the destruction of the world: nor are they artificial, according to the universally received meaning of this word. We cannot, however, avoid giving them a place here, especially after having admitted the petrifactions; and shall therefore arrange the principal of them, according to their external marks.  

A. Iceland agate; Achates islandicus niger.  
It is black, solid, and of a glaffy texture; but in thin pieces it is greenish and semitransparent like glafs-bottles, which contain much iron. The most remarkable circumstance is, that such large solid masses are found of it, that there is no possibility of producing the like in any glafs-bottle.  
It is found in Iceland, and in the island of Ascension; The jewellers employ it as an agate, though it is too soft to refit wear.  

B. Rheinish millstone; Lapis molaris Rheinana.  
Is blackish-grey, porous, and perfectly resembles a fort of flag produced by mount Vesuvius. A Appendix. variety of lava, according to Kirwan.  

C. Pumice-stone; Pumex.  
It is very porous and blistered, in consequence of which it is specifically very light. It resembles that frothy flag which is produced in the iron furnaces.  

1. White.  
2. Black.  
The colour of the first is perhaps faded or bleached, because the second kind comes in that slate from the laboratory itself, viz. the volcanoes.  

D. Pearl flag; Scoriae confertes globuli vitreis conglomeratis.  
It is compounded of white and greenish glass particles, which seem to have been conglutinated while yet soft or in fusion. Found on the Isle of Attenfion.  

E. Slag-lard or ashes; Scoriae pulverulentae cinereae vulcanarum.  
This is thrown out from volcanoes in form of larger or smaller grains. It may perhaps be the principle of the Terra Puzzolana; because such an earth is said at this time to cover the ruins of Herculaneum near Naples, which history informs us was destroyed by a volcano during an earthquake.

II. Lava.s.  
Lava has been generally understood to denote the aggregate mass of melted matters which flow out of the mouths, or burst out from the sides, of burning mountains. According to Mr. Kirwan, however, lavas are the immediate produce of liquefaction or vitrification by the volcanic fires, and "should carefully be distinguished from the subsequent productions affected by the water either in a liquid or fluid slate, which generally is ejected at the same time." And of lavas, so distinguished, he describes several varieties. See the article Lava, in the order of the alphabet; where the nature, origin, kinds, and phenomena of lavas, are copiously described and explained.

III. Basaltes.  
This fort of stone was by Cronstedt, in the first edition of his Mineralogy, ranked among the garnet earths, and confounded with the schoers; an improbity which was pointed out by Bergman in his Sciagraphia, sect. 120.—Mr. Kirwan considers basaltes as an imperfect lava, and ascribes its origin both to fire and water. He describes it as found, either, 1. In opaque triangular or polyangular columns; which is the proper basaltes; Or, 2. In amorphous masses of different magnitudes; forming solid blocks, from the smallest fire to that of whole mountains; which kind is called trapp. See the detached article Basaltes (1); where its species and varieties

(1) For the nature, history, theory, &c. of volcanoes, see the article Volcano.  
(1) In that article, p. 45. col. 1. l. 9. dele the words, "The English miners call it cockle, the German schoerl." —P 47 col. 2. l. 28. for "a kind of marble," read "a volcanic production." The Lapis Lydus, or Touchstone, mentioned in the same paragraph, should have been specified to be of the fort called Trapp.
(X) There is a great variety of basaltes in Scotland, particularly of the grey kinds; some of which are capable of the highest degree of polish. A good black kind is met with on the fourth side of Arthur's Seat near Edinburgh, where it forms a smooth perpendicular rock, with several of the columns broken off, and the fissured pieces threatening to fall down upon the passengers below. This stone is capable of receiving a fine polish; and, in the opinion of Mr. Williams, would be fit for all sorts of ornaments upon sepulchral monuments. It will polish to a bright and beautiful black which will be unfading.

There is another kind, heavy and hard, of a black, or blackish-grey colour; of which great quantities have been carried from the Frith of Forth to pave the streets of London. This, for the most part, is coarsely granulated in the inside, though sometimes the grain is pretty fine. Sometimes it is bright in the inside when broken. It is composed of grains of quartz and fihl of different sizes, and commonly contains some iron. It always appears in thick, irregular, beds, some of which are enormously thick; and seldom or never equally so; on the contrary, where it is found uppermost, it frequently swells into little hills of various sizes. Most of the small islands in the Frith of Forth are composed of this kind of stone; as well as some hills in the neighbourhood of Inverkeithing and of Edinburgh.

The known characteristick of the basaltes is to form itself into balls, columns, and other regular figures. The columnar kind assumes a pentagonal, hexagonal or heptagonal figure; but quadrangular columns are not common. They are all smooth on the outside, and lie parallel and contiguous to one another; sometimes perpendicular, sometimes inclining, in proportion to the position of the stratum which is thus divided: If the stratum lies horizontal, the columns are perpendicular; if inclining, the pillars also incline in exact proportion to the declivity of the strata, being always broken right across the stratum. Some are of one piece from top to bottom; others divided by one or more joints laid upon one another, which form a column of several parts. The rock called the Giant's Causeway in Ireland is a pretty good specimen of the jointed columnar basaltes; but there is a more beautiful species above Hillhouse lime-quarry, about a mile south of Linlithgow in Scotland; and a border one near the tower north side of Queen's Ferry, and several other places in Fife. In some places the basaltes are formed into magnificent columns of great length; and in others afford an assemblage of small and beautiful pillars resembling a range of ballustrades or organ pipes. Some of the columns on the fourth side of Arthur's Seat already mentioned are very long; and there are likewise magnificent columns of great length in the island of Egg, and others of the Hebrides. These columns, when broken, are frequently of a black, or blackish grey, in the inside; some of them being composed of small grains, which gives them an uniform and smooth texture; but much of this species of stone has larger grains in its composition, rough, sharp, and unequal, when broken. All the grains, however, are fine, hard, and bright; and the stone in general is capable of a fine polish.

The other species of basaltes which forms itself into distinct masses, assumes sometimes a quadrangular, sometimes an oval, globular, or indeterminate figure. They are found of all sizes from the size of an egg to that of a house; but though they differ in shape from the columnar basaltes, they agree in almost every other respect: whence Mr. Williams thinks that they are only to be accounted a variety of the columnar kind. It is common to see one stratum of the basaltine rocks exhibiting, in one place, regular pillars or globes; and near these, very irregular ones, differing very little from the common cutters found in all rocks; and at no great distance, the same rock is found to run into one entire mass, exhibiting no tendency to be broken or divided into any columns whatever. Of this the rock of Arthur's Seat is an instance. Some of these only produce solid masses of different figures and sizes; while others produce quantities of a softer, friable, flabby matter, of the same quality in which the hard masses of different figures are found imbedded. Pretty good specimens of the second kind or variety of basaltes are met with on the road-side between Crandum bridge and the Queen's Ferry, and in several other places in the Lothians and in Fife.

The crustate basaltes are of two kinds; 1. Such as have the crusts more dry and friable than the internal parts; and, 2. Such as are dry and friable throughout the whole mass.

The first of these has not only a crust of the friable matter adhering to it, but is likewise imbedded in a quantity of the same. Our author has seen many quarries of this kind of basaltes dug for the high roads, in which the quantity of soft friable matter greatly exceeded that of the hard masses, and in which incrusted stones of various sizes and shapes appeared. In such quarries, some of the largest masses have only a few coats of penetrable friable matter, surrounding a nucleus which varies in size, but is uniformly hard throughout; and we shall find other yolks in the same quarry imbedded in the softer matter, which, when broken, exhibit a net of stones including one another like the several coats of an onion. These crustate basaltes which envelope one another are a curious species of stone. The several coats of surrounding matter differ nothing in quality from the stones contained in them, and some of the inner crusts are often very hard; but the nucleus within, though small, is always the hardest. The decomposition by the weathering of the softer matter found surrounding and enveloping the harder masses of stone in this and the second spe-
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The stratification of basaltine rocks, has produced a phenomenon frequently met with in Great Britain, especially in Scotland, which greatly puzzles many. It is very common in low grounds, and upon some moderate eminences, to see a prodigious multitude of stones of all shapes and sizes, very hard, and pretty smooth on the outside. These stones are sometimes so numerous and large, that it is often found impracticable to clear a field of them. Where those stones are a species of basaltine, which they commonly are, and of the second species of basaltine described above, they always originate from a decomposition of the more soft or friable parts of those rocks, which moulder or fall away, and leave the harder stones detached and scattered about, and the decomposed matter diffolves by degrees, and becomes good corn mould.

Here Mr Williams takes occasion to contest the opinion of tho'se who think that stones grow or vegetate like plants. He owns indeed that they increate in bulk; but this, he says, is only in such situations as are favourable for an accretion of matter carried down and deposited by the water; in all other situations they grow less and less. "Others (says he) imagine, that these stones (on which this extraneous matter has been deposited) were rolled about; that the asperities and sharp angles were by that means worn off; and that they were all at last deposited as we see them, by the waters of the universal deluge: and, having their obtuse fides and angles, as if they had been rounded by rolling in water, makes these gentlemen confident that they are right; and if we did not frequently find stones exactly of the same figure, size, and quality in the rock, it would be very difficult to overthrow this hypothesis. I have taken great pains to investigate this point, having frequently examined circumstances; and now think to discover the stratum of rock which those detached stones originally belonged to. "The strata or beds of the several species of basaltine spread as wide, and stretch as far, as the other concomitant strata in the neighbourhood where they are found: but they often lie very flat, or with a moderate degree of declivity; and consequently, when the softer and more friable matter found in the interlaced of these rocks, which incloses and binds the harder masses in their native beds, is decomposed, the harder stones must then lie scattered wide upon the face of the ground."

The second species of the crumated basaltine, viz. that which is dry and friable throughout the whole mass, is generally of a coarse and granulated texture, and of all the various shades of grey colours; from a ruddy black to a light-coloured grey. This kind of crumated basaltine is developed when the masses are either broken or in a state of decomposition; and there are masses of it of all sizes and shapes found in the rocks, resembling the second and third species of the basaltine; appearing alike smooth on the outside, with obtuse angles; and short, resembling the basaltine in every respect: but when they are exposed to the external air and weather for any considerable time, the several incrassations decay, decompose, and crumble down by degrees. When they quarry this species of basaltine for the roads, they are able to break and pound them small with ease; but the harder species are so hard and cohesive, that they are with the greatest difficulty broken into sufficiently small parts.

Composite basaltine resembles the three last species, in figure, colour, and all other external appearances; being distinguishable from them only in the internal structure or grain of the stone. It resembles some of the granites, as confiding of much larger grains than the other basaltine. Many of the larger grains in the composite basaltine are more than an eighth part of an inch over, and some more than a fourth; appearing with smooth flat surfaces, and of a tabulated texture, exactly resembling the quartz of rocks, which forms commonly found in the composition of most of the granites. The chief, if not the only, distinguishable difference between the grains in each of them is the colour. They are evidently large grains of quartz, &c. which exhibit flat shining surfaces in both. Those grains or fragments are commonly white, yellowish, red, or black, in the composition of most of the granites; whereas they are often seen of a pale blue, or a bluish grey colour, in the composite basaltine, and some of them approaching to white. It is only in the internal structure, however, that these basaltine have any resemblance to the granites; in all the external characters, they differ nothing from the rest of their own genus.

A fifth species of basaltine is indurated through the whole stratum, solid and uniform through all its parts, and exhibiting only such cracks and fissures or cutters as are commonly met with in other hard beds of stones. Many beds of this species are frequently met with in the coal-fields, and the miners are often obliged to sink through them in their coal-pits. The Salisbury craigs at Edinburgh (says our author) might be singled out as a good example of this species of stone, were it not that part of the same stratum is formed into columns on Arthur's seat; though, I believe, this is no good exception, as it evidently appears that the beds of basaltine which are formed into columns, globes, &c. only assume those figures where they are exposed to the influence of the external air, or have but little cover of rock above them. When any of those beds strike deep under the cover of several other strata, they are not found in columns, &c. Nothing but an uniform mass then appears, although the same stratum is regularly formed near the surface; which proves that the columnar and other basaltine are formed by thinking and chipping.

The strata of basaltine spread as wide, and stretch as far in the longitudinal bearing, as the other different strata which accompany them in the countries where they are found. The rocks of basaltine also are generally found in very thick strata; and that generally in places where no other rock is found above the basaltine, the strata of it are often very unequal in thicknes. But this, in general, is only in situations where no other rock is found above it; for when it fairly enters into the surface of the earth, so as to have other regular strata above it, which is seen in several places in the Lothians, Fife, and other parts of Scotland, it then appears pretty equal in thicknes, as equal as most other beds of such great thicknes are; and yet it is remarkable, that although most of the strata of basaltine are of great thicknes, there are frequently thin strata.
MINERVA, or PALLAS, in Pagan worship, the goddess of sciences and of wisdom, sprung completely armed from Jupiter's brain; and on the day of her nativity it rained gold at Rhodes. She disputed with Neptune the honour of giving a name to the city of Athens; when they agreed that whosoever of them should produce what was most useful to mankind, should have that advantage. Neptune, with a stroke of his trident, formed a horse; and Minerva caused an olive to spring from the ground, which was judged to be most useful, from its being the symbol of peace. Minerva changed Arachne into a spider, for pretending to excel her in making tapestry. She fought the giants; favoured Cadmus, Ulysses, and other heroes; and refused to marry Vulcan, choosing rather to live in a state of celibacy. She also deprived0 Tiresias of sight, turned Medusa's locks into snakes, and performed several other exploits.

Minerva is usually represented by the poets, painters, and sculptors, completely armed, with a composted but agreeable countenance, bearing a golden bridle, a spear in her right-hand, and heregis or shield in the left, on which is represented Medusa's head encircled with snakes, and her helmet was usually entwined with olives.

Minerva had several temples both in Greece and Italy. The usual victim offered her was a white heifer, never yoked. The animals sacrificed to her were the cock, the owl, and the basilisk.


Minerva Promontorium (anc. geogr.), the seat of the Sirens, a promontory in the Sinus Paetinus, the south boundary of Campania on the Tufcan coast; so called from a temple of Minerva on it: situated to the south of Surrentum, and therefore called Surrentinum. Minervalia, or Pallastium, Minervium, E. Long. 15. 42. N. Lat. 40. 10.

MINERVALIA, in Roman antiquity, celebrated in honour of Minerva, in the month of March; at which time the scholars had a vacation, and usually made a present to their masters, called from this festival Minerval.

MINGRELIA, anciently Colchis, a part of Western Georgia, in Asia; bounded on the east by Iberia, or Georgia properly so called; on the west, by the Euxine Sea; on the north, by Armenia, and part of Pontus; and on the north, by Mount Caucasus. Colchis, or Mingrelia, is watered by a great many rivers; as the Corax, the Hippus, the Cyaneus, the Charisius, the Phasis, where the Argonauts landed, the Abyarus, the Ciffa, and the Ophis, all emptying themselves into the Euxine Sea. The Phasis does not spring from the Mountains in Armenia, near the sources of the Euphrates, the Araxes, and the Tigris, as Strabo, Pliny, Ptolemey, Dionysius, and after them Arrian, Reland, Calmet, and Sanfon, have falsely asserted; but rises in Mount Caucasus, and flows not from south to north, but from north to south, as appears from the map of Colchis or Mingrelia in Thevenot's collection, and the account which Sir John Chardin gives of that country. This river forms in its course a small island called allo Phasia; whence the peacocks, if Ibis is to be credited, were first brought to Europe, and thence called by the Greeks Phalanges. The other rivers of Colchis are considerable. The whole kingdom of Colchis was in ancient times very pleasant and fruitful, as it is still where duly cultivated; abounded in all the necessaries of life; and was enriched with many mines of gold, which gave occasion to the tale of the Golden Fleece and the Argonautic expedition so much celebrated by the ancients.

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Mingrelia. Sir John Chardin tells us, that this country extends above 100 miles in length and 60 in breadth; being not near so extensive as the ancient Colchis, which reached from the frontiers of Iberia or Georgia Proper, westward to the Palus Moesitis: that it is beautifully diversified with hills, mountains, valleys, woods, and plains, but badly cultivated: that there are all the kinds of fruits which are found in England, growing wild, but tasteless and insipid for want of culture: that, if the natives understand the art of making wines, those of this country would be the finest in the world: that there are many rivers which have their sources in mount Caucausus, particularly the Pheafs, now called the Kione: that the country abounds in beeves, hogs, wild boars, flags, and other venison: and in partridges, phaenafs, and quails; that falcons, eagles, pelicans, lions, leopards, tigers, wolves, and jackals, breed on Mount Caucausus, and sometimes greatly annoy the country: that the people are generally handlime, the men strong and well made, and the women very beautiful; but both sexes very vicious and debauched: that they marry their nieces, aunts, or other relations, indifferently: and take two or three wives if they please; and as many concubines as they require to be viewed very near.

The cities of most note in this country in ancient times were Pitius; Dioscurias, or Dioecorias, which was so called from Caftor and Pollux, two of the Argonauts, by whom it is supposed to have been founded, and who in Greek are styled Dioecoras, at present known by the name of Savatapoli; Aeons the Phaeis, supposed to be the same as Hupolis; Phafs, so called from the river on which it flowed; Cyta, at the mouth of the river Cyaneus, the birth place of the famous Medea, called from thence, by the poets, Cydæs; Saraces, Zadrís Surium, Madiæ, and Zollia. As for modern cities, it does not appear that there are any here considerable enough to merit a description; or, if there are, they seem to be little, if at all, known to Europeans.

MINHO, a great river in Spain, which taking its rise in Galicia, divides that province from Portugal, and falls into the Atlantic at Caminha.

MINIATURE, in a general sense, signifies representation in a small compass, or less than the reality.

MINIATURE-Painting;

A DELICATE kind of painting, consisting of little points or dots; usually done on vellum, ivory, or paper, with very thin, simple water-colours.—The word comes from the Latin minium, “redlead;” that being a colour much used in this kind of painting. The French frequently call it mignature, from mignon, “fine, pretty;” on account of its smallness and delicacy: and it may be ultimately derived from minus “small.”

Miniature is distinguished from other kinds of painting by its smallness and delicacy of its figures and paitnjes of the colouring; on which account it requires to be viewed very near.

SECTION I. Of Drawing and designing.

To succeed in this art, a man should be perfectly skilled in the art of designing or drawing: but as most people who affect the one, know little or nothing of the other, and would have the pleasure of painting without giving themselves the trouble of learning to design (which is indeed an art that is not acquired without a great deal of time, and continual application), inventions have been found out to supply the place of it; by means of which a man designs or draws, without knowing how to design.

The first is chalking: that is, if you have a mind to do a print or design in miniature, the backside of it on another paper, must be blackened with small-coal, and then rubbed very hard with the finger wrapped in a linen cloth: afterwards the cloth must be lightly drawn over the side so blackened that no black grains may remain upon it to soil the vellum you would paint upon; and the print or draught must be fastened upon the vellum with four pins, to keep it from fluffing. And if it be another paper that is blackened, it must be put between the vellum and the print, or draught, with the blackened side upon the vellum. Then, with a blunted pin or needle, you must pass over the principal lines or strokes of the print, or draught, the contours, the plates of the drapery, and over every thing else that must be distinguished; pressing so hard, that the strokes may be fairly marked upon the vellum underneath.

Copying by squares is another convenient method for such as are but little skilled in the art of designing, and would copy pictures, or other things, that cannot be chalked. The method is this: The piece must be divided
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To divide a paper or vellum into equal parts, mark off with charcoal; if the piece be clear and white, and the black can be fairly seen upon it; or with white chalk, if it be too brown and dull. After which, as many squares of equal dimensions must be made upon white paper, upon which the piece must be designed; because, if this be done immediately upon vellum, (as it will be chalked upon the vellum upon the back of it;) the vellum may be foiled with taffe touches. But when it is neatly done upon paper, it must be chalked upon the vellum in the manner before described. When the original and the paper are thus ordered, observe what is in each done upon paper, it is one is apt to find where to place the parts of the piece to be drawn upon your piece; through it you will see drawn upon the varnished paper, bladder, or silver needle, mark out upon the paper or vellum you have put uppermost, all the lines and touches you shall see drawn upon the varnished paper, bladder, tale, or ifinglass, you have made use of, and which will plainly appear through this window.

After this manner, making use of the window, or of glafs exposed to the light, you may copy all sorts of prints, designs, and other pieces, on paper or vellum; laying and fastening them under the paper or vellum upon which you would draw them. And it is a very good and very easy contrivance for doing pieces of the same size and proportion.

If you have a mind to make pieces look another way, there is nothing to be done but to turn them; laying the printed or drawn side upon the glass, and fastening the paper or vellum upon the back of it; remembering to let your lights fall on the left side.

A good method likewise to take a true copy of a picture in oil, is to give a touch of the pencil upon all the principal strokes, with lake tempered with oil; and to clap upon the whole a paper of the same size; then passing the hand over it, the touches of the lake will stick and leave the design of your piece expressed upon the paper, which may be chalked like other things. But you must remember to take off with the crumb of bread what remains of the lake upon the picture before it be dry.

You must likewise make use of pounce, made of powdered charcoal put in a linen-rag; with which the piece you would copy must be rubbed, after you have pricked all the principal strokes or touches, and fastened white paper or vellum underneath.

But aurer and easier help than all these, for one who knows nothing of designing, is a mathematical compass; it is generally made of ten-pieces of wood, in form of rulers, half a quarter of an inch thick, half an inch broad, and a foot long, or more, according as you have a mind to draw pieces of a greater or less size. To facilitate the construction of this instrument, a figure is given, with an explanation of the manner in which it is to be used.

The little board A is to be of fir, and covered with linen or any other cloth; because the piece you copy, and the vellum or paper you copy upon, must be fixed upon it. Upon this board must the compass also be fixed with a pin, by the end of the fir foot B, deep enough to keep it close, but so deep as to hinder it from turning easily. When you have a mind to reduce things, place your original on the side of the foot C, and the vellum or paper you would draw upon on the side of the foot B; removing the vellum, or drawing it nearer, according as you intend to reduce or enlarge.

In order to enlarge a piece, you have nothing to do but to change the places of your original and your copy: placing the left towards C, and the other on the side of B.

And in both one and the other method, a crayon or leaden needle must be put in the foot under which the vellum lies; and a pin, a little blunted, in that over the original, with which all the traces are to be followed; conducting the pin with one hand, and with the other pricking gently upon the crayon or needle that marks the vellum. When the crayon or needle bears sufficiently upon the vellum, you have no occasion to touch it.

By this instrument you may also draw in equal dimensions; but in order to this, the compass must be fixed in another manner upon the board; for if it is to be fastened upon it by the middle at D, your original and your copy must be fixed on each side of this middle foot, at the equal distances, or from corner to corner: that is, from C to E, when the pieces are large. One may likewise draw several copies at once of equal and different dimensions.

When your piece is marked out upon the vellum, you must pass with a pencil of very clear carmine over all the traces, to the end they may not be effaced as you work: then clean your vellum with a crumb of bread, there will no black may remain upon it.

Your vellum must be paffed upon a little plate of brafs or wood, of the size you would make your piece, to keep it firm and tight: but this passi ng must be on the edges of your vellum only, and behind the plate; for which purpose your vellum must exceed your plate above an inch on every side: for the part you paint upon must never be paffed; because it would not only give it an ill look, but you could not take it off if you would. Cut off the little flags and locks of the vellum; and wetting the fair side with a linen-cloth dipped in water, clap the other upon the plate with a clean paper between them: so much as hangs over must be paffed upon the back of the plate, drawing it equally on all sides, and hard enough to stretch it well.

SECT. II. Of Materials.

The chief colours made ufe of for painting in miniature, are

Carmine.

Venice and Florence lake.

Rose
MINIATURE-PAINTING.

Colours.

Rose pink.
Vermilion.
Red-lead.
Brown red.
Red ochre.
Ultramarine.
Verditer.
Indigo.
Gall-tone.
Yellow-ochre.
Dutch pink.
Gamboge.
Naples yellow.
Pale mallicot.
Deep yellow mallicot.
Ivory-black.
Lamp-black.
True Indian ink.
Bilfre, or wood-foot.
Raw umber.
Burnt umber.
Sap-green.
Verdigris.
Flake-white.
Crayons of all colours.
Gold and silver shells.
Leaf-gold and leaf-silver.

The seven transparent colours, which are used where writing is seen through the colour.

Lake.
Blue.
Yellow.

Liquid

Grafs-green.
Dark-green.
Purple-colour.
Brown.

Most of these colours necessary for miniature-painting may easily be prepared by attending to the directions given under the article Colour-Making.

As colours taken from earth and other heavy matter are always too coarse, be they never so well ground, especially for delicate work, because of a certain sand remaining in them; the finest parts may be drawn out by diluting them with the finger in a cup of water. When they are well steeped, let them settle a while: then pour out the clearest, which will be at top, into another vessel. This will be the finest, and must be let dry; and when it is used, must be diluted with gum-water.

If you mix a little of the gall of an ox, a carp, or an eel, particularly of the last, in green, black, grey, yellow, and brown, colours, it will not only take away their greasy nature, but also give them a lustre and brightness they have not of themselves. The gall of eels must be taken out when they are skinned, and hung upon a nail to dry; and when you would use it, it must be diluted with brandy; add a little of it mixed with the colour you have diluted already. This likewise makes the colour fir better to the vellum, which it hardly does when it is greasy: moreover, this gall hinders it from sealing.

Some colours are made clearer by fire; as yellow ochre, brown red, ultramarine, and umber: all others are darkened by it. But if you heat the said colours with a sharp fire, they change; for the brown-red becomes yellow; yellow ochre becomes red; umber reddens also. Ceru's by fire takes the colour of citron, and is often called mastic. Observe, that yellow ochre heated, becomes more tender than it was, and softer than brown red. Likewise brown red heated becomes softer than fine yellow ochre. Both are very proper. The finest and truest ultramarine, heated upon a red-hot iron, becomes more glittering; but it wanters, and is coarser and harder to work with in miniature.

All these colours are diluted in little cups of ivory, made upon purpose, or in sea-shells, with water in which gum arabic and sugar-candy are put. For instance, in a glass of water put a piece of gum as big as a walnut, and half that quantity of sugar-candy. This last hinders the colours from scaling when they are laid on, which they generally do when they want it, or the vellum is greasy.

This gum-water must be kept in a neat bottle corked; and you never must take any out of it with a pencil that has colour upon it, but with a quill or some such thing.

Some of this water is put in the shell with the colour, you would temper, and diluted with the finger till it be very fine. If it be too hard, you must let it often in the shell with the said water before you dilute it. Afterwards let it dry; and do thus with every colour, except lily-green, sap-green, and gamboge, which must be tempered with fair water only. But ultramarine, lake, and bilfre, are to be more gummned than other colours.

If you make use of sea-shells, you must let them steep two or three days beforehand in water; then cleanse them in boiling hot water, mixed with vinegar, in order to carry off a certain salt, which otherwise sticks to them, and spoils the colours that are put to them.

To know whether colours are sufficiently gummned, you have nothing to do but to give a stroke of the pencil upon your hand when they are diluted, which dries immediately; if they chap and scale, there is too much gum; if they rub out by passing the finger over them, there is too little. It may be seen likewise when the colours are laid on the vellum, by passing the finger over them. If they flick to it like a powder, it is a sign there is not gum enough, and more must be put to the water with which you temper them: but take care you do not put too much; for that makes the colour extremely hard and dry. It may be known likewise by their glueness and brightness: so the more they are gummned, the darker they paint; and when you have a mind to give a greater strength to a colour than it has of itself, you have nothing to do but to give it a great deal of gum.

Provide yourself with an ivory pallet, very smooth, as big as your hand; on one side of which the colours for the carnation, or naked parts of a picture, are to be ranged in the following manner. In the middle put a great deal of white, pretty largely spread; because it is the colour most made use of: and upon the edges, from the left to the right, place the following colours at a little distance from the white.

Mallicot.
Dutch-pink.
Orpiment.

Yellow
Let us now shew how they are to be employed. In the first place, then, when you would paint a piece, be it carnation, drapery, or any thing else, you must begin by dead-colouring; that is to say, by laying your colours on with liberal strokes of the pencil, in the smoothest manner you can, as the painters do in oil; not giving it all the force it is to have for a finishing; that is, make the lights a little brighter, and the shades less dark, than they ought to be; because in dotting upon them, as you must do after dead-colouring, the colour is always fortified, and would at last be too dark.

There are several ways of dotting; and every painter has his own. Some make their dots perfectly round; others make them a little longish; others hatch by little strokes that cross each other every way, till the work appears as if it had been wrought with dots. This last method is the belt, the boldest, and the soonest done: wherefore such as would paint in miniature ought to use it, and to inure themselves from the fink to dot in the plump and the soft way; that is to say, where the dots are loft, in a manner, in the ground upon which you work, and not so much as to make the work seem dotted. The hard and the dry way is quite the reverse, and always to be avoided. This is done by dotting with a colour much darker than your ground, and when the pencil is not moistened enough with the colour, which makes the work seem rough and uneven.

Study likewise carefully to lufe and drown your colours one in another, so that it may not appear where they disjoin; and to this end, soften or allay your colours with colours that partake of both, in such a fort that it may not appear to be your touches which cut and disjoin them. By the word cut, we are to understand what manifestly separates and divides, and does not run in and blend itself with the neighbouring colours; which is rarely practised but upon the borders of drapery.

When your pieces are finished, to heighten them a little, give them a fine air; that is to say, give, upon the prematurity of the lights, small touches with a colour yet lighter, which must be lost and drowned with the rest.

When the colours are dry upon your pallet or in your shells, in order to use them, they must be diluted with water. And when you perceive they want gum, which is seen when they easily rub off the hand or the vellum if you give a touch with them upon either, they must be tempered with gum-water instead of pure water, till they are in condition.

There are several sorts of grounds for pictures and portraits. Some are wholly dark, composed of bistre, umber, and Cologn earth, with a little black and white; others more yellow, in which is mixed a great deal of ochre; others greyer, which partake of indigo. In order to paint a ground, make a wash of the colour or mixture you would have it, or according to that of the picture or portrait you would copy; that is to say, a very light lay, in which there is hardly any thing but water, in order to soak the vellum. This put another lay over that, somewhat thicker, and strike it on very smoothly with large strokes as quick as you can, not touching twice in the same place before it be dry; because the second stroke carries off what
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When there are clouds in the sky, you may spare the places where they are to be; that is to say, you need not lay on any blue there, but form them, if they are reddish, with vermilion, gall-stone, and white, with a little indigo; and if they are more upon the black, put in a good deal of the left; painting the lights of one and the other with maflicot, vermilion, and white, more or less of any of these colours, according to the strength you would give them, or according to that of the original you copy; rounding the whole as you dot; for it is a difficult matter to lay them very smooth at the first painting: and if the sky is not even enough, you must dot it also.

It is at your pleasure to exempt the places of the clouds, for you may lay them upon the ground of the sky; heightening the bright parts by putting a good deal of white, and fortifying the shadows by using less. This is the shortest way.

The light or stormy sky is done with indigo, black, and white, mixed together; which is laid as for a day-sky. To this mixture must be added ochre, vermilion, or brown-red, for the clouds; the lights of which are to be of maflicot, or red-lead, and a little white; now redder, now yellower, at discretion. And when it is a tempestuous sky, and lightning appears in some places, be it blue or red, it is to be done as in a day-sky, drowning and losing the whole together at the first forming or dead-colouring, and at the finishing.

SECT. IV. Of Draperies.

To paint a blue drapery, put ultramarine near the white upon your pallet; and mix a part of the one with the other, till it makes a fine pale, and has a body. With this mixture you must form the brightest parts; and then adding more ultramarine, form such as are darker; and go on after this manner till you come to the deepest plaits and the thickest shades, where you must lay pure ultramarine: and all this must be done as for a first-forming or dead-colouring; that is to say, laying the colour on with free strokes of the pencil, yet as smooth as you can; losing the lights in the shadows with a colour neither so pale as the light nor so dark as the shades. Then dot with the same colour as in the first-forming, but a small matter deeper; that the dots may be fairly seen. All the parts must be drowned one in another, and the plaits appear without intercession. When the ultramarine is not dark enough to make the deeper shadows, how well ever it be gummed, mix a little indigo with it to finish them. And when the extremities of the lights are not bright enough, heighten them with white and a very little ultramarine.

A drapery of carmine is done in the same manner as the blue; except that in the darkest places there is to be a lay of pure vermilion, before you dead-colour with carmine, which must be applied at top; and in the strongest shades, it must be gummed very much. To deepen it the more, mix a little bitre with it.

There is likewise made another red drapery, which is first drawn with vermilion, mixing white with it to dead-colour the bright places, laying it pure and unmixed for those that are darker, and adding carmine.
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The light-grey is begun with black and white, and finished with the same colour deeper.

For a brown drapery, make a lay of bistre, white, and a little brown red; and shadow with this mixture, made a little: darker.

There are other draperies, called "variable," because the lights are of a different colour from the shades. These are multil; used for the vestments of angels, for young and gay people, for scarfs and other airy attire, admitting of a great many folds, and flowing at the pleasure of the wind. The most common are the violets; of which they make two sorts; one, where the lights are blue; and the other, where they are yell w.

For the first, put a lay of ultramarine and very pale white upon the lights; and shadow with carmine, ultramarine, and white, as for drapery wholly violet; so that only the grand lights appear blue. Yet must be dotted with violet, in which there is a great deal of white, and loft incendiary in the shades.

The other is done by puttiug upon the lights only, instead of blue, a lay of mastic; working the rest as in the drapery all violet, excepting that it must be dotted, and the light parts blended with the shadowy, that is, the yellow with the violet, with a little gamboge.

The carmine-red is done like the last; that is, let the lights be done with mastic, and the shades with carmine; and to lose the one in the other, make use of gamboge.

The lake-red is done like that of carmine.

The green is done as the lake; always mixing verditer with lily or sap green, to make the shades; which are not very dark.

Several other sorts of draperies may be made at discretion, always taking care to preserve the union of the colours, not only in one sort of cloth or so, but also in a group of several figures; avoiding, as much as the subject will allow, the putting of blue near the colour of fire, of green against black; and so of other colours which cut and disjoin, and whose union is not kind enough.

Several other draperies are made of soul colours, as brown-red, bistre, indigo, &c. and all in the same manner. Likewise of other colours, simple and compound; the agreement between which is always to be minded, that the mixture may produce nothing harsh and disagreeable to the eye. No certain rule can be laid down for this. The force and effect of your colours are only to be known from use and experience, and you must work according to that knowledge.

Linen cloths are done thus. After drawing the plaits or folds, as is done in a drapery, put a lay of white over all; then dead-colour and finish the shades with a mixture of ultramarine, black, and white, using more or less of the last, according to their strength or tenderness; and in the greatest deepnings put bistre, mixed with a little white; giving only some touches of this mixture, and even of pure bistre, upon the extremities of the greatest shadows, where the folds must be drawn, and lost with the rest.

They may be done in another manner, by making a general lay of this mixture of ultramarine, black, and
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and very pale white; and dead-colour (as has been
said before) with the same colour, but a little deeper.
And when the shades are dotted and finished, heighten
the lights with pure white, and lose them with the
deepenings of the linen. But of whatever sort you
make them, when they are finished, you must give a
yellowish tint of orpiment and white to certain places;
laying it lightly on, and as it were in water; so that
what is underneath may, notwithstanding, plainly
appear, as well the shadows as the dotting.

Yellow linen-cloth is done by putting a lay of
white, mixed with a little ochre. Then form and fi-
nish the shades with bistre, mixed with white and
ochre; and in the thickest shades use pure bistre: and
before you finish, give some teints here and there of
ochre and white, and others of white and ultramarine,
as well upon the shades as the lights; but let them
be very bright: and drown the whole together in dot-
tings, and it will look finely. As you finish, lighten
the extremities of the lights with malficlot and white.
You may add to this fort of linen, as well as to the
white, certain bars from space to space, as in Turkey-
mantua; that is, small stripes blue and red with ul-
tramarine and carmine; one of red between two of
blue, very bright and clear upon the lights, and deeper
upon the shades. Virgins are very often dressed
with veils of this fort (by Popish painters), and scurf
of this kind are put about necks that are bare; be-
cause they become the teint mighty well.

If you would have both these sorts of linen transpa-
rent, and the stuff or other thing that is beneath ap-
pear through them, make the first lay for them very
light and clear, and mix in the colour to shadow, with,
a little of that which is underneath, especially towards
the end of the shades; and only do the extremities of
the lights, for the yellow with malficlot and white;
and for the white, with pure white.

They must be drawn in another manner, especially
when you would have them altogether as clear as muf-
lin, lawn, or gauze. To this end form and finish what
is to be beneath, as if nothing was to be put over it.
Then mark out the light and clear folds with white or
malficlot; and a shadow with bistre and white, or
with black, blue, and white, according to the colour
you would make them of; making the rest somewhat
clearer: yet this is not necessary but for the parts that
are not to be so clear.

Crape is done the same way; excepting that the
folds of the shades and the lights, and the borders too,
are to be marked out with little filaments of black upon
what is underneath; which is likewise to be finis-
ed beforehand.

When you would make a stuff like watered tab-
by, make the waves upon it with a colour a little
lighter, or a little darker, in the lights and the shades.

There is a manner of touching draperies which dif-
tinguishes the filkens from the woollens. The last are
more terrestrial and senible; the others more light
and fading. But it must be observed that this is an
effect which depends partly upon the stuff and partly
upon the colour; and for the employing these in a
manner suitable to the subjects and the deepenings
of painting, we shall here touch upon their different qua-

ties.

We have no colour which partakes more of light,
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Of Carnations.

For doing a building, if it be of stone, take indigo, bistre, and white, with which make the beginning or first form of it; and for shadowing it, put lefs of this last, and more bistre than indigo, according to the colour of the tone you would paint. To these you may likewise add a little ochre, both for the forming and the finishing. But to make it finer, you must give, here and there, especially for old fabrics, blue and yellow teints, some with ochre, others with ultramarine, mixing always white with them, whether before the first-forming, provided they appear through the draught, or whether upon it, losing or drowning them with the rest when you finish.

When the building is of wood, as there are many forts, it is done at discretion; but the most ordinary way is to begin or first-form with ochre, bistre, and white, and finish without, or with very little; and if the shades are deep, with pure bistre. In the other they add sometimes vermilion, sometimes green or black; in a word, just according to the colour they would give it, and they finish with dotting, as in draperies and every thing else.

Sect. V. Of Carnations, or the naked parts of Painting.

There are in carnation so many different colourings, that it would be a difficult thing to give general rules upon so variable a subject. Nor are they minded, when one has got, by custom and practice, some habit of working easily: and such as are arrived to this degree, employ themselves in copying their originals, or else they work upon their ideas, without knowing how: insomuch, that the most skilful, who do it with less reflection and pains than others, would likewise be more put to it to give an account of their maxims and knowledge in the matter of painting, if they were to be asked what colours they made use of for the shades and such a colouring, a tint here, and another there.

Nevertheless, as beginners want some instruction at the first, we will shew in general after what manner several carnations are to be done.

In the first place, after having drawn your figure with carmine, and ordered your piece, apply, for women and children, and generally for all tender colourings, a lay of white, mixed with a very little of the blue made for faces, of which we have told the composition; but let it hardly be seen.

And for men, instead of blue, they put in this first lay a little vermilion; and when they are old, a little ochre is mixed with it.

Afterwards follow all the traces with vermilion, carmine and white, mixed together; and begin all the shades with this mixture, adding white in proportion as they are weaker; and putting but little in the darkest, and none, in a manner, in certain places where strong touches are to be given: for instance, in the corner of the eye; under the nose; at the ears; under the chin; in the separation of the fingers; in all joints; at the corners of the nails; and generally in every part where you would mark out separations in shades that are obscure. Neither need you fear to give to those places all the force and strength they ought to have as soon as you begin or first-form them, because in working at top with green, the red you have put there is always weakened.

After having begun, or first-formed, or dead-coloured, with red, make blue teints with ultramarine and a great deal of white, upon the parts which fly from the eye; that is to say, upon the temples; under and in the corners of the eyes; on both sides of the mouth, above and below; a little upon the middle of the forehead; between the nose and the eyes; on the side of the cheeks; on the neck and other places where the flesh assumes a bluish cast. Yellowish teints are likewise made with ochre or orpiment, and a little vermilion mixed with white, under the eye-brows, on the sides of the nose towards the bottom, a little underneath the cheeks, and upon the other parts which rise and come nearer the eye. It is especially from these teints that the natural complexion is to be observed, in order to catch it for painting being an imitation of nature, the perfection of the art consists in the justness and simplicity of the representation, especially in face-painting.

When, therefore, you have done your first lay, your dead colouring, and your teints, you must work upon the shades, dotting with green for the carnations or naked parts, mixing according to the rule we have given for the teints, a little blue for the parts which fly from the eye; and, on the other hand, making it a little yellower for those that are more sensible; that is to say, which rise, and come nearer the eye: and at the end of the shades, on the side of the light, you must blend and lose your colour insensibly in the ground of the carnation with blue, and then with red, according to the places where you paint. If this mixture of green does not work dark enough at first, pass over the shades several times, now with red, and now with green; always dotting: and this do till they are as they should be.

And if you cannot with these colours give the shades all the force they ought to have, finish, in the darkest, with bistre mixed with orpiment, ochre, or vermilion, and sometimes with pure bistre, according to the colouring you would make, but lightly, laying on your colour very clear.

You must dot upon the clear and bright places with a little vermilion or carmine, mixed with much white, and a very small matter of ochre, in order to lose them with the shadowy, and make the teints die away insensibly into one another; taking care, as you dot, or hatch, to make your strokes follow the turnings and windings of the fleshy parts. For though the rule be to cross always, this dotting or hatching ought to appear a little more here, because it rounds the parts. And as this mixture might make a colouring too red, if it was always to be used, they work likewise in every part, to blend the teints and the shades, with blue and a little green, and much white, so mixed as to be very pale; excepting, nevertheless, that this colour must not be put upon the cheeks, nor upon the extremities of the clear parts, no more than the other mixture upon these last, which must be left with all their light; as certain places of the chin, of the nose, and of the forehead, and upon the cheeks; which ought nevertheless to be redder than the rest, as well as the feet, the hollows of the hands, and the fingers of both.
Observe, that these two last mixtures ought to be so pale, that the work shall hardly be visible; for they serve only to soften it; to unite the teints with one another, and the shades with the lights, and to drown the traces. Care must likewise be taken that you work not too much with the red mixture upon the blue teints, nor with the blue upon the others; but change the colour from time to time, when you perceive it works too blue or too red, till the work be finished.

The white of the eyes must be shadowed with this same blue, and a little flesh-colour; and the corners, on the side of the nose, with vermilion and white; giving them a little touch of carmine. The whole is softened with this mixture of vermilion, carmine, white, and a very small matter of ochre.

The apples or balls of the eyes are done with the mixture of ultramarine and white; the lids with indigo, bistre, or black, according to the colour they are of; giving to each a small touch of pure vermilion round the middle, called the crysal of the eye; and especially the upper ones, which must be heightened by little strokes of blood, or for the finishing. This gives vivacity to the eye.

The round or circumference of the eye is done with bistre and carmine; that is to say, the fists or partings, and the eye-lids, when they are large and bold; especially the upper ones; which must afterwards be softened with the red or blue mixtures we have mentioned above, to the end they may be lost in one another, and nothing seem interfected. When this is done, give a little touch of pure white upon the crysal, on the side of the eyes. This makes the eye shine, and gives life to it.

The mouth is dead-coloured with vermilion, mixed with white; and finished with carmine, which is softened as the rest. And when the carmine does not work dark enough, mix a little bistre with it. This is to be underflood of the corners in the separation in the lips; and particularly, of certain mouths half open.

The hands, and all the other parts of carnation, are done in the same manner as the faces; observing, that the ends of the fingers be a little redder than the rest. When your whole work is formed and dotted, mark the separations of all the parts with little touches of carmine and orpiment mixed together, as well in the shades as in the light places; but a little deeper and stronger in the first, and lost in the rest of the carnation.

The eye-brows and the beard are dead-coloured, as are the shades of carnations; and finished with bistre, ochre, or black, according to the colour they are of; drawing them by little strokes the way they ought to go; that is to say, give them all the nature of hair. The lights of them must be heightened with ochre and bistre, a little vermilion, and much white.

For the hair of the head, make a lay of bistre, ochre, and white, and a little vermilion. When it is very dark-coloured, use black instead of ochre. Afterwards form the shadowy parts with the same colours, putting less white in them; and finish with pure bistre, or mixed with ochre or black, by small strokes very fine, and close to each other, waving and buckling them according to the curling of the hair. The light parts must also be heightened by little strokes with ochre or orpiment, white, and a little vermilion. After which, lose the lights and the shades in each other, by working sometimes with a dark and sometimes with a light colour; but not too much with the red mixture upon the blue.

And for the hair about the forehead, through which the skin is seen, it must be first formed with the colour thereof, and that of the carnation, working and shadowing with one and the other, as if you designed to paint none. Then form it, and finish with bistre. The lights are to be heightened as the other. Grey hair is dead-coloured with white, black, and bistre, and finished with the same colour, but deeper; heightening the bright and clear parts of the hair, as well as those of the eye brows and the beard, with white and very pale blue, after having formed them as the others, with the colour of the flesh or skin; and finish with bistre.

But the most important thing is to soften one's work; to blend the teints in one another, as well as the beard and the hair about the forehead, with the other hair and the carnation; taking especial care not to work rough and dry; and that the traces, turnings, and windings of the carnation, or naked parts, be not interfected. You must likewise accustom yourself to put white in your colours only in proportion as you work lighter or darker: for the colour you use the second time must be always a little stronger and deeper than the first, unless it be for softening.

Different colourings are easily made, by putting more or less of red, or blue, or yellow, or bistre, whether for the dead-colouring, or for the finishing. That for women ought to be bluish; that for children a little red; and both fresh and florid. That for men ought to be yellower; especially when they are old.

To make a colouring of death, there must be a first lay of white and orpiment, or a very pale ochre: dead-colour with vermilion, and lake, instead of carmine, and a good deal of white; and afterwards work over it with a green mixture, in which there is more blue than any other colour, to the end the flesh may be livid and of a purple colour. The teints are done the same way as in another colouring; but there must be a great many more blue than yellow ones, especially upon the parts which fly from the sight, and about the eyes; and the half are only to be upon the parts which rise and come nearer the eye. They are made to die away in one another, according to the ordinary manner; sometimes with very pale blue, and sometimes with ochre and white, and a little vermilion; softening the whole together. The parts and contours must be rounded with the same colours. The mouth is to be, in a manner, of a quite violet. It is dead-coloured, however, with a little vermilion, ochre, and white; but finished with lake and blue; and to give it the deep strokes, they take bistre and lake, with which they likewise do the same to the eyes, the nose, and the ears. If it is a crucifix, or some martyr, upon whom blood is to be seen, after the finishing the carnation, form it with vermilion, and finish it with carmine, making in the drops of blood a little bright reflecting spark, to round them. For the crown of thorns, make a lay of sea-green and mallicot;
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Iron is formed, or first laid, with indigo, a little black and white; and finished with pure indigo, heightening it with white.

For painting fire and flames, the lights are done with mallicot and orpiment; and for the shades, they mix vermilion and carmine.

A smoke is done with black, indigo, and white, and sometimes with bife; one may likewise add vermilion or ochre, according to the colour it is to be of.

Pearls are painted by putting a lay of white, and a little blue; they are shadowed and rounded with the same colour; deeper; a small white dot is made almost in the middle, on the side of the light; and on the other side, between the shadow and the edge of the pearl, they give a touch with mallicot, to make the reflection; and under the pearls is made a little shadow of the colour of the ground they are upon.

Diamonds are made with pure black; then they heighten them with little touches of white on the side, between the shadow and the edge of the pearl, they give a touch with mallicot, to make the reflection; and under the pearls is made a little shadow of the colour of the ground they are upon.

One great means to acquire a perfection in the art, is to copy excellent originals. We enjoy with pleasure and tranquility the labour and pains of others. But a man must copy a great number before he is able to produce as fine effects; and it is better to be a good copier than a bad author.

Sect. VI. Of Landscapes.

In the first place, after having ordered the economy of your landscape as of your other pieces, you must form the nearest grounds or lands, when they are to appear dark, with lap or lily-green, bife, and a little verditer, to give a body to your colour; then dot with this mixture, but a little darker, adding sometimes a little black to it.

For such pieces of ground as the light falls upon, and which are therefore clear and bright, make a lay of ochre and white: then shadow and finish with bife.

In some they mix a little green, particularly for shadowing and finishing.

Trees are not done till the sky be finished; one may, nevertheless, spare the places of them when they contain a good number; and however it be, such as come near the eye, are to be dead-coloured with verditer, mixing sometimes ochre; and shadowed with the same colours, adding lily green. Afterwards you must work leaves upon them by dotting without crossing: for this must be done with small length dots, of a darker colour, and pretty full of it, which must be conducted on the side the branches go, by little tufts of a little darker colour. Then heighten the lights with verditer or sea-green, and mallicot, making leaves in the same manner; and when there are dry branches or leaves, they are dead-coloured with brown-red or gallstone, with white; and finished with gallstone, without white, or with bife.

The trunks of trees are to be dead-coloured with ochre, white, and a little green, for the light and clear parts; and for the dark, they mix black, adding bife and green for shadowing one and the other. Blue and yellow teints are likewise made upon them, and little touches given here and there with white and mallicot; such as you ordinarily see upon the bark of trees.

The branches which appear among the leaves are done with ochre, verditer, and white; or with bife and white, according to the light they are placed in. They must be shadowed with bise and lily-green.

Trees, which are at a little distance, are dead-coloured with verditer and sea-green; and are shadowed with
and finished with the same colours, mixed with lily-green. When there are some which appear yellowish, lay with ochre and white, and mix with gall-flour.

For such as are in the distances and remote views, you must dead-colour with sea-green; with which, for finishing, you must mix ultramarine. Heighten the lights of one and the other with mallow, by small disjointed leaves.

It is the most difficult part of landscape, in manner of miniature, to leaf a tree well. To learn, and break one's hand to a little, the way is to copy good ones; for the manner of touching them is singular, and cannot be acquired but by working upon trees themselves; about which you must observe to make little boughs, which must be leafed, especially such as are below and toward the sky.

And generally, let your landscapes be coloured in a handsomely manner, and full of nature and truth; for it is that which gives them all their beauty.

**Sect. VII. Of Flowers.**

It is an agreeable thing to paint flowers, not only on account of the splendour of their different colours, but also by reason of the little time and pains that are bestowed in trimming them. There is nothing but delight in it: and, in a manner, no application. You maym bungle a face, if you make one eye higher than another; a small nose with a large mouth; and so of other parts. But the fears of these disproportions confine not the mind at all in flower-painting; for unless they be very remarkable, they spoil nothing. For this reason most persons of quality, who divert themselves with painting, keep to flowers.

Nevertheless, you must apply yourself to copy judiciously: and for this part of miniature, as for the rest, we refer you to nature, for the is your best model. Work, then, after natural flowers; and look for the tints and different colours of them upon your pallet: a little will make you find them easily; and to facilitate this to you at the first, we shall, in the continuance of our design, shew the manner of painting some of natural flowers are not always to be had; and one is often obliged to work after prints, where nothing is seen but graving.

It is a general rule, that flowers are designed and laid like other figures; but the manner of forming and finishing them is different: for they are first formed only by large strokes and traces, which you must turn at the first the way the small ones are to go, with which you finish; this turning aiding much thereto. And for finishing them, instead of hatching or dotting, you draw small strokes very fine, and very close to one another, without croffing; repalling several times, till your dark and your clear parts have all the force you would give them.

Of Roses.—After making your first sketch, draw with carmine the red rose, and apply a very pale lay of carmine and white. Then form the shades with the same colour, putting white least in it: and lastly, with pure carmine, but very bright and clear at the first; fortifying it more and more as you proceed in your work, and according to the darkness of the shades. This is done by large strokes. Then finish; working upon it with the same colour by little strokes, which you must make go the same way with those of the graving, if it be a print you copy; or the way the leaves of the rose turn, if you copy after a painting, or after nature; losing the dark in the clear parts, and heightening the greatest lights, and the brightest or most lightfome leaves, with white and a little carmine. You must always make the hearts of roses, at the side of the shadow darker than the rest; and mix a little indigo for shadowing the first leaves, particularly when the roses are blown, to make them seem faded. The feed is dead-coloured with gamboge; with which a little sap-green is mixed for shadowing. Roses streaked with several colours, ought to be paler than others, that the mixture of colours may be better seen; which are done with carmine; a little darker in the shades, and very clear in the lights; always hatching by strokes. For white roses you must put a lay of white, and form and finish them as the red; but with black, white, and a little bistre; and make the feed a little yellower. Yellow roses are done by putting in every part a lay of mallow, and shadowing them with gamboge, gall-flour, and bistre. Heightening the clear and light places with mallow and white.

The flies, the leaves, and the buds of all kinds of roses are formed with verditer, with which is mixed a little mallow and gamboge; and for shadowing them, they add sap-green, putting less of the other colours when the shades are deep. The outside of the leaves ought to be bluer than the inside: wherefore it must be dead-coloured with sea-green, and sap-green mixed with that for shadowing, making the veins or fibres on this side clearer than the ground, and those on the other side darker. The prickles which are upon the flies and buds of roses, are done with little touches of carmine, which are made to go every way; and for those that are upon the stalks, they are formed with verditer and carmine, and shadowed with carmine and bistre; making the bottoms of the stalks more reddish than the top: e. g., you must mix with the green, carmine and pure bistre.

Of Tulips.—As there is an infinity of tulips, different from one another, one cannot pretend to mention the colours with which they are all done. We will only touch upon the handsomest, called fleaked; and these streaks are dead-coloured with very clear carmine in some places, and with darker in others; finishing with the same colour by little strokes, which must be carried the same way with the streaks. And in others is put first a lay of vermillion. Then they form them by mixing carmine, and finish them with pure carmine. In some they put Florence-lake over the vermillion instead of carmine. Some are done with lake and carmine mixed together, and with lake alone, or with white and lake for the first forming; whether it be rose-pink or Florence-lake. There are some of a purple colour, which are formed with ultramarine, carmine, or lake, sometimes bluer and sometimes redder. The manner of doing both one and the other is the same; there is no difference but in the colours. You must, in certain places, as between the streaks of vermillion, carmine, or lake, sometimes put blue made of ultramarine and white, and sometimes a very bright purple, which is finished by strokes as the rest, and lost with the streaks. There are some likewise
likewise that have fawlor teints, that are made with
laje, alitre, and ochre, according as they are: but
this is only in fine and rare tulips, and not in the
common ones. For shadowing the bottom of them,
they ordinarily take indigo and white for such whole
streaks are of carmine. For such as are of lake, they
take black and white; with which, in some, alitre is
mixed, and in others green. Some are likewise to be
shadowed with gamboge andumber, and always by
strokes and traces, that turn as the leaves turn. Other
tulips are likewise done, called bordered; that is to say,
the tulip is not streaked but on the edges of the leaves,
where there is a border. It is white in the purple;
red in the yellow; yellow in the red; and red in the white.
The purple is laid with ultramarine, carmine, and
white; shadowing and finishing it with this mixture.
The border is spared; that is to say, let only a
light lay of white be put there, and let it be shadowed
with very bright indigo. The yellow is formed with
gamboge, and shadowed with the same colour, mixing
ochre andumber or bitre with it. The border is
laid with vermilion, and finished with a very small
matter of carmine. The red is formed with vermi­
lion, and finished with the same colour, mixing
carmine or lake with it. The bottom and the border
are done with gamboge; and for finishing, they add
lillôte andumber, or bitre. The white is shadowed
with black, blue, and white. Indian ink is
very proper for this. The shadowings of it are very
tender. It produces alone the effect of blue and
white, mixed with the other black. The border of
this white tulip is done with carmine. In all these
forts of tulips, they leave a nerve or finew in the
middle of the leaves that are brighter than the red:
and the borders are drowned at the bottom by small
strokes, turning crofwise; for they must not appear
cut and separated, as the streaked or party-coloured.
They make them likewise of several other colours.
When they happen to be fuch white bottoms on the
infide are black, as it were, they form, and finish
with indigo, and at the bottom, the mouth of the
nozzle or flalk. And if the bottom is yellow, it is formed with
gamboge, and finished by adding umber or bitre. The
leaves and the flarks of tulips are ordinarily formed with
green, and shadowed and finished with lily-
green, by large traces all along the leaves. Some
may likewise be done with verdier, mixing mallicot
with it, and shadowed with fap.green, that the green
of the shades may be yellower.

The Anemone, or Wind-flowers.—There are feral
forts of them, as well double as fingle. The lail are
ordinarily without streaks. Some are made of a purple
colour, with purple and white, shadowing them with
the fame colour; some redder; others blue; someti­
times very pale; and sometimes very dark. Others
are formed with lake and white, and finished with
the fame, putting left white; fome without any white
at all. Others are formed with vermilion, and
shadowed with the fame colour, adding carmine. We
see likewise white ones, and fome of a citron colour.
The lail are laid with mallicot; and one and the other
shadowed and finished fometimes with vermilion, and
sometimes with very brown lake, efcentially near the
feed, at the bottom; which is often likened to a blackish colour, that is done with indigo, or black and
blue, mixing for some a little bilfer; and always
working by very fine strokes and traces, and losing
the lights in the shades. There are others that are
brighter and clearer at the bottom than any where
else; and fometimes they are perfectly white there,
though the reft of the flower be dark. The feed of
all these anemones is done with indigo and black, with
a very little white, and shadowed with indigo; and
in fome it is railed with mallicot. The double ane­
omies are of feveral colours. The handfome have
their large leaves streaked. Some are done, that is,
the streaked or party-coloured, with vermilion, in
which carmine is added for the fhiawing; shadowing
the reft of the leaves with indigo; and for the small
leaves within, a lay is put of vermilion and white,
and they are shadowed with vermilion mixed with
carmine, mixing here and there fome stronger touches,
especially in the heart of the flower, next the great
leaves on the fide of the shadow. They fhirn with
carmine, by little strokes and traces, turning the fame
way with the mixed or party-colours, and the leaves.
They form and finish the streaks or party-colours of
fome others, as well as the small leaves, with pure
carmine; leaving, nevertheless, in the middle of the
lail, a little circle, in which is laid dark purple, which
is lost with the reft. And when all is finished, they
give fome touches with this fame colour round about
the small leaves, efcentially on the fide of the fha­
dow; drowning them with the large ones, the remainder
of which is shadowed either with indigo or black. In
fome, the small leaves are done with lake or purple,
though the party-colours of the large ones be done
with carmine. There are others, whose mixed colours
are done with carmine, in the middle of most of the
large leaves; putting in fome places vermilion under­
neath, and losing thefe colours with the shadows of
the bottom; which are done with indigo and white.
The small leaves are laid with mallicot, and shadowed
with very dark carmine on the fide of the shade, and
with very clear on the fide of the lail, and with indigo
in a manner pure mallicot, and giving only fome little
touches with carmine and carmine, to separate the
leaves, which may be shadowed fometimes with a very
little pale-green. There are double anemones painted
all red, and all purple. The first are formed with
vermilion and carmine, in a manner without white,
and shadowed with pure carrine, well gunned, that
they may be very dark. Purple anemones are laid with
purple and white, and finished with white. In a
word, there are double anemones as there are fingle
ones, of all colours; and they are done in the fame
manner. The green of one and the other is verdier;
which mallicot is mixed for forming, leaving thine
in a manner pure mallicot, and giving only fome little
hours with carpine and carpine, to separate the
leaves, which may be shadowed fometimes with a very
little pale-green. There are double anemones painted
all red, and all purple. The first are formed with
vermilion and carmine, in a manner without white,
and shadowed with pure carrine, well gunned, that
they may be very dark. Purple anemones are laid with
purple and white, and finished with white. In a
word, there are double anemones as there are fingle
ones, of all colours; and they are done in the fame
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in a manner pure mallicot, and giving only fome little
hours with carpine and carpine, to separate the
leaves, which may be shadowed fometimes with a very
little pale-green. There are double anemones painted
all red, and all purple. The first are formed with
vermilion and carmine, in a manner without white,
and shadowed with pure carrine, well gunned, that
they may be very dark. Purple anemones are laid with
purple and white, and finished with white. In a
word, there are double anemones as there are fingle
ones, of all colours; and they are done in the same
manner. The green of one and the other is verdier;
which mallicot is mixed for forming, leaving thine
in a manner pure mallicot, and giving only some little
hours with carpine and carpine, to separate the
leaves, which may be shadowed sometimes with a very
little pale-green. There are double anemones painted
all red, and all purple. The first are formed with
vermilion and carmine, in a manner without white,
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The bottoms are ordinarily shadowed with indigo and white. There are pinks of a very pale flesh-colour, and streaked and diversified with another, a little deeper, made with vermilion and lake. Others, which are of lake and white, are shadowed and streaked without white. Others all red, which are done with vermilion and carmine as dark as possible. Others all of lake, and lastly, there are others, wherein nature or fancy is the rule. The green of one and the other is sea-green, shadowed with lily-green or sap-green.

The Red-lily.—It is laid with red lead, formed with vermilion, and in the deepest of the shades with carmine; and finished with the same colour by strokes and traces, turning as the leaves turn. The clear and light parts are heightened with red lead and white. The feed is done with vermilion and carmine. The green parts are done with verditer, shadowed with lily or sap-green.

The Day-lily.—There are three sorts of them: 1. The grindelin, a little red; 2. The grindelin, very pale; and, 3. The white.

For the first they put a lay of lake and white, and shadow and finish with the same colour deeper; mixing a little black to deaden it, especially in the darkest places.

The second are laid with white, mixed with a very little lake and vermilion, in such a manner that these two last colours are hardly seen. Afterwards they shadow with black and a little lake, working redder in the middle of the leaves, next the stalks which ought to be, as also the feed, of the same colour, particularly towards the top; and at the bottom a little greener.

The file of the feed is laid with masticot, and shadowed with sap-green.

The other day-lilies are done by putting a lay of pure white, and shading and finishing with black and white.

The stalks of these last, and the greens of them all, are done with sea-green, and shadowed with sap-green.

The Hyacinth, or Purple-flower.—There are four sorts of them:

The blue, a little dark; Others paler; The grindelin; And the white.

The first are laid with ultramarine and white; and shadowed and finished with left white. Others are laid and shadowed with pale blue. The grindelins are formed with lake and white, and a very small matter of ultramarine; and finished with the same colour a little deeper. For the last they put a lay of white; then they shadow them with black, with a little white; and finish them all by strokes and traces, following the turnings and windings of the leaves. The green and the stalks of such as are blue, are done with sea and lily-green very dark: and in the stalks of the first may be mixed a little carmine, to make them redder. The stalks of the two others, as also the green, are formed with verditer and masticot, and shadowed with sap-green.

The Piony.—A lay of Venice-lake and white must be put on all parts pretty strong; then shadow with leaf white, and with none at all in the darkest places; after which finish with the same colour by traces, turning them as for the roots; gumming it very much in the deepest of the shades; and raising the lights and the edges of the moist lightsome leaves with white and a little lake. Little veins are likewise made, which go like the strokes in hatching, but are more visible. The green of this flower is done with sea-green, and shadowed with sap green.

Cowlips.—They are of four or five colours. There are some of a very pale purple.

The grindelin, the white, and the yellow.

The purple is done with ultramarine, carmine, and white; putting leaf white for shadowing. The grindelin is laid with Venice-lake, and a very small matter of ultramarine, with much white; and shadowed with the same colour deeper. For the white, a lay of white must be put; and they must be shadowed with black and white; and finished, as the others, by strokes or strokes. The heart of these cowslips is done with masticot, in the shape of a tear, which is shadowed with gamboge, making a little circle in the middle with sap-green. The yellow are laid with masticot, and shadowed with gamboge and umber. The file, the leaves, and the buds, are formed with verditer, mixed with a little masticot, and finished with sap-green; making the fibres or veins, which appear upon the leaves, with this same colour; and heightening the lights of the largest with masticot.

The Ranunculus, or Crow-foot.—There are several sorts of them: the finest are the orange-coloured. For the first, they put a lay of vermilion, with a very small matter of gamboge; and add carmine for shadowing; finishing it with this last colour, and a little gall-floate. In the others may be put Venice-lake, instead of carmine, especially in the heart of the flower. The orange-coloured are laid with gamboge, and finished with gall-floate, vermilion, and a little carmine; leaving some little yellow streaks. The green of the stalks is done with verditer and very pale masticot; mixing lily-green to shadow them. That of the leaves is a little darker.

The Crocuses.—These are of two colours: Yellow and purple. The yellow are formed with masticot and gall-floate, and shadowed with gamboge and gall-floate: after which, upon each leaf, on the outside, are made three streaks, separate from one another, with billet and pure lake; which are left, by little traces, in the bottom. The outside of the leaves is left all yellow. The purple is laid with carmine, mixed with a little ultramarine, and very pale white. They are formed and finished with leaf white; making likewise, in some, purple stripes or streaks, very dark, as in the yellow; and in others only small veins. The feed of both is yellow, and is done with orpiment and gall-floate. For the files, they put a lay of white, and shadow with black, mixed with a little green. The green of this flower is formed with very pale verditer, and shadowed with sap-green.

The Iris.—The Perian iris is done by putting, for the inside leaves, a lay of white, and shadowing them with indigo and green together, leaving a little white separation in the middle of each leaf; and for thos
white are laid with white, and shadowed with black and white; excepting the cup or bell, which is done with mafficott and gamboge. The green is sea-green, shadowed with sap-green.

The Marigold.—It is done by putting a lay of mafficott, and then one of gamboge; shadowing it with this very colour, after vermilion is mixed with it; and for finishing, they add gall-flone and a little carmine. The green is done with verditer, shadowed with sap-green.

The Austrian Rose.—For making the Austrian rose, they put a lay of mafficott, and another of gamboge. Then they form it, mixing gall-flone; and finish it with the last colour, adding biftre and a very small matter of carmine in the deepest shades.

The Indian Pink, or French Marigold.—It is done by putting a lay of gamboge; shadowing it with this colour, after you have mixed a good deal of carmine and gall-flone with it; and leaving about the leaves a little yellow border of gamboge, very clear in the lights and darker in the shades. The feed is shadowed with biftre. The green, as well as the rofe as the pink, is formed with verditer, and finished with sap-green.

The Sun-flower.—It is formed with mafficott and gamboge, and finished with gall-flone and biftre. The green is laid with verditer and mafficott, and shadowed with sap-green.

The Passion-flower.—It is done with mafficott and gamboge, and finished with gall-flone and biftre. The green is laid with verditer and mafficott, and shadowed with sap-green.

The Passion-flower.—It is done as the rofe, and the green of the leaves likewise; but the veins are done with a darker green.

Poetical Pinks and Sweet-william.—They are done by putting a lay of lake and white; shadowing them with pure lake, with a little carmine for the laft; which are afterwards dotted on all parts with little round dots, separate from one another; and the threads in the middle are raised with white. The green of them is sea-green, which is finished with sap-green.

The Scabious.—There are two sorts of feabolous, the red and the purple. The leaves of the flirft are laid with Florentine lake, in which there is a little white; and shadowed without white: and for the middle, which is a great biffre or huifk in which the feed lies, it is formed and finished with pure lake, with a little ultramarine or indigo to made it darker. Then they make little white longifh dots over it, at a pretty distance from one another, clearer in the light than in the shade, making them go every way. The other is done by putting a lay of very pale purple, as well upon the leaves as the biffre in the middle; shadowing both with the fame colour, a little deeper: and instead of little white touches for the feed, they make them purple; and about each grain they put a lay of gamboge, very clear in the lights and darker in the shades. Then they make little white longifh dots over it, at a pretty distance from one another, clearer in the light than in the shade, making them go every way. The other is done by putting a lay of very pale purple, as well upon the leaves as the biffre in the middle; shadowing both with the fame colour, a little deeper: and instead of little white touches for the feed, they make them purple; and about each grain they make out a little circle, and this over the whole biffre or huifk in the middle. The green is formed with verditer and mafficott, and shadowed with sap-green.

The Sword or Day-lily.—It is laid with Florence lake, and very pale white; formed and finished with pure lake, very clear and bright in some places, and very dark in others; mixing even biftre in the thickest of the shades. The green is verditer, shadowed with sap-green.

Hepatica, or Liverwort.—There is red and blue. The laft is done by putting on all parts a lay of ultra­marine, white, and a little carmine or lake; shadowing...
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The Pomegranate.—The flower of the pomegranate is laid with red lead; shadowed with vermilion and carmine; and finished with this last colour. The green is laid with verditer and malicott, and shadowed with sap-green.

The Flower of the Indian Bean.—It is done with a lay of Levant-lake and white; shadowing the middle leaves with pure lake; and adding a little ultramarine with sap green.

The Columbine.—There are columbines of several colours; the most common are the purple, the griddelin, and the red. For the purple, they lay with ultramarine, carmine, and white; and shadow with this mixture, deeper. The griddelin are done the same way, putting a great deal less ultramarine than carmine. The red are done with lake and white. There are some mixed flowers of this kind, of several colours; which must be formed and finished as the others, but paler, making the mixtures of a little darker colour.

The Lark’s Heel.—These are of different colours, and of mixed colours: the most common are the purple, the griddelin, and the red; which are done as the columbines.

Violets and Pansies.—Violets and pansies are done the same way; excepting that in the last the two middle leaves are bluer than the others, that is, the borders or edges; for the inside of them is yellow: and their little black veins are made, which take their beginning from the heart of the flower, and die away towards the middle.

The Muscipula, or Catch-fly.—There are two sorts of it, the white and the red; the last is laid with lake and white, with a little vermilion, and finished with pure lake. As for the knot or nozelle of the leaves, it is formed with white and a very small matter of vermilion, mixing bitre or gall-stone to finish it. The leaves of the white are laid with white; adding bitre and malicott upon the knots, which are shadowed with pure bitre, and the leaves with black and white. The green of all these flowers is done with verditer and malicott, and shadowed with sap-green.

The Crown Imperial.—There are of two colours, the yellow and the red. The first is done by putting a lay of orpiment, and shadowing it with gall-stone and orpiment, with a little vermilion. The other is laid with orpiment and vermilion, and shadowed with gall-stone and vermilion; making the beginning of the leaves next the flile, with lake and bitre, very dark; and veins with this mixture, both in one and the other, all along the leaves. The green is done with verditer and malicott, shadowed with sap-green and gamboge.

The Cyclamen, or Swebrood.—The red is laid with carmine, a little ultramarine, and much white; and finished with the same colour, deeper; putting, in a manner, only carmine in the middle of the leaves, next the heart, and in the rest a little more ultramarine. The other is laid with white, and shadowed with black. The stalks of one and the other ought to be a little reddish; and the green, verditer and sap-green.

The Gillyflower.—There are several sorts of gillyflowers; the white, the yellow, the purple, the red, and the mixed, of various colours. The white are laid with white, and shadowed with black; and, with a little indigo in the heart of the leaves. The yellow, with malicott, gamboge, and gall-stone. The purple are formed with purple and white; and finished with white; making the colour brighter in the heart, and even a little yellowish. The red with lake and white; shadowing them with white. The mixed-coloured are laid with white, and the mixtures are sometimes made with purple, in which there is much ultramarine; others again, in which there is more carmine. Sometimes they are of lake, and sometimes of carmine. Some are done with white, and others without white; shadowing the rest of the leaves with indigo. The seed of all is formed with verditer and malicott, and finished with sap-green.

The leaves and files are laid with the fame green, mixing sap-green to finish them.

Fruits, filhes, serpents, and all sorts of reptiles, are to be touched in the same manner as the figures of men are; that is, hatched or dotted.

Birds and all other animals are done like flowers, by strokes or traces.

Never make use, for any of these things, of white lead. It is only proper in oil. It blackens like ink, when only tempered with gum; especially if you let your work be moist, or where perfumes are. Cernis of Venice is as fine, and of as pure a white. Be not sparing in the use of this, especially in forming or dead colouring; and let it enter into all your mixtures, in order to give them a certain body, which will render your work glinsh, and make it appear soft, plump, and strong.

The taste of painters is, nevertheless, different in this point. Some use a little of it, and others none at all. But the manner of the last is meagre and dry. Others use a great deal; and doubtles it is the best method, and most followed among skilful perfons: for besides that it is speedy, one may by the use of it copy all sorts of pictures; which would be almost impossible otherwise; notwithstanding the contrary opinion of fome who say, that in miniature we cannot give the force and all the different teints we see in pieces in oil. But this is not true, at least of good painters; and eftects prove it pretty plainly: for we fee figures, landscapes, pictures, and every thing else in miniature, touched in as grand, as true, and as noble a manner (though more tender and delicate), as they are in oil.

However, painting in oil has its advantages; were they only these, that it exhibits more work, and takes up less time. It is better defended likewise against the injuries of time; and the right of birth must be granted it, and the glory of antiquity.

But miniature likewise has its advantages; and without repeating such as have been mentioned already, it is nearer and more commodious. You may easily carry
of Flowers.

MINIM, in music, a note equal to two crotchets, or half a semibreve. See Music.

MINIMS, a religious order in the church of Rome, founded by St Francis de Paula, towards the end of the 16th century. Their habit is a coarse black woolen stuff, with a woolen girdle, of the same colour, tied in five knots. They are not permitted to quit their habit and girdle night nor day. Formerly they went bare-footed, but are now allowed the use of shoes.

MINIMUM, in the higher geometry, the least quantity attainable in a given case.

MINISTER, a person who preaches, performs religious worship in public, administers the sacraments, &c.

MINISTER OF STATE, a person to whom the prince intrusts the administration of government. See Council.

FOREIGN MINISTER, is a person sent into a foreign country, to manage the affairs of his province or of the state to which he belongs. Of these there are two kinds: those of the first rank are ambassadors and envoy extraordinary, who represent the persons of their sovereigns; the ministers of the second rank are the ordinary ministers.

MINIMUM, or RED-LEAD, is a calx of lead of a vivid red colour, which colour it acquires by a slow calcination and reverberation. See Chemistry, n° 1213. The minimum in commerce is chiefly brought from Holland, where large quantities of it are manufactured.

The method in which minimum is made in large quantities in general is this—they first burn lead in a furnace into a kind of litharge, by continually stirring it while melted with an iron rake; this they afterwards grind with two pair of flones, which deliver it from one to another, the first pair grinding it coarser, the second finer; these are worked by means of a mill which moves six pair of them at once. When thus reduced to a fine powder, it is washed and then put into a furnace, and is burnt with a reverberatory fire for two or three days, all the while they continue stirring it with a large iron rake, hung on a tripod or iron hook; and toward the end of the time they watch its being of the right colour. When this is done, the fire must not be carried beyond a certain degree, left the matter cold and run together.

The processes by which minimum is prepared is described in the following manner by M. Jars. The furnace is of the reverberatory kind, with two fire-places at the ends; each fire-place being separated from the area, or body of the furnace, by a wall twelve inches high. The fire places are fifteen inches broad, and their length is equal to the breadth of the whole furnace, which is about eight or nine feet.

The length of the area from one place to the other is nine or ten feet. The quantity of lead used in one operation is about 1000 pounds, of which nine parts are lead obtained from furnaces where the ore is finelined, and one part is lead extracted from the scoria which is formed in smelting the ore. This latter kind is said to be necessary, as the former could not alone be reduced into powder. All the lead is at once put into the area, the bottom of which is level. The calc, as fast as it is formed, is drawn to one side, by means of a rake suspended by a chain before the mouth of the furnace. In four or five hours the whole quantity of the lead is calcined, or, if any pieces remain uncalcined, they are separated, and kept for the next operation. The heat employed is that of a cherry-red, and the fire-places and mouth are kept open, that the air may accelerate the calcination. The powder or calc is to be frequently stirred to prevent its concreting, and when this operation has been continued about 24 hours, the matter is taken out of the furnace, and laid on a flat pavement. Then cold water is thrown on it, to give it weight, as the workmen say; but rather (as M. Jars thinks) to make it friable. It is then to be ground in a mill, and the finer part is separated by washing, while the coarser part, reserved for some following operation, is to be placed at the mouth of the furnace in order to retain the melted lead. The fine powder, which is now of a yellow colour, is again put into the same or a similar furnace, and exposed to a very moderate fire, from 36 to 48 hours; during which time, it is stirred frequently to prevent its concreting; and the powder gradually acquires its proper red colour. The minimum is then to be taken out of the furnace, cooled, and sifted through an iron sieve placed in a calc.

The bright colour of minimum might render it valuable in painting, if it could stand with certainty in either oil or water. But as it is subject to become black, it cannot be safely trusted, except in hard varnishes; and is, therefore, seldom used in oil, or even in water, unless for very gross purposes, or as a ground for vermilion. The goodness of minimum may be distinguished by the brightness of its colour: and the adulteration to which it is liable may be detected by putting an ounce of it into a crucible with an equal quantity of charcoal dust, well mixed together, and placing the crucible in a common fire sufficient to melt lead, which is to be covered with another small crucible inverted into it. When it has been continued for some time on the fire, take it out and strike it X against
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MINU. A stringed instrument of music among the ancient Hebrews, having three or four cords to it. See Plate CCCXIV. Though there is reason to question the antiquity of this instrument, both because it requires a hair-bow, which was a kind of plectrum not known to the ancients, and because it so much resembles the modern viol, Kircher took the figures of this, the machul, chinor, and paltery, from an old book in Th Vatican library.

MINOR, a Latin term, literally denoting last, used in opposition to major, greater.

Minor, in law, denotes a person under age; or who by the laws of the country, is not yet arrived at the power of administering his own affairs, or the possession of his estate. Among us, a person is a minor till the age of twenty-one: before which time his acts are invalid. See Age, and Infant.

It is a maxim in the common law of England, that in the King there is no minority, and therefore he hath no legal guardian; and his royal grants and affents to acts of parliament are good, though he has not in his natural capacity attained the legal age of twenty-one. It is also provided by the custom and law of parliament, that no one shall sit or vote in either house, unless he be twenty-one years of age. This is likewise expressly declared by Stat. 7 and 8. Will. III. cap. 25, with regard to the house of commons.

Minor, in logic, is the second repition of a formal or regular syllogism, called also the affirmation.

Minor, in music, is applied to certain concords, which differ from or are lower than others of the same denomination by a lesser femitone or four commas. Thus we say, a third minor, or lesser third, or a fifth major and minor. Concords that admit of major and minor, i.e. greater and less, are said to be imperfect concords.

MINORCA, an island of the Mediterranean, situated between 39 and 40 degrees of North Latitude, and near four degrees of East Longitude. It is about 33 miles in length from north-west to south-east, in breadth from eight to twelve, but in general about ten miles; so that in five it may nearly equal the county of Huntingdon or of Bedfordshire. The form is very irregular; and the coasts are much indented by the sea, which forms a great number of little creeks and inlets, some of which might be very advantageous.

This island is one of those called by the ancient Romans Baleares, which arose from the dexterity of the inhabitants in using the fling. It fell under the power of the Romans, afterwards of the northern barbarians, who destroyed that empire. From them it was taken by the Arabs, who were subdued by the king of Majorca, and by the king of Spain. The English subdued it in 1708, and the French in the late war; but it was restored to Britain by the treaty of Paris in 1763.

The air of this island is much more clear and pure than in Britain; being seldom darkened with thick fogs: yet the low valleys are not free from mists and unwholesome vapours; and in windy weather the spray of the sea is driven over the whole island. Hence it happens that utensils of brass or iron are extremely susceptible of rust, in spite of all endeavours to preserve them; and household-furniture becomes mouldy. The summers are dry, clear, calm, and exceptionally hot; the autumns moist, warm, and unequal; at one time perfectly serene, at another cloudy and tempestuous. During the winter there are sometimes violent storms, though neither frequent nor of long continuance and whenever they cease, the weather turns by degrees to its usual serenity. The spring is always variable, but resembles the winter more than the summer. The changes of heat and cold are neither so great nor so sudden in this climate as in many others. In the compass of a year, the thermometer seldom rises above the 80th, or falls below the 48th degree. In summer there is scarcely ever a difference of four or five degrees between the heat of the air at noon and at night; and in winter the variation is still less considerable. But this must be understood of a thermometer shaded from the influence of the solar beams; for if exposed to them it will often rise 12, 14, or 16 degrees higher than what we have mentioned; and in other localities the difference between the heat of the air in the sun and shade is much greater. Yet, even in the dog days, the heat of the atmosphere, at least in open places, seldom surpasses that of human blood.

The winds are very boisterous about the equinoxes, and sometimes during the winter. At other times they are generally moderate, and, according to the observations of seamen, they rarely blow in the same direction near the islands adjacent to the gulph of Lyons as in the open sea. During the summer there is commonly a perfect calm in the mornings and evenings; but the middle of the day is cooled by refreshing breezes which come from the east, and, following the course of the sun, increase gradually till two or three in the afternoon; after which they insensibly die away as right approaches. This renders the heat of the sun less dangerous and inconvenient; and if these breezes intermit for a day or two, the natives grow languid and inactive from the heat. The northerly winds in general are clear and healthy, dispel the mists, and make a clear blue sky; whilst thofe which blow from the opposite quarter, render the air warm, moist, and unhealthy. The north wind is superior in power to all the rest; which appears from hence, that the tops of all the trees incline to the south, and the branches on the north side are bare and blasted. The next to it in force is the north-west. Both are frequent towards the close of winter and in the spring; and, being dry and cold, they shiver up the leaves of the vegetables, destroy their tender shoots, and are often exceedingly detrimental to the vineyards and ri-
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Minorca.  Sing corn. The piercing blasts at that season from the north-east, as they are more moist and more frequently attended with rain, are less prejudicial. The south and south-east winds are by much the most unhealthy. In whatever seasons they blow, the air is foggy, and affects the breathing; but in the summer season they are sultry and suffocating. An excessive dejection of spirits is then a universal complaint; and on exposing the thermometer to the rays of the sun, the mercury has frequently risen above the 100th degree. The west wind is usually drier than the south: the east is cold and blistering in the spring, and sultry in the summer.

The weather in Minorca is generally fair and dry; but when it rains, the flowers are heavy, though of short continuance, and they fall most commonly in the night. The sky in summer is clear, and of a beautiful azure, without clouds or rain; but moderate dews descend regularly after sunset. In autumn the weather becomes less serene; whirlwinds and thunder become frequent; and in the night-time lightning, and those meteors called falling stars, are very common. Water-spouts also are often seen at that season, and frequently break upon the shore. A sudden alteration in the weather takes place about the autumnal equinox; the skies are darkened with clouds, and the rains fall in such quantities, that the torrents thereby occasioned, pouring down from the hills, tear up trees by the root, carry away cattle, break down fences, and do considerable mischief to the gardens and vineyards. But these anniversary rains are much more violent than lasting; always falling in sudden and heavy showers, with intervals of fair weather. They are accompanied with thunder, lightning, and squalls of wind, most commonly from the north. Hail and snow are often intermixed with the rains which fall in winter and in spring; but the snow, for the most part, dissolves immediately; and ice is here an uncommon appearance.

The whole coast of Minorca lies low; and there are only a few hills near the centre, of which the most considerable, named Toro by the inhabitants, may be seen at the distance of 12 or 14 leagues from the land. The surface of the island is rough and unequal; and in many places divided by long narrow vales of a considerable depth, called barrancos by the natives. They begin towards the middle of the island, and after several windings terminate at the sea. The south-west side is more plain and regular than towards the north-east; where the hills are higher, with low marshy valleys betwixt them, the soil lies fruitful, and the whole tract unhealthy to man and beast. Near the towns and villages the fields are well cultivated, and inclosed with stone-walls; but the rest for the most part are rocky, or covered with woods and thickets. There are some pools of standing water, but very few rivulets, which is the greatest defect about the island, as the inhabitants have scarcely any wholesome water excepting what is faved from the clouds.

The soil is light, thin, and very flopy, with a good deal of sea-salt, and, in some places, of calcareous nitre intermixed. In most places there is so little earth, that the island appears to be but one large irregular rock covered here and there with mould, and an infinite variety of flones. Notwithstanding this, however, it is not only extremely proper for vineyards, but produces more wheat and barley than could at first sight be imagined; and, if the peasants may be credited, it would always yield a quantity of corn and wine sufficient for the natives, did not the violence of the winds, and the excessive drought of the weather, frequently spoil their crops. The fields commonly lie fallow for two years, and are sown the third. About the latter end of winter, or the beginning of spring, they are first broke up: and next autumn, as soon as the rains fall, they are again ploughed and prepared for receiving the proper seeds. The tillage is very easily performed; for a plough so light as to be transported from place to place on the ploughman's shoulder, and to be drawn by an heifer, or an ass sometimes filled by an hog, is sufficient for opening so thin a foil. The later the harvest happens, the more plentiful it proves. The barley is usually cut down about the 20th of May, N. S. and the wheat is reaped in June, so that the whole harvest is commonly got in by midsummer.

Bread of the finest wheat flour, well fermented and well baked, is more than half the diet of people of all ranks. Rice, pulse, vermicelli, herbs and roots from the garden, summer-fruits, pickled olives, and pods of the Guinea pepper, make up almost all the other half, to which the peasants are able to add the produce of their gardens. Of these articles the most esteemed are the home-grown vegetables, particularly artichokes and garlic, which are much relished by the natives. The fish of the sea are numerous, and the sea is very rich in shell-fish, clams, oysters, and other such delicacies. The climate of Minorca is remarkably healthy; and the natives are generally long-lived and robust. The concern of all the inhabitants is business, and the luxurious indulgence of the other nations is unknown to them. They never think of going to market, nor taste the luxury of the table, nor of the gridiron; for they are contented, as they are happy, to live on a very plain diet, and without expense; and their pertinacity in this point is so great, that they impose such stringent rules on their children, that they never depart from it, but that they are, as it were, born with it; and when they are grown to years of discretion, they are not yet able to give them up. They live on fish, greens, butter, &c. and some little oil and salt, which is the common breakfast of the peasants, well known by the name of olaga. Their ordinary meals are

X 2 very
very frugal, and consist of very little variety; but on festivals and other solemn occasions their entertainments are to the last degree profuse and extravagant, info-
much that the bill of fare of a country farmer's wed-
ding-dinner would scarce be credited.

With regard to other matters, the Minorquins are
accused of prodigious indolence in the way of busi-
ness, and neglect of the natural advantages they posses.
In the bowels of the earth are iron, copper, and lead-ores,
of none of which any use hath been made except the
lait. A lead-mine was worked to advantage some time
ago, and the ore sent into France and Spain for the
use of the potteries in those countries. The propor-
tor discontinued his work on some small discouragement;
and indeed it is said, that these people are of
all mankind the most easily put out of conceit with an
undertaking that does not bring them in mountains of
present gain, or that admits of the slightest prob-
ability of disappointing their most sanguine expecta-
tions: nor will their purse admit of many disappointments;
and thus their poverty co-operating with their natural
deadliness, the breeding of poultry, and the
There are in it a

The island is divided into what they style terminos,
of which there were anciently five, now reduced to
four, and resemble our counties. The termino of
Ciudadella, at the north-westerly extremity of the
island, is so styled from this place, which was once a
city, and the capital of Minorca. It makes a venera-
table and majestic figure, even in its present state of
decay, having in it a large Gothic cathedral, some
other churches and convents, the governor's palace,
and an exchange, which is no contemptible pile.
There are in it 600 houses, which, before the loss of
government and the courts of justice were removed to
Mahon, were fully inhabited; and there are still more
gentlemens families here than in all the rest of the
island. It hath a port commodious enough for the
vessels employed in the trade of Britain, which, though
in the possession of a maritime power, is less than it
formerly was. It is still, in the style of the officers,
the best quarters (and there are none bad) in the
country; and if there was a civil government, and
the place made a free port, the best judges are of opin-
ion it would very soon become a flourishing place
again; and the fortifications, if it should be found ne-
necessary, might then also be easily restored and im-
proved.

The termino of Ferries is the next, a narrow slip
reaching crofs from sea to sea, and the country is little
cultivated; it is therefore united to Mercandies. In this
island lies Mont-toro in the very centre of the
country, and the highest ground, some say the only moun-
tain in it; on the summit of which there is a convent,
where even in the hottest months the monks enjoy a
cool air, and at all times a most delightful prospect.
About six miles north from Mont-toro stands the
castle that covers Port Fornelles, which is a very spa-
cious harbour on the east side of the island. There are
in it shoals and foul ground, which, to those who are
unacquainted with them, render it difficult and dan-
gerous; yet the packets bound from Mahon to Mar-
folles frequently take shelter therein; and while the
Spaniards were in possession of the isle, large ships
and men of war frequented it. At a small distance
from this lies another harbour called Adaxia, which
runs far into the land; but being reputed unsafe, and
being so far from Fornelles, is now of no use. The
country about it is, however, said to be the pleasantest
and wholesomest spot in the island, and almost the only
one plentifully supplied with excellent spring-water;
so that the gardens are well laid out, and the richest
and finest fruits grow here in the highest perfection.
Alair is the next termino, in which there is nothing
remarkable.
Minors, or friers minor, an appellation which the Franciscans assume, out of shew of humility, calling themselves fratenus minoris, i. e. lesser brothers, and sometimes minorites. There is also an order of regular minors at Naples, which was established in the year 1598, and confirmed by Sextus V.

MINOS (fab. hist.), a king of Crete, son of Jupiter and Europa. He flourished about 1432 years before the Christian era. He gave laws to his subjects, which still remained in full force in the age of the philosopher Plato, about 1000 years after the death of the legislator. His justice and moderation procured him the appellation of the favourite of the gods, the confident of Jupiter, and the wise legislator, in every city of Greece; and, according to the poets, he was rewarded for his equity after death with the office of suprême and absolute judge in the infernal regions. In this capacity he is represented sitting in the middle of the shades, and holding a scepter in his hand. The dead plead their different causes before him; and the impartial judge shakes the fatal urn, which is filled with the destinies of mankind. He married Idona, by whom he had Lycaestes, who was the father of Minos II.

MINOS II was a son of Lycaestes, the son of Minos I. and king of Crete. He married Pasiphaë, the daughter of Sol and Perijice, and by her he had many children. He increased his paternal dominions by the conquest of the neighbouring islands; but showed himself cruel in the war which he carried against the Athenians, who had put to death his son Androgeus. He took Megara by the treachery of Scylla, and not satisfied with victory, he obliged the vanquished to bring him yearly to Crete seven chosen boys, and the same number of virgins to be devoured by the Minotaur. This bloody tribute was at last abolished when Theseus had destroyed the monster. When Dedalus, whose industry and invention had fabricated the labyrinth, and whose imprudence in affisting Pasiphaë in the gratification of her unnatural desires, had offended Minos, fled from the place of his confinement with wings, and arrived safe in Sicily; the incensed monarch pursued the offender, resolved to punish his infidelity. Cocalus, king of Sicily, who had hospitably received Dedalus, entertained his royal guest with dissembled friendship; and, that he might not deliver to him a man whose ingenuity and abilities he so well knew, he put Minos to death. Minos died about 35 years before the Trojan war. He was father of Androgeus, Glauceus, and Deucalion; and two daughters, Phaedra and Ariadne. Many authors have confounded the two Minos, the grandfather and the grandson; but Homer, Plutarch, and Diodorus, prove plainly that they were two different persons.

MINOTAUR (fab. hist.), a celebrated monster, half a man and half a bull, according to this verse of Ovid,

Semivirum virum, semivirumque bovem.

It was the fruit of Pasiphaë's amour with a bull. Minos refused to sacrifice a white bull to Neptune, an animal which he had received from the god for that purpose. This offended Neptune, and he made Pasiphaë the wife of Minos enamoured of this fine bull, which had been refused to his altars. Dedalus profited his talents in being subservient to the queen's unnatural desires; and by his means, Pasiphaë's horrid passions were gratified, and the Minotaur came into the world. Minos confined in the labyrinth this monster, which convinced the world of his wife's licentiousness, and reflected disgrace upon his family. The Minotaur usually devoured the chosen young men and maidens which the tyranny of Minos yearly exacted from the Athenians. Theseus delivered his country from this tribute, when it had fallen to his lot to be sacrificed to the voracity of the Minotaur; and by means of Ariadne, the king's daughter, he destroyed the monster, and made his escape from the windings of the labyrinth. — The fabulous tradition of the Minotaur, and of the infamous commerce of Pasiphaë with a favourite bull, has been often explained. Some suppose that Pasiphaë was enamoured of one of her husband's courtiers called Taurus; and that Dedalus favoured the passions of the queen, by offering his house to become the retreat of the two lovers. Pasiphaë some time after brought twins into the world, one of whom greatly resembled Minos and the other Taurus; and in the natural resemblance of their countenance with that of their supposed fathers, originated their name, and consequently the fable of the Minotaur.

MINOW, a very small species of cyprium, so well known that it needs no description.
MINSTER (Saxon, Minster or Mynster), anciently signified the church of a monastery or convent.

MINSTERLE, an ancient term for a singer and instrumental performer.

The word minstrel is derived from the French minstrel, and was not in use here before the Norman conquest. It is remarkable, that our old monkish historians do not use the word citareius, cantator, or the like, to express a minstrel in Latin; but either minst, hysfria, joculator, or some other word that implies guffle. Hence it should seem that the minstrels set off their singing by mimicry or action, or, according to Dr Brown's hypothesis, united the powers of melody, poem, and dance.

The Saxons, as well as the ancient Danes, had been accustomed to hold men of this profession in the highest reverence. Their skill was considered as something divine, their persons were deemed sacred, their attendance was solicited by kings, and they were everywhere loaded with honours and rewards. In short, poets and their art were held among them in that rude admiration which is ever shown by an ignorant people to such as excel them in intellelual accomplishments.

When the Saxons were converted to Christianity, in proportion as letters prevailed among them, this rude admiration began to abate, and poetry was no longer a peculiar profession. The poet and the minstrel became two persons. Poetry was cultivated by men of letters indiscriminately, and many of the most popular rhymes were composed amidst the leisures and retirement of monasteries. But the minstrels continued a distinct order of men, and got their livelihood by singing verses to the harp at the houses of the great. There they were still hospitably and respectfully received, and retained many of the honours shown to their predecessors the Bards and Scalds. And indeed, though some of them only recited the compositions of others, many of them still composed fongs themselves; and all of them could probably invent a few stanzas on occasion. There is no doubt but most of the old heroic ballads were produced by this order of men. For although some of the larger metrical romances might come from the pen of the monks or others, yet the smaller narratives were probably composed by the minstrels who sung them. From the amazing variations which occur in different copies of these old pieces, it is evident they made no scruple to alter each other's productions, and the reciter added or omitted whole stanzas according to his own fancy or convenience.

In the early ages, as is hinted above, this profession was held in great reverence among the Saxon tribes, as well as among their Danish brethren. This appears from two remarkable facts in history, which show that the same arts of music and song were equally admired among both nations, and that the privileges and honours conferred upon the professors of them were common to both; as it is well known their customs, manners, and even language, were not in those times very dissimilar.

When King Alfred the Great was desirous to learn the true situation of the Danish army, which had invaded his realm, he assumed the dress and character of a minstrel; and taking his harp, and only one attendant (for in the earliest times it was not usual for a minstrel to have a servant to carry his harp), he went with the utmost secrecy into the Danish camp.

And though he could not but be known to be a Saxon, the character he had assumed procured him a hospitable reception; he was admitted to entertain the king at table, and laid among them long enough to convince that assault which afterwards destroyed them. This was in the year 878.

About 60 years after, a Danish king made use of the same disguise to explore the camp of King Athelstan. With his harp in his hand, and dressed like a minstrel, Anlaff king of the Danes went among the Saxons tents, and taking his stand near the king's pavilion, began to play, and was immediately admitted. There he entertained Athelstan and his lords with his singing and his music, and was at length dismissed with an honourable reward, though his songs must have discovered him to have been a Dane. Athelstan was favored from the condescensions of this stratagem by a soldier, who had observed Anlaff bury the money which he had been given him, from some scruple of his honour or motive of superstitition. This occasioned a discovery.

From the uniform procedure of both these kings, it is plain that the same mode of entertainment prevailed among both people, and that the minstrel was a privileged character among both. Even as late as the reign of Edward II. the minstrels were easily admitted into the royal presence, as appears from a passage in Stow, which also shows the splendor of their appearance.

"In the year 1316, Edward II. did solemnly his feast at Pentecost at Westminster, in the great hall: where sitting royally at the table with his peers about him, there entered a woman adorned like a minstrel, sitting on a great horse, and as minstrels then used, who rode round about the tables, showing pastime; and at length came up to the king's table, and laid before him a letter, and forthwith turning her horse, fainted every one, and departed."—The subject of this letter was a renoncement to the king on the favours heaped on him by his minions, to the neglect of his knights and faithful servants.

The messenger was sent in a minstrel's habit, as what would gain an easy admission; and was a woman concealed under that habit, probably to disarm the king's resentment: for we do not find that any of the real minstrels were of the female sex; and therefore conclude this was only an artful contrivance peculiar to that occasion.

In the 4th year of Richard II. John of Gaunt erected at Tetbury in Staffordshire, a court of minstrels, with a full power to receive suit and service from the men of his profession within five neighbouring counties, to enact laws, and determine their controversies; and to apprehend and arrest such of them as should refuse to appear at the said court, annually held on the 16th of August. For this they had a charter, by which they were empowered to appoint a king of the minstrels, with four officers, to preside over them. These were every year elected with great ceremony; the whole form of which is described by Dr Plot; in whose time, however, they seem to have become mere musicians.

Even so late as the reign of King Henry VIII., the reciters of verses or moral speeches learnt by heart, intruded without ceremony into all companies; not only
This minstrel, the author tells us a little below, "after three lowly courtesies, cleared his voice with a hem..." and wiped his lips with the hollow of his hand for "filling his napkin; tempered a string or two with his wrist; and, after a little warbling on his harp for a prelude, came forth with a solemn song, warranted for story out of King Arthur's acts, &c."

Towards the end of the 16th century, this chev of men had lost all credit, and were sunk so low in the public opinion, that in the 39th year of Elizabeth a statute was passed by which "minstrels, wandering abroad," were included among "rogues, vagabonds, and sturdy beggars," and were adjudged to be punished as such. This act seems to have put an end to the profession, for after this time they are no longer mentioned.

MINT, the place in which the king's money is coined. See COINAGE.

There were anciently mints in almost every county in England; but the only mint at present in the British dominions is that in the tower of London. The officers of the mint are, 1. The warden of the mint, who is the chief; he oversees the other officers, and receives the bullion. 2. The master-worker, who receives bullion from the warden, causes it to be melted, delivers it to the monyers, and, when it is coined, receives it again. 3. The comptroller, who is the overruler of all the inferior officers, and sees that all the money is made to the full value. 4. The assay-master, who weighs the gold and silver, and sees that it is according to the standard. 5. The two auditors who take the accounts. 6. The surveyor of the melting; who, after the assay-master has made trial of the bullion, sees that it is cast out, and not altered after it is delivered to the melter. 7. The engraver, who engraves the tamp and dies for the coinage of the money. 8. The clerk of the irons; who sees that the irons are clean and fit to work with. 9. The melter who melts the bullion before it be coined. 10. The provost of the mint; who provides for and oversees all the monyers. 11. The blanchers; who anneal and cleanse the money. 12. The monyers; some of whom forge the money, some share it, some round and mill it, and some stamp and coin it. 13. The porters who keep the gate of the mint.

Mint was also a pretended place of privilege, in Southwark, near the King's Bench, put down by statute. If any perfon, within the limits of the mint, shall obstruct any officer in the serving of any writ or process, &c. or assault any person therein, he who shall be guilty of felony, and be transported to the plantations, &c. Stat. 9. Geo. I.

Mint-Marks. It hath been usual, from old time, to oblige the masters and workers of the mint, in the indentures made with them, "to make a privy mark in all the money that they made, as well of gold as silver, so that another time they might know, if need were, and wit which moneys of gold and silver among other of the same moneys, were of their own making, and which not." And whereas, after every trial of the pix at Westminster, the masters and workers of the mint, having there proved their moneys to be lawful and good, were immediately entitled to receive their quittance under the great seal, and to be discharged.

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MINT, the place in which the king's money is coined. See COINAGE.

There were anciently mints in almost every county in England; but the only mint at present in the British dominions is that in the tower of London. The officers of the mint are, 1. The warden of the mint, who is the chief; he oversees the other officers, and receives the bullion. 2. The master-worker, who receives bullion from the warden, causes it to be melted, delivers it to the monyers, and, when it is coined, receives it again. 3. The comptroller, who is the overruler of all the inferior officers, and sees that all the money is made to the full value. 4. The assay-master, who weighs the gold and silver, and sees that it is according to the standard. 5. The two auditors who take the accounts. 6. The surveyor of the melting; who, after the assay-master has made trial of the bullion, sees that it is cast out, and not altered after it is delivered to the melter. 7. The engraver, who engraves the stamps and dies for the coinage of the money. 8. The clerk of the irons; who sees that the irons are clean and fit to work with. 9. The melter who melts the bullion before it be coined. 10. The provost of the mint; who provides for and oversees all the monyers. 11. The blanchers; who anneal and cleanse the money. 12. The monyers; some of whom forge the money, some share it, some round and mill it, and some stamp and coin it. 13. The porters who keep the gate of the mint.

Mint was also a pretended place of privilege, in Southwark, near the King's Bench, put down by statute. If any perfon, within the limits of the mint, shall obstruct any officer in the serving of any writ or process, &c. or assault any person therein, he who shall be guilty of felony, and be transported to the plantations, &c. Stat. 9. Geo. I.

Mint-Marks. It hath been usual, from old time, to oblige the masters and workers of the mint, in the indentures made with them, "to make a privy mark in all the money that they made, as well of gold as silver, so that another time they might know, if need were, and wit which moneys of gold and silver among other of the same moneys, were of their own making, and which not." And whereas, after every trial of the pix at Westminster, the masters and workers of the mint, having there proved their moneys to be lawful and good, were immediately entitled to receive their quittance under the great seal, and to be discharged.
MINUTE, in geometry, the 60th part of a degree of a circle.

Minutes of Time, the 60th part of an hour.

Minutes, in architecture, usually denotes the 30th, part of a module. See Architecture.

Minute is also used for a short memoir, or sketch of a thing taken in writing.

MINUTIUS FELIX. See Felix.

MINEY, a name given to the inhabitants of Orchomenos in Boetia, from Minyas king of the country. The son of Minyas gave his name to the capital of the country, and the inhabitants still retained their original appellation, in contradiction to the Orchomenians of Arcadia. A colony of Orchomenians passed into Thessaly and settled in Iolchoi; from which circumstance the people of the place, and particularly the Argonauts, were called Miney. This name they received, according to the opinion of some, not because a number of Orchomenians had settled among them, but because the chief and noblest of them were descended from the daughters of Minyas. Part of the Orchomenians accompanied the sons of Codrus when they migrated to Ionia. The defendant's of the Argonauts, as well as the Argonauts themselves, received the name of Miney. They first inhabited Lemnos, where they had been born from the Lemnian women who had murdered their husbands. They were driven from Lemnos by the Pelasgians, about 1160 before the Christian era, and came to settle in Laconia, from whence they passed into Cilicia with a colony of Lacedemonians.

MINEY, in botany. See Mentha.

MINTURNæ, a town of Compania between Sinuessa and Formiae. It was in the marches in this neighbourhood that Marius concealed himself in the mud to avoid the partisans of Sylla. The people condemned him to death; but when his voice alone had terrified the executioner, they showed themselves compassionate and favoured his escape.

MINT, a very graceful kind of dance, consisting of a couple, a high step, and a balance: it begins with a beat, and its motion is triple.

The invention of the minuet seems generally to be ascribed to the French, and particularly to the inhabitants of the province of Pouitou. The word is said by Menage and Furetiere to be derived from the French minue or menu, "small, or little," and in strictness signifies a small pace. The melody of this dance consists of two strains, which, as being repeated, are called repriés, each having eight or more bars, but never an odd number. The measure is three crotchets in a bar, and thus marked ¾, though it is commonly performed in the time ⅔. Walther speaks of a minuet in Lully's opera of Roland, each strain of which contains ten bars, the sectional number being 5; which renders it very difficult to dance.

MINUTE, in architecture, usually denotes the 60th, sometimes the 30th, part of a module. See Architecture.

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MIRACLE, in its original sense, is a word of the same purport with wonder; but in its usual and more appropriate signification, it denotes "an effect contrary to the established constitution and course of things, or a sensible deviation from the known laws of nature."

That the visible world is governed by stated general rules, or that there is an order of causes and effects established in every part of the system of nature which falls under our observation, is a fact which cannot be controverted. If the Supreme Being, as some have supposed, be the only real agent in the universe, we have the evidence of experience, that, in the particular system to which we belong, he acts by stated rules. If he employs inferior agents to conduct the various motions from which the phenomena result, we have the same evidence that he has subjected those agents to certain fixed laws, commonly called the laws of nature. On either hypothesis, effects which are produced by the regular operation of these laws, or which are conformable to the established course of events, are properly called natural; and every contradiction to this constitution of the natural system, and the correspondent course of events in it, is called a miracle.

If this definition of a miracle be just, no event can be deemed miraculous merely because it is strange, or even to us unaccountable; since it may be nothing more than a regular effect of some unknown law of nature. In this country earthquakes are rare; and for monstrous births perhaps no particular and satisfactory account can be given; yet an earthquake is, as regular an effect of the established laws of nature as any of those with which we are most intimately acquainted; and under circumstances in which there would always be the same kind of production, the monster is nature's genuine issue. It is therefore necessary, before we can pronounce any effect to be a true miracle, that the circumstances under which it is produced be known, and that the common course of nature be in some degree understood: for in all those cases in which we are totally ignorant of nature, it is impossible to determine what is, or what is not, a deviation from its course. Miracles, therefore, are not, as some have represented them, appeals to our ignorance. They suppose some antecedent knowledge of the course of nature, without which no proper judgment can be formed concerning them; though with it their reality may be so apparent as to prevent all possibility of a dispute.
Deviation from notions into first principles, of which they would not evacuate. Were man, in the exercise of his mental and corporeal powers, subjected to the laws of physical necessity, the circumstances supposed would indeed never occur, and of course no miracle could be admitted. But such is not the nature of man.

Without repeating what has been said elsewhere (see Metaphysics, Part III. chap. v.), of necessity and liberty, we shall here take it for granted, that the relation between motives and actions is different from that between cause and effect in physics; and that mankind have such command over themselves, as that by their voluntary conduct, they can make themselves in a great degree either happy or miserable. We know likewise from history, that, by some means or other, almost all mankind were once sunk into the grossest ignorance of the most important truths; that they knew not the Being by whom they were created and supported; that they paid divine adoration to flocks, stones, and the vilest reptiles; and that they were slaves to the most impious, cruel, and degrading superstitions.

From this depraved state it was surely not unworthy of the common "Father of all" to reduce his helpless creatures, to enlighten their understandings that they might perceive what is right, and to prevent them from motives of sufficient force to engage them in the practice of it. But the understandings of ignorant barbarians cannot be enlightened by arguments; because of the force of such arguments as regard moral science they are not qualified to judge. The philosophers of Athens and Rome inculcated, indeed, many excellent moral precepts, and they sometimes ventured to expose the absurdities of the reigning superstition; but their lectures had no influence upon the multitude; and they had themselves imbued such erroneous notions respecting the attributes of the Supreme Being, and the nature of the human soul, and converted those notions into first principles, of which they would not permit an examination, that even among them a thorough reformation was not to be expected from the powers of reasoning. It is likewise to be observed, that there are many truths of the utmost importance to mankind, which unaided reason could never have discovered. Amongst these we may confidently reckon the immortality of the soul, the terms upon which God will be reconciled to sinners, and the manner in which that all-perfect Being may be acceptably worshipped; about all of which philosophers were in such uncertainty, that, according to Plato, "Whatever is set right, and as it should be, in the present evil state of the world, can be so only by the particular interposition of God." An immediate revelation from Heaven, therefore, was the only method by which infinite wisdom and perfect goodness could reform a bewildered and vicious race. But this revelation, at whatever time we suppose it given, must have been made directly either to some chosen individuals commissioned to instruct others, or to every man and woman for whose benefit it was ultimately intended. Were every person intended in
in the knowledge of his duty by immediate inspiration, and were the motives to prudently bring home to his mind by God himself, human nature would be wholly changed: men would not be masters of their own actions; they would not be moral agents, nor by consequence be capable either of reward or of punishment. It remains, therefore, that if God has been graciously pleased to enlighten and reform mankind, without destroying that moral nature which is essential to virtue, he can have done it only by revealing his truth to certain chosen instruments, who were the immediate instructors of their contemporaries, and through them have been the instructors of succeeding ages.

Let us suppose this to have been actually the case, and consider how those inspired teachers could communicate to others every truth which had been revealed to themselves. They might easily, if it was part of their duty, deliver a sublime system of natural and moral science, and establish it upon the common basis of experiment and demonstration; but what foundation could they lay for those truths which have not been immediately received from God, no rational being could be expected to admit? The teachers might be men of known veracity, whose simple assertion would be admitted as sufficient evidence for any fact, in conformity with the laws of nature; but as every man has the evidence of his own conscience and experience that revelations from heaven are deviations from these laws, an assertion is apparently extravagant would be rejected as false, unless supported by some better proof than the mere affirmation of the teacher. In this state of things, we can conceive no evidence sufficient to make such doctrines be received as the truths of God, but the power of working miracles committed to him who taught them. This would, indeed, be fully adequate to the purpose. For if there were nothing in the doctrines themselves impious, immoral, or contrary to truths already known, the only thing which could render the teacher's assertion acceptable, would be its implying such an intimate communion with God as is contrary to the established course of things, by which men are left to acquire all their knowledge by the exercise of their own faculties.

Let us now suppose some of those inspired teachers to tell their countrymen, that he did not desire them, on his ipse dixit, to believe that he had any preternatural communion with the Deity, but that for the truth of his assertion he would give them the evidence of his own senses; and after this declaration let us suppose him immediately to raise a person from the dead in their presence, merely by calling upon him to come out of his grave. Would not the only possible objection to the man's veracity be removed by this miracle? and his assertion that he had received such and such doctrines from God be as fully credited, as if it related to the most common occurrence? Undoubtedly it would; for when so much preternatural power was visibly communicated to this person, no one could have reason to question his having received an equal portion of preternatural knowledge. A palpable deviation from the known laws of nature, in one instance, is a sufficient proof that such a deviation is possible in another; and in such a case as this it is the witness of God to the truth of a man.

Miracles, then, under which we include prophecy, are the only direct evidence which can be given of divine inspiration. When a religion, or any religious truth, is to be revealed from heaven, they appear to be absolutely necessary to enforce its reception among men; and this is the only case in which we can suppose them necessary, or believe for a moment that they ever have been or will be performed.

The history of almost every religion abounds with relations of prodigies and wonders, and of the intercourse of men with the gods; but we know of no religious system, those of the Jews and Christians excepted, which appealed to miracles as the sole evidence of its truth and divinity. The pretended miracles mentioned by Pagan historians and poets are not said to have been publicly wrought to enforce the truth of a new religion contrary to the reigning idolatry. Many of them may be clearly shown not to have been mere natural events; (see Magic). Others of them are represented as having been performed in secret on the most trivial occasions, and in obscure and fabulous ages long prior to the era of the writers by whom they are recorded. And such, of them as at first view appear to be best attested, are evidently tricks contrived for interested purposes; to flatter power, or to promote the prevailing superstitions. For these reasons, as well as on account of the immoral character of the divinities by whom they are said to have been wrought, they are altogether unworthy of examination, and carry in the very nature of them the completest proofs of falsehood and imposture.

But the miracles recorded of Moses and of Christ bear a very different character. None of them are represented as wrought on trivial occasions. The writers who mention them were eye-witnesses of the facts; which they affirm to have been performed publickly, in attestation of the truth of their respective systems. They are indeed incorporated with their systems, that the miracles cannot be separated from the doctrines; and if the miracles were not really performed, the doctrines cannot possibly be true. Besides all this, they were wrought in support of revelations which opposed all the religious systems, superstitions, and prejudices, of the age in which they were given: a circumstance which, if itself sets them, in point of authority, infinitely above the Pagan prodigies, as well as the lying wonders of the Romish church.

It is indeed, we believe, universally admitted, that the miracles mentioned in the book of Exodus and in the four Gospels, might, to those who saw them performed, be sufficient evidence of the divine inspiration of Moses and of Christ; but to us it may be thought that they are no evidence whatever, as we must believe in the miracles themselves, if we believe in them at all, upon the bare authority of human testimony. Why, it has been sometimes asked, are not miracles wrought in all ages and countries? If the religion of Christ was to be of perpetual duration, every generation of men ought to have complete evidence of its truth and divinity.

To the performance of miracles in every age and in every country, perhaps the same objections lie as to the immediate inspiration of every individual. Were
Miracles.

...those miracles universally received as such, men would be so overwhelmed with the nature rather than with the force of their authority, as hardly to remain masters of their own conduct; and in that case the very end of all miracles would be defeated by their frequency. The truth, however, seems to be, that miracles so frequently repeated would not be received as such, and of course would have no authority; because it would be difficult, and in many cases impossible, to distinguish them from natural events. If they recurred regularly at certain intervals, we could not prove them to be deviations from the known laws of nature, because we should have the same experience for the one series of events as for the other; for the regular succession of preternatural effects, as for the established constitution and course of things.

Be this, however, as it may, we shall take the liberty to affirm, that for the reality of the Gospel miracles we have evidence as convincing to the reflecting mind, though not so striking to vulgar apprehension, as those had who were contemporary with Christ and his apostles, and actually saw the mighty works which he performed. To the admirers of Mr Hume's philosophy this assertion will appear an extravagant paradox; but we hope to demonstrate its truth from the principles which, consistently with himself, that author could not have denied. He has indeed endeavoured to prove, that "no testimony is sufficient to establish a miracle;" and the reasoning employed for this purpose is, that "a miracle being a violation of the laws of nature, which a firm and unalterable experience has established, the proof against a miracle, from the very nature of the fact, is as entire as any argument from experience can be, whereas our experience of human veracity, which (according to him) is the sole foundation of the evidence of human veracity, is far from being uniform, and can therefore never preponderate against that experience which admits of no exception." This bold and plausible argument, with equal candour and acuteness has been examined by Dr Campbell; who judiciously observes, that so far is experience from being the sole foundation of the evidence of testimony, that, on the contrary, testimony is the sole foundation of by far the greater part of what Mr Hume calls firm and unalterable experience; and that if in certain circumstances we did not give an implicit faith to testimony, our knowledge of events would be confined to those which had fallen under the immediate observation of our own senses. For a short view of this celebrated controversy, in which the Christian faith completely vanquishes the philosopher, see the word ABRIDGEMENT.

But though Dr Campbell has exposed the sophistry of his opponent's reasoning, and overturned the principles from which he reasons, we are persuaded that he might safely have joined issue with him upon those very principles. To us, at least, it appears that the testimony upon which we receive the Gospel miracles is precisely of that kind which Mr Hume has acknowledged sufficient to establish even a miracle. "No testimony (says he) is sufficient to establish a miracle, unless the testimony be of such a kind that its falsehood would be more miraculous than the fact which it endeavours to establish. When one tells me that he saw a dead man restored to life, I immediately consider with myself whether it be more probable that this person should either deceive or be deceived, or that the fact which he relates should really have happened. I weigh the one miracle against the other; and according to the superiority which I discover I pronounce my decision, and always reject the greater miracle." In this passage every reader may remark what did not escape the perpicious eye of Dr Campbell, a strange confusion of terms: but as all miracles are equally easy to the Almighty; and as Mr Hume has elsewhere observed, that "the raising of a feather, when the wind wants ever so little of a force requisite for that purpose, is as real a miracle as the raising of a house or a ship into the air;" candour obliges us to suppose, that by talking of greater and less miracles, and of always rejecting the greater, he meant nothing more but that of two deviations from the known laws of nature he always rejects that which in itself is least probable.

If, then, we can shew that the testimony given by the apostles and other first preachers of Christianity to the miracles of their Master would, upon the supposition that those miracles were not really performed, have been as great a deviation from the known laws of nature as the miracles themselves, the balance must be considered as evenly poised by opposite miracles; and whilst it continues so, the judgment must remain in a state of suspense. But if it shall appear, that in this case the false testimony would have been a deviation from the laws of nature less probable than the miracles recorded in the Gospels, the balance will be instantly destroyed; and by Mr Hume's maxim we shall be obliged to reject the supposition of falsehood in the testimony of the apostles, and admit the miracles of Christ to have been really performed.

In this argument we need not waste time in proving that those miracles, as they are represented in the writings of the New Testament, were of such a nature, and performed before so many witnesses, that no imposture could possibly be practised on the senses of those who affirm that they were present. From every page of the Gospels this is so evident, that the philosophical adversaries of the Christian faith never suppose the apostles to have been themselves deceived, but boldly accuse them of bearing false witness. But if this accustom be well founded, their testimony itself is as great a miracle as any which they record of themselves or of their Master.

It has been shown elsewhere (see Metaphysics, n° 138.), that by the law of association, which is one of the laws of nature, mankind, in the very process of learning to speak, necessarily learn to speak the truth; that ideas and relations are in the mind of every man so closely associated with the words by which they are expressed in his native tongue, and in every other language of which he is master, that the one cannot be entirely separated from the other; that therefore no man can on any occasion speak falsehood without some effort; that by no effort can a man give consistency to an unpredetermined detail of falsehood, if it be of any length, and include a number of particulars; and that it is still less possible for several men to agree in such a detail, when at a distance from each other, and cross-questioned by their enemies.

This being the case, it follows, if the testimony of the
the apostles to their own and their Master's miracles be false, either that they must have concerted a consistent scheme of falsehood, and agreed to publish it at every hazard; or that God, or some powerful agent appointed by him, must have divested all the associations formed in their minds between ideas of faith and the words of language, and arbitrarily formed new associations, all in exact conformity to each other, but all in direct contradiction to truth. One or other of these events must have taken place; because, upon the supposition of falsehood, there is no other alternative. But such a diffusion and formation of associations as the latter implies, must, to every man who shall attentively consider it, appear to be as real a miracle, and to require as great an exertion of power, as the resurrection of the dead. Nor is the supposed voluntary agreement of the apostles in a scheme of falsehood, more consistent with the event itself in which they were fat down to fabricate their pretended revelation, and to contrive a series of miracles to which they were unanimously to appeal for its truth, than it is plain, since they proved successful in their daring enterprize, that they must have clearly foreseen every possible circumstance in which they could be placed, and have prepared consistent answers to every question that could be put to them by their most inveterate and most enlightened enemies; by the statesman, the lawyer, the philosopher, and the priest. That such foreknowledge as this would have been miraculous, will not firely be denied; since it forms the very attribute which we find it most difficult to allow even to God himself. It is not, however, the only miracle which this supposition would compel us to swallow. The very refutation of the apostles to propagate the belief of false miracles in support of such a religion as that which is taught in the New Testament, is as great a miracle as human imagination can easily conceive.

When they formed this design, either they must have hoped to succeed, or they must have foreseen that they should fail in their undertaking; and in either case, they chose evil for its own sake. They could not, if they foresaw that they should fail, look for anything but that contempt, disgrace, and persecution, which were then the inevitable consequences of an unsuccessful endeavour to overthrow the established religion. Nor could their prospects be brighter upon the supposition of their success. As they knew themselves to be false witnesses and impious deceivers, they would have none hopes beyond the grave; and by determining to oppose all the religious systems, superstitions, and fanims of the age in which they lived, they willfully exposed themselves to inevitable misery in the present life, to infult and imprisonment, to stripes and death. Nor can it be said that they might look forward to power and influence when they should, through sufferings, have converted their countrymen; for so defirous were they of obtaining nothing but misery as the end of their mission, that they made their own persecution a pretext of the truth of their doctrines. They introduced the Master from whom they pretended to have received these doctrines as telling them, that "they were sent forth as sheep in the midst of wolves; that they should be delivered up to councils, and scourged in synagogues; that they should be hated of all men for his name's sake; that the broth-

...
MIRANDA DE EBRO, a town of Spain

MIRANDO DE DUERO, a strong town of Portugal, and capital of the province of Tras-Montes, with a bishop's see. It is well fortified, and seated on a rock near the confluence of the river Douro and Pheina. W. Long. 5. 40. N. Lat. 41. 30.

MIRANDOLA, a town of Italy, and capital of a duchy of the same name, situated between the duchies of Mantua and Modena. It is a pretty large place, well fortified, and has also a strong citadel and fort. It has been several times taken and retaken; the last time by the king of Sardinia in 1742. E. Long. 11. 5. N. Lat. 44. 52.

MIRANULA. See Picus.

MIREVELT (Michael Jansen), portrait-painter, was the son of a Goldsmith, and born at Delft in 1568. His father, perceiving his early inclination for the arts, placed him at first with one of the Wierixes, of whom he learned to draw in crayons and to engrave. At the age of twelve he executed a print of the Samaritan woman; and not long after a figure of Judith holding the head of Holofernes. These juvenile performances attracted the notice of Anthony Blockland, an historical painter of great note; and under his instructions Mirevelt took up the pencil. He was very successful in his attempts at painting history; but finding portraits to be more profitable, he quitted the former by degrees, and applied himself to portrait painting only. His reputation according to De Piles, was so great, that he executed what price for his pictures he pleased, never taking less than 150 florins a piece. The portraits drawn and painted by this artist are exceedingly numerous; and many of them were excellently engraved by William James Delft, his near relation, a very skilful artist. He died in 1641.

Mirevelt (Peter), son of Michael, was born at Delft in 1596, and died in 1632. In his manner of design, in his style of colouring, and in the delicacy of his pencil, he exactly resembled his father; and by the best judges of that time he was accounted to be in no degree inferior to him.

MIRIAM, sister of Aaron and Moses, makes two or three remarkable appearances in scripture. It was owing to her that her mother was employed by Pharoah's daughter as nurse to Moses. She put herself at the head of the women of Israel after their passage through the Red Sea, in order to sing the song which the men had sung before. She joined with her brother Aaron in murmuring against Moses, and was severely chastised for that action; for she became leprous, and continued separate from the rest without the camp for seven days. She died before her brothers, though in the same year with them, and was buried at the public expense.

MIRROR, a name for a looking glafs, or any polished body, whose use is to form the images of distant objects, by reflection of the rays of light. See Refraction.

MIRRORS are either plain, convex, or concave. The first reflect the rays of light in a direction exactly similar to that in which they fall upon them, and therefore represent bodies of their natural magnitude. The convex ones make the rays diverge much more than before refraction, and therefore greatly diminish the images of those objects which they show: while the concave ones, by collecting the rays into a focus, not only magnify the objects they show, but will burn very fiercely when exposed to the rays of the sun; and hence they are commonly known by the name of burning mirrors. See Burning-Mirror.

In ancient times the mirrors were made of some kind of metal; and from a passage in the Mosaic writings we learn that the mirrors used by the Jewish women were made of brass. The Jews certainly had been taught to use that kind of Mirrors by the Egyptians; from whence it is probable that brazen mirrors were the first kind used in the world. Any kind of metal, indeed, when well polished, will reflect very powerfully, but of all others silver reflects the most, tho' it has been in all countries too expensive a material for common use. Gold also is very powerful; and metals, or even wood, gilded and polished, will act very powerful as burning mirrors. Even polished ivory, or draw nicely platted together, will form mirrors capable of burning, if on a large scale.

Since the invention of glafs, and the application of quicksilver to it, became generally known, it hath been universally employed for those plain mirrors used as ornaments to houses; but in making reflecting telescopes, they have been found much inferior to metallic ones. It doth not appear that the fame superiority belongs to the metalline burning mirrors, considered merely as burning glafs; since the mirror with which Mr Macquer melted platina, though only 22 inches diameter, and which was made of quicksilvered glafs, produced much greater effects than M. Villette's metalline speculum, which considerably exceeded it in size. It is very probable, however, that this mirror of M. Villette's was by no means so well polished as it ought to have been; as the art of preparing the metal for taking the finest polish has but lately been discovered and published in the Philosophical Transctions.
MIS

MISADVENTURE, in common language, signifies any unlucky accident which takes place without being foreseen.

MISADVENTURE, in law, has an especial signification for the killing a man partly by negligence, and partly by chance. See HOMICIDE.

MISANTHROPY (formed from hatred, and aversion, a man); a general dislike or aversion to man, and mankind. In which sense it stands opposed to philanthropy, or the love of mankind.

MISARRIAGE. See ABORTION and MIDWIFERY.

MISCHNA, or Misna, (from taw, iteravit), a part of the Jewish Talmud.

The Mischna contains the text; and the Gemara, which is the second part of the Talmud, contains the commentaries on that the Gemara is, as it were, a glossary on the Mischna.

The Mischna consists of various traditions of the Jews, and of explanations of several passages of Scripture; these traditions serving as an exposition of the written law, and supplement to it, are said to have been delivered to Moses during the time of his abode on the Mount; which he afterwards communicated to Aaron, Eleazar, and his servant Joshua. By these they were transmitted to the 70 elders, by them to the prophets, who communicated them to the men of the great sanhedrim, from whom the wife men of Jerusalem and Babylon received them. According to Prideaux's account, they passed from Jeremiah to Baruch, from him to Ezra, and from Ezra to the men of the great synagogue, the last of whom was Simon the Jelt: who delivered them to Antigonus of Socho; and from him they came down in regular succession to Simeon, who took the Saviours in his arms; to Gamaliel, at whose feet Paul was educated; and last of all to Rabbi Judah the Holy, who committed them to writing in the Mischna. But Dr Prideaux, rejecting this Jewish fiction, observes, that after the death of Simon the Just, about 299 years before Christ, the Michtiial doctors arose, who, by their comments and conclusions, added to the number of those traditions which had been received and allowed by Ezra and the men of the great synagogue; so that towards the middle of the second century after Christ, under the empire of Antoninus Pius, it was found necessary to commit these traditions to writing; more especially, as their country had considerably suffered under Adrian, and many of their schools had been dissolved; and their learned men cut off; and therefore the usual method of preserving their traditions had failed. Rabbi Judah on this occasion being rector of the school at Tiberias, and president of the sanhedrim in that place, undertook the work, and compiled it in six books, each consisting of several tracts, which altogether make up the number of 63. 

PRID. CONNECT. vol. ii. p. 468, &c. ed. 9. This learned author computes, that the Mischna was composed about the 150th year of our Lord; but Dr Lightfoot says, that Rabbi Judah compiled the Mischna about the year of Christ 150, in the latter end of the reign of Commodus; or, as some compute, in the year of Christ 220. Dr Larner is of opinion, that this work could not have been finished before the year 150, or later. Colled. of Jewish and Heathen Testimonies, &c. vol. i. p. 178. Thus the book called the Mischna was formed; a book which the Jews have generally received with the greatest veneration. The original has been published with a Latin translation by Surenhusius, with notes of his own, and others from the learned Maimonides, &c. in 6 vols. fol. Amfterd. A. D. 1698-1703. (See Talmud.) It is written in a much purer style, and is not near so full of dreams and visions as the Gemara.

MISDEMEANOUR, in law, signifies a crime. Every crime is a misdemeanor; yet the law has made a distinction between crimes of an higher and a lower nature; the latter being denominated misdemeanours, the former crimes, &c. For the understanding of which distinction, we shall give the following definition from Blackstone's Commentaries, vol. iv. 5.

"A crime, or misdemeanor, is an act committed or omitted, in violation of a public law, either forbidding or commanding it. This general definition comprehends both crimes and misdemeanours; which, properly speaking, are mere synonymous terms; though, in common usage, the word crime is made to denote such offences as are of a deeper and more atrocious dye; while smaller faults, and omissions of less consequence, are comprised under the gentler name of misdemeanours only."

MISE, in law-books, is used in various senses; thus it sometimes signifies costs or expenses; in which sense it is commonly used in entering of judgments in actions personal. It is also used for the fine to be tried on the grand affize; in which case, joining of the fine upon the mere right, is putting an fine between the tenant and demandant, Who has the best or clear right.

Mise also signifies a tax or tallage, &c. An honorary gift, or customary present from the people of Wales to every new king or prince of Wales, anciently given in cattle, wine, and corn, but now in money, being 5000l. or more, is denominated a mise: so was the usual tribute or fine of 3000 marks paid by the inhabitants of the county palatine of Chester at the change of every owner of the said earldoms, for enjoying their liberties. And at Chester they have a mife-book, wherein every town and village in the county is rated what to pay towards the mise. The 27 Hen. VIII. c. 26, ordains that lords shall have all such mises and profits of their lands as they had in times past, &c.

Miss, is sometimes also corruptly used for mess, in law French medio, a messuage, or a mise place, in some manors, is such a messuage or tenement as answers the lord a heriot at the death of its owner.

2. Inf. 228.

MISENUM, or Misenum, (anc. geog.); a promontory, port, and town in Campania, situated to the south-west of Baiae, in the Sinus Puteolanus, on the north side. Here Augustus had a fleet, called Caesars Misenum, for guarding the Mare Infernum; as he had another at Ravenna for the Superbum.

On this peninsula a villa was built by Caius Marius, with a degree of elegance that gave great offence to the more autemne among the Romans, who thought it
Upon the same foundation Lucullus, the plunderer of the eastern world, erected an edifice, in comparison of which the former house was a cottage; but even his magnificence was eclipsed by the splendour of the palace which the emperors raised upon the same spot. To these proud abodes of heroes and monarchs, which have long been levelled to the ground, a few filling huts, as Mr Swinburn informs us, and a lonely public house, have succeeded; hither boatmen resort to tipple, perhaps on the identical site where the voluptuous masters of the world quaffed Chin and Falernian wines.

Mr Miseric, a parsimonious person who is at the same time rich; or a wretch covetous to extremity, whom avarice has divested of all the charities of human nature, and made even an enemy to himself.

Of this most unaccountable of all characters, many instances occur; some of them so extraordinary as almost to surpass belief. The following are here selected, as being of recent date, perfectly authentic, and the last of them in particular exhibiting an assemblage of qualities the most singular perhaps that ever centered in the same person. Too little dignified to merit a place in regular biography, yet too curious a variety of human character to pass unnoticed in this Work, the present seemed the only title under which it could with propriety be introduced.

1. In December 1790, died at Paris, literally of want, Mr Ottewald, a well-known banker. This man, originally of Neuchatel, felt the violence of the disease of avarice (for surely it is rather a disease than a passion of the mind) so strongly, that, within a few days of his death, no importunities could induce him to buy a few pounds of meat for the purpose of making a little soup for him. "Tis true (said he), I should not dislike the soup, but I have no appetite for the meat; what then is to become of that?" At the time that he refused this nourishment, for fear of being obliged to give away two or three pounds of meat, there was tied round his neck a silk bag, which contained 800 assignats of 1000 livres each. At his outlet in life, he drank a pint of beer, which served him for supper, every night at a house much frequented, from which he carried home all the bottle corks he could come at. Of theft, in the course of eight years, he had collected as many as fold for 12 louis d'ors, a sum that laid the foundation of his future fortune, the superstructure of which was rapidly raised by his uncommon success in stock-jobbing. He died possessed of three millions of livres (L. 125,000 sterling.)

2. The late John Elwes, Esq., was member for Berkshire in three successive parliaments. His family name was Meggot; and his father was a brewer of great eminence, and distinguished by no peculiarity of character: but his mother, though she was left nearly L. 100,000 by her husband, starved herself to death! At an early period of life he was sent to Westminster school, where he remained for 10 or 12 years. During that time he certainly had not misapplied his talents; for he was a good classical scholar to the left: and it is a circumstance not a little remarkable, though well authenticated, that he never read afterwards, nor had he ever any knowledge in accounts; to which may in some measure be attributed the total ignorance he was always in as to his affairs. From Welfminster school Mr Meggot removed to Geneva, where he soon entered upon pursuits more agreeable to him than study. The riding-master of the academy there had then to boast perhaps of three of the best riders in Europe, Mr Worley, Mr Elwes, and Sir Sidney Meadows. Of the three, Elwes was reckoned the most desperate; the young horses were always put into his hands, and he was the rough rider to the other two.

On his return to England, after an absence of two or three years, he was to be introduced to his uncle the late Sir Harvey Elwes, that was then living at Stoke in Suffolk, perhaps the most perfect picture of human penury that ever existed. The attempts at saving money were in him so extraordinary, that Mr Elwes perhaps never quite reached them, even at the last period of his life. Of what temperance can do, Sir Harvey was an instance. At an early period of life he was given over for a consumption, and he lived till between 80 and 90 years of age. On his death, his fortune, which was at least L. 250,000, fell to his nephew Mr Meggot, who by will was ordered to assume the name and arms of Elwes. To this uncle, and this property, Mr Elwes succeeded when he had advanced beyond the 40th year of his age. And for fifteen years previous to this period, it was that he was known in the most fashionable circles of London. He had always a turn for play; and it was only late in life; and from paying always and not always being paid, that he conceived difficulty at it. The theory which he professed, "that it was impossible to ask a gentleman for money," he perfectly confirmed by the practice; and he never violated this feeling to the latest hour of his life.

The manners of Mr Elwes were such—so gentle, so attentive, so gentlemanly, and so engaging—that rudesness could not ruffle them, nor strong ingratitude break their observance. He retained this peculiar feature of the old court to the last: but he had a praise beyond this; he had the most gallant disregard of his own person, and all care about himself, that can be imagined. The infinences in younger life, in the most imminent personal hazard, are innumerable; but when age had dispoiled him of his activity, and might have rendered care and attention about himself natural, he knew not what they were: He wished no one to afflict him: "He was as young as ever; he could walk; he could ride, and he could dance; and he hoped he should not give trouble even when he was old." He was at that time 75.

It is curious to remark how he contrived to mingle small attempts at saving with objects of the most unbounded dissipation. After fitting up a whole night at play for thousands with the most fashionable and profligate men of the time, amidst splendid rooms, gilt sofas, wax lights, and waiters attendant on his call, he would walk out about four in the morning, not towards home, but into Smithfield, to meet his own cattle, which were coming to market from Thaydonhall, a farm of his in Essex! There would this same man, forgetful of the scenes he had just left, stand in the cold and rain bartering with a carcase-butcher for a hilling! Sometimes, when the cattle did not arrive at the hour he expected, he would walk on in the mire to meet them; and more than once has gone on foot the whole
whole way to his farm without flopping, which was
17 miles from London, after fitting up the whole
night. Had every man been of the mind of Mr Elwes,
the race of innkeepers must have perished, and poth-
ditches been returned back to those who made
them; for it was the buisiness of his life to avoid both.
He always travelled on horseback. To see him setting
out on a journey, was a matter truly curious; his
first care was to put two or three eggs, boiled hard,
into his great-coat pocket, or any scraps of brood
which he found; baggage he never took: then mount-
ing one of his hunters, his next attention was to get
out of London into that road where turnpikes were
the fewest: then, flopping under any hedge where
grabs pretended itself for his horse, and a little water
for himself, he would sit down and refresh himself
and his horse together.

The chief residence of Mr Elwes at this period of
his life was in Berkshire, at his own seat at Marcham.
Here it was he had two natural sons born, who inherit
the greatest part of his property by a will made about
the year 1785. The keeping fox-hounds was the on-
ly influence in the whole life of Mr Elwes of his ever
sacrificing money to pleasure; and may be felted as
the only period when he forgot the cares, the per-
plexities, and the regret, which his wealth occasioned.
But even here every thing was done in the most frugal
manner. Scrub, in the Beaux Stratagem, when com-
pared with Mr Elwes's huntman had an idle life of
it. This famous huntman might have fixed an epoch
in the history of servants: for in a morning, getting
up at four o'clock, he milked the cows; he then
prepared breakfast for Mr Elwes or any friends he
might have with him: then, slipping on a green coat, he
hurried into the stable, saddled the horse, got the hounds
out of the kennel, and away they went into the field.
After the fatigues of hunting, he refreshed himself by
rubbing down two or three horses as quickly as he
could; then running into the house to lay the cloth,
and wait at dinner; then hurrying again into the sta-
ble to feed the horses—who diversified with an interlude
of the roads, to drink a glass or two, to milk, the dogs to feed, and eight
hunters to litter down for the night.

In the penury of Mr Elwes there was something
that seemed like a judgment from heaven. All earth-
ly comforts he voluntarily denied himself: he would
walk home in the rain in London rather than pay a
shilling for a coach; he would sit in wet cloaths fooner
than have a fire to dry them; he would eat his pro-
visions in the last stage of putrefaction sooner than
have a fresh joint from the butchers; and he wore a wig
for above a fortnight, which his biographer * now him
pick up out of a rut in a lane where they were riding.
This was the last extremity of humble economy;
for to all appearance it was the call-of-wig of some beggar.

Mr Elwes had now resided about 17 years in Suf-
folk, when the contest for Berkshire presented itself
on the dissolution of the parliament—and when, to pre-
sure the peace of that county, he was nominated by
Lord Craven. Mr Elwes, though he had retired from
public business for some years, had still left about him
some of the seeds of more active life, and he agreed to the
proposel. It came further enhanced to him, by the
agreement, that he was to be brought in by the
Vol. XI.

* Mr Tep-
ham; from whose
Life of
John El-
we, Esq;
the parti-
culars of
this article
are exten-
ed.

fresher holders for nothing. All he did on the occasion
was dining at the ordinary at Reading; and he got
into parliament for 18 pence!

Though a new man, Mr Elwes could not be called
a young-member; for he was at this time nearly 63
years old when he thus entered on public life. But
he was in possession of all his activity; and prepara-
tory to his appearance on the board of St Stephen's
Chapel, he used to attend constantly during the races
and other public meetings all the great towns where
his voters resided. At the different assemblies, he
would dance amongst the youngest to the last, after
riding over on horseback, and frequently in the rain,
to the place of meeting. A gentleman who was one
night standing by, observed on the extraordinary agi-
ty of so old a man,—"Oh! that is nothing (replied
another); for Mr Elwes, to do this, rode 20 miles in
the rain, with his shoes stuck into his boots and his bag-
wig in his pocket."

The honour of parliament made no alteration in
the dress of Mr Elwes; on the contrary, it seemed
at this time to have attained additional meanness;
and nearly to have reached that happy climax of po-
vety, which has more than once drawn on him the
complaisance of those who passed by him in the street.
For the speaker's dinners, however, he had one fait,
with which the speaker in the court of the fellows
became very familiar. The minister likewise was well
acquainted with it; and at any dinner of opposition
still was his apparel the same. The wits of the minor-
ity used to say, "that they had full as much reason
as the minister to be satisfied with Mr Elwes, as he
had the same habit with everybody." At this period
of his life Mr Elwes wore a wig. Much about the time
when his parliamentary life ceased, that wig was worn
out; so then, being older and wiser as to expense, he
wore his own hair, which like his expenses was very
fmal. All this time the income of Mr Elwes was in-
creasing hourly, and his present expenditure was next
to nothing; for the little pleasures he had once engaged
in he had now given up. He kept no house, and on-
ly one old servant and a couple of horses: he refi ned
with his nephew: his two sons had stationed in
Suffolk and Berkshire, to look after his respective
cities; and his dress certainly was no expense to him;
for had not other people been more careful than him-
self, he would not have had it even mended.
When he left London, he went on horseback to his
country-seats with his couple of hard eggs, and with-
out once stopping upon the road at any house. He
always took the most unfrequented road, and used
every shift to avoid turnpikes. Marcham was the first
he now chiefly visited; which had some reason to be
flattered with the preference, as his journey into Suf-
folk cost him only two-pence half-penny, while that in
to Berkshire amounted to four-pence!

As Mr Elwes came into parliament without ex-
pence, he performed his duty as a member would have
done in the pure days of our constitution. What
he had not bought, he never attempted to sell; and
he went forward in that straight and direct path,
which can alone satisfy a reflecting mind. Amongst
the smaller memorals of the parliamentary life of Mr
Elwes may be noted, that he did not follow the cu-
When he quitted parliament, he was, in the common phrase, "a fish out of water!" The style of Mr Elwes's life had left him no domestic scenes to which he could retire—his home was dreary and poor—his rooms received no cheerfulness from fire; and while the outside had all the appearance of a "House to be Let," the inside was a defect; but he had his penury alone to thank for this, and for the want of all the little confolations which should attend old age, and smooth the paffage of declining life. At the close of the spring 1785, he wished again to vifit, which he had not done for some years, his feat at Stoke. But then the journey was a moft fervile object to him. The famous old fervant was dead; all the horses that remained with him were a couple of worn-out broodmares; and he himself was not in that vigour of body in which he could ride 60 or 70 miles on the fufperance of two boiled eggs. The mention of a poft-chaise would have been a crime—"He afford a poft-chaffe, indeed! where was he to get the money?" would have been his exclamation. At length he was carried into the country as he was carried into parliament, free of expence, by a gentleman who was certainly not quite fo rich as Mr Elwes. When he reached Stoke—the feat of more active fenes, of somewhat refembling hofpitality, and where his fox-hounds had fpread somewhat like vivacity around,—he remarked, "he had expended a great deal of money once very foolishly; but that a man grew wifher by his foftuions.

The rooms at this feat, which were now much out of repair, and would have all fallen in but for his fon John Elwes, Esq.; who had refided there, he thought too expenfively furnifhed, as worfe things might have ferved. If a window was broken, there was to be no repair but that of a little brown paper, or that of piecing in a bit of broken glafs; which had at length been done fo frequently, and in fo many fpates, that it would have puzzled a mathematician to fay "what figure they deferved." To fave fire, he would walk about the remains of an old greenhouse, or fit with a fervant in the kitchen. During the harveft he would amufe himself with going into the fields to glean the corn on the grounds of his own tenants; and they ufed to leave a little more than common to pleaf the old gentleman, who was as eager after it as any pauper in the parish. In the advance of the feafon, his morning employment was to pick up any flary chips, bones, or other things, to carry to the fire, in his pocket—and he was one day furprifed by a neighbouring gentleman in the act of pulling down, with some difficulty, a crow's net for this purpofe. On the gentleman wondering why he gave himfelf this trouble—"Oh, Sir, (replied old Elwes), it is reafonably that thofe creatures fhould do fo. Do but fee what waffe they make! They don't care how extravagant they are!"

As no gleam of favourite paffion, or any ray of amufement, broke through this gloom of penury, his infaftible defire of faving was now become uniform and fystematic. He ufed flill to ride about the country on one of these mares—but then he rode her very economically, on the soft turf, adjoining the road, without putting himfelf to the expence of shoes, as he observed, "The turf was fo pleafant to a horfe's foot!" And when any gentleman called to pay him a vifit, and the boy who attended in the flables was profufe enough to put a little hay before his horfe, old Elwes would frily steal back into the flable, and take the hay very carefuilly away. That very fharp appetite which Mr Elwes had in some meafure restrained during the long fitting of parliament, he now indulged moft voracioufly, and on every thing he could find: To fave, as he thought, the expence of going to a butcher, he would have a whole fheep killed, and fo eat mutton to the—end of the chapter. When he occafoonally had his river drawn, though fometimes horfe-loads of small ftilt were taken, not one would he fuf­fer to be thrown in again; for he observed, "He fhould never fee them again!" Came in the laft flate of purfueation, and meat that walked about his plates would he continue to eat, rather than have new things killed before the old provision was finished. With this diet—the charnel-houfe of fufpereance—his defte kep­pace—equally in the laft fage of absolute diftuffion. Sometimes he would walk about in a tattered brown-coloured hat, and fometimes in a red and white woolen cap, like a prisoner confined for debt. His shoes he never would fuffer to be cleaned, left they fhould be worn out the fooner. But ftilt, with all this felf-denih—that penury of life to which the inha­bitant of an alm-houfe is not doomed—all did he think he was profufe, and frequently fay, "He muft be a little more careful of his property." His difqueftude on the fubjeft of money was now continual. When he went to bed, he would put five or ten guineas into a bureau; and then, full of his mo­ney, after he had retired to rest, and fometimes in the middle of the night, he would come down to fee if it was there.

The feene of mortification at which Mr Elwes was now arrived was all but a denial of the common ne­ceffaries of life: and indeed it might have admitted a doubt, whether or not, if his manors, his fift-ponds, and fome grounds in his own hands, had not furnished a fubfifence, where he had not any thing actually to buy, he would not, rather than have bought any thing, have tarved. Strange as this may appear, it is not exaggerated.—He one day, during this period, dined upon the remaining part of a moo-hef, which had been brought out of the river by a rat! and at another time an undigefled part of a pike which a larger one had almonds, but had not finished, and which were taken in this flate in a net. At the time this laft circumstance happened, he discovered a strange kind of fatisfaftion; for he faid to a friend, "Aye! this was killing two birds with one fone!" In the room of all comment—of all moral—let it be remark­ed, that at this time Mr Elwes was perhaps worth nearly eight hundred thoufand pounds! and, at this pe­riod, he had not made his will, of course was not faving from any fentiment of affection for any perfon.

The Summer of 1788 Mr Elwes paifed at his hone­ in Welbeck-freet, London; and he paifed that sum­mer without any other fociety than that of two maid­servants;
find a comfortable home. In London he was certainly soon uncomfortable: but still, with these temptations before and behind him, a journey with the expense annexed to it was unremunerative. This, however, was greatly alleviated by an offer from Mr. Partis, a gentleman of the law, to take him to his ancient seat in Berkshire with his purse perfectly whole. But there was one circumstance still very distressing— the old gentleman had now nearly worn out his last coat, and he would not buy a new one; his own, therefore, with a pious fraud, contrived to get Mr. Partis to buy him a coat and make him a present of it. Thus, formerly having had a good coat, then a bad one, and at last no coat at all, he was kind enough to accept one from a neighbour.

Mr. Elwes carried with him into Berkshire five guineas and a half, and a half crown. Left the mention of this sum may appear singular, it should be said, that previous to his journey he had carefully wrapped it up in various folds of paper, that no part of it might be lost. On the arrival of the old gentleman, Mr. George Elwes and his wife did everything they could to make the country a scene of quiet to him. But "he had that within" which baffled every effort of this kind. Of his heart it might be said, "there was no peace in Israel." His mind, cast away upon the vast and troubled ocean of his property extending beyond the bounds of his calculation, returned to a muse itself with fetching and carrying about a few guineas, which in that ocean was indeed a drop. But nature had now carried on life nearly as far as she was able, and the fund was almost run out. The first symptoms of more immediate decay was his inability to enjoy his rest at night. Frequently would he be heard at midnight as if struggling with some one in his chamber, and crying out, "I will keep my money, I will; nobody shall rob me of my property." On any one of the family going into his room, he would start from this fever of anxiety, and, as if waking from a troubled dream again hurry into bed, and seem unconscious of what had happened. At length, on the 26th of November 1789, expired this miserably rich man, whole property, nearly reaching to a million, extended itself almost through every county in England.

MISERICORDIA, in law, is an arbitrary fine imposed upon any person for an offence: this is called _misericordia_, because the amercement ought to be but small, and less than that required by magna charta. If a person be outrageously amerced in a court that is not of record, the writ called _moderata misericordia_ lies for moderating the amercement according to the nature of the fault.

MISFORTUNE. An unlucky accident.

Misfortune, or chance, in law, a deficiency of the will; or committing of an unlawful act by misfortune or chance, and not by design. In such case, the will observes total neutrality, and does not co-operate with the deed; which therefore wants one main ingredient of a crime. See _CRIME_.

Of this, when it affects the life of another, we have spoken under the article _Homicides_; and in this place have only occasion to observe, that if _any_ accidental mischief happens to follow from the performance of a lawful act, the party stands exonerated from all guilt; but...
MISPRISIONES, or misprisions, are generally denominated contempt or high misdemeanours; of which the principal is the mal-administration of such high officers as are in public trust and employment.

This is usually punished by the method of parliamentary impeachment; wherein such penalties, short of death, are inflicted, as to the wisdom of the house of peers shall seem proper; consisting usually of banishment, imprisonment, fines, or perpetual disability. Hitherto also may be referred the offence of embezzling the public money, called among the Romans, peculium; which the Julian law punished with death in a magistrate, and with deportation, or banishment, in a private person. In England it is not a capital crime, but subjects the committer of it to a discretionery fine and imprisonment.—Other misprisions are, in general, such contempt of the executive magistrate as demonstrate themselves by some arrogant and undutiful behaviour towards the king and government: for a detail of which, vide Blackstone's Comment. iv. 22.

MISSAL, the Roman mass-book, containing the several masses to be said on particular days. It is derived from the Latin word missa, which, in the ancient Christian church, signified every part of divine service.

MISSEL-BIRD, a species of Turdus.

MISSIO, among the Romans, was a full discharge given to a soldier after 20 years service, and differed from the excusatior, which was a discharge from duty after 17 years service. Every soldier had a right to claim his missio at the end of 20 years.

MISSION, in theology, denotes a power or commission to preach the gospel. Jesus Christ gave his disciples their mission in these words Go and teach all nations, &c.

The Romanists reproach the protestants, that their ministers have no mission, as not being authorized in the exercise of their ministry, either by an interrupted succession from the apostles, or by miracles, or by an extraordinary proof of a vocation.

There are many who deny any other mission necessary for the ministry than the talents necessary to discharge it.

Mission is also used for an establishment of people zealous for the glory of God and the salvation of souls; who go and preach the gospel in remote countries and among infidels.

There are missions in the East as well as in the West Indies. Among the Romanists, the religious orders of St Dominic, St Francis, St Augustine, and the Jesuits, have missions in the Levant, America, &c. The Jesuits have also missions in China, and all other parts of the globe where they have been able to penetrate. There have been also several Protestant missions for diffusing the light of Christianity through the benighted regions of Asia and America. Of this kind has been the Danish mission planned by Frederic IV. in 1706. And the liberty of private benefactors in other countries has been also extended to
MITCHELSTOWN, a poll-town of Ireland, in the county of Cork and province of Munster in Ireland, 103 miles from Dublin. Here is a college for the support of 12 decayed gentlemen and 12 decayed gentlewomen, who have £40 yearly, and handsome apartments, and a chappel at £100 a-year, with a house; divine service is daily performed in a neat chapel belonging to the college; the whole was founded by the late earl of Kingston. Here is also a most magnificent feat of Lord Kingborough.—Fair are held at this town 30th July and 12th November.

MITE, a small piece of money mentioned Luke xii. 59. and xxii. 2. In the Greek it is ἴδραρες, i. e. quarter, or a quarter of the Roman denarius, so that the mite was worth about seven farthings, or two pence halfpenny.

MITE, in zoology. See ACARUS.

MITELLA, BASTARD AMERICAN SANICLE: A genus of the digyna order, belonging to the decandria class of plants; and in the natural method ranking under the 13th order, Scrofulariae. The calyx is quinquifid; the corolla pentagynous, and inserted into the calyx; the petals pinnatifid; the capsule unilocular and bivalved, with the valves equal. There are two species, both natives of North America, differing with annual herbageal flanks from five or six to eight or nine inches in height, and producing spikes of small whitish flowers, whose petals are fringed on their edges. They are easily propagated by parting their roots; and should be planted in a sandy situation, and in a level loamy soil.

MITHRAGA, feasts of, in antiquity, were feasts celebrated among the Romans in honour of Mithras or the sun. The most ancient influence of this Mithras among the Romans occurs in an inscription dated in the third consulate of Trajan, or about the year of Christ 101. This is the dedication of an altar to the sun under the above name, thus inscribed, Den Sac Mithrae. But the worship of Mithras was not unknown in Egypt and Syria in the time of Origen, who died about the year of Christ 265; though it was common at Rome for more than a century before this time. The worship of Mithras was proscribed at Rome in the year 378, by order of Gratian, prefect of the praetorium. According to M. Fre ret, the feasts of Mithras were derived from Chalda, where they had been instituted for celebrating the entrance of the sun into the sign Taurus.

MITHRAS, OF MITHRAE, a god of Persia and Chalda, supposed to be the sun. His worship was introduced at Rome. He is generally represented as a young man, whose head is covered with a turban after the manner of the Persians. He supports his knee upon a bull that lies on the ground, and one of whose horns he holds in one hand, while with the other he plunges a dagger in his neck.

MITHRIDATE, in pharmacy; an antidote, or composition, in form of an elemtory, supposed to serve either as a remedy or a preservative against poisons. (See PHARMACY.) It takes its name from the inventor, Mithridates king of Pontus; who is said to have fortified his body against poisons with antides and preservatives, that when he had a mind to dispatch himself, he could not find any poison that would take effect. The receipt of it was found in his cabinet, written with his own hand, and was carried to Rome by Pompey. It was translated into
MITHRIDATES, the name of several kings of Pontus. See Pontus.

Mithridates VII. surnamed Eupator and the Great, succeeded to the throne at the age of 14 years, about 225 years before the Christian era. The beginning of his reign was marked by ambition, cruelty, and artifice. He murdered his own mother, who had been left by his father coheires of the kingdom; and he fortified his constitution by drinking antides against the poison with which his enemies at court attempted to destroy him. He early inured his body to hardship, and employed himself in the most manly exercises, often remaining whole months in the country, and making frozen snow and the earth the place of his repose. Naturally ambitious and cruel, he spared no pains to acquire to himself power and dominion. He murdered the two sons whom his father Laodice had had by Ariarathes King of Cappadocia, and placed one of his own children, only eight years old, on the vacant throne. These violent proceedings alarmed Nicomedes king of Bithynia, who had married Laodice the widow of Ariarathes. He fuborned a youth to be king of Cappadocia, as the third son of Ariarathes; and Laodice was sent to Rome to impose upon the senat, and assure them that her third son was now alive, and that his pretensions to the kingdom of Cappadocia were just and well founded. Mithridates, on his part, sent to Rome: Gordius the governor of his son; who solemnly declared before the king's council, that he had never declared the false pretensions of his son by his mother, who had been small. To prevent surprises, and to escape from the enemy's hands. The appointment of Glabrio to the command of the Roman forces, instead of Lucullus, was favourable to Mithridates, who recovered the greatest part of his dominions. The sudden arrival of Pompey, however, put an end to his victories. A battle in the night was fought near the Euphrates, in which the troops of Pontus laboured under every disadvantage. The engagement was by moon-light, and as the moon then shone in the face of the enemy, the lengthened shadows of the arms of the Romans having induced Mithridates to believe that the two armies were close together, the arrows of his soldiers were darted from a great distance, and their effects rendered ineffectual. An universal overthrow ensued, and Mithridates, bold in his misfortunes, rushed through the thick ranks of the enemy at the head of 800 horsemen, 500 of whom perished in the attempt to follow him. He fled to Tigranes; but that monarch refused an asylum to his father-in-law, whom he had before supported with all the collected forces of his kingdom. Mithridates found a safe retreat among the Scythians; and though destitute of power, friends, and resources, yet he mediated the overthrow of the Roman empire, by penetrating into the heart of Italy by land. The wild projects were rejected by his followers, and he sued for peace. It was denied to his ambassadors; and the victorious Pompey declared, that to obtain it, Mithridates must ask it in person. He scorned to trust himself in the hands of his enemy, and resolved to conquer or to die. His subjects refused to follow him any longer; and revolving from him, made his son Pharnaces king. The son showed himself ungrateful to his father; and even, according to some writers, he ordered him to be put to death. This unnatural treatment broke the heart of Mithridates; he obliged his wife to poison herself, and attempted to do the same himself. It was in vain: the frequent antides he had taken in the

verse by Democritus, a famous physician; and was afterwards translated by Galen, from whom we have it: though there is room to imagine it has undergone considerable alterations since the time of its royal pre­scriber.

MITHRIDATES, the name of several kings of Pontus. See Pontus.
the early part of his life, strengthened his constitution against the poison; and when this was unavailing, he attempted to flay himself. The blow was not mortal; and a Gaul who was then present, at his own request gave him the fatal stroke, about 64 years before the Christian era. Such were the misfortunes, abilities, and miserable end, of a man, who supported himself so long against the power of Rome, and who according to the declarations of the Roman authors, proved a more powerful and indefatigable adversary to the capital of Italy than the great Annibal, Pyrrhus, Pericles, or Anitocorus. Mithridates has been commended for his eminent virtues, and cen- curred for his vices. As a commander, he deserves to be ranked amongst the heroes, lions, eagles, and by the like names. They admired to see him waging war, with such success, were so much below the heroes and in the battles of the first intelligence that ever sat on a throne, according to the opinion of Cicero; and indeed no greater proof of his military character can be brought, than the mention of the great rejoicings which happened in the Roman armies and in the capital at the news of his death. No less than 12 weeks were appointed for public thank-givings to the immortal gods; and Pompey, who had sent the first intelligence of his death to Rome, and who had partly halted his fall, was rewarded with the most uncommon honours. It is said that Mithridates conquered 24 nations, whose different languages he knew, and spoke with the same ease and fluency as his own. As a man of letters he also deserves attention. He was acquainted with the Greek language, and even wrote in that dialect a treatise on botany. His skill in physic is well known; and even now there is a celebrated antidote which bears his name, and is called mithridate. Superflition as well as nature had united to render him great; and if we rely upon the authority of Julius, his birth was accompanied by the appearance of two large comets, which were seen for 70 days successively, and whose splendor eclipsed the mid-day sun, and covered the fourth part of the heavens.

MITHRIDATICUM Bellum, the Mithridatic War, one of the longest and most celebrated wars ever carried on by the Romans against a foreign power. See Pontus.

Mitra, was a cap or covering for the head, worn by the Roman ladies, and sometimes by the men; but it was looked upon as a mark of effeminacy in the Mityleneans suffered greatly from that of the high-priest, especially when it was tied upon their heads.

Mitre, a facetorial ornament worn on the head, by bishops and certain abbots on solemn occasions: being a sort of cap, pointed and cleft at top. The high-priest among the Jews wore a mitre or bonnet on his head. The inferior priests of the same nation had likewise their mitres; but in what respect they differed from that of the high-priest, is uncertain. Some contend that the ancient bishops wore mitres; but this is by no means certain.

Mitre, in architecture, is the workmen's term for an angle that is just 45 degrees, or half a right one. If the angle be a quarter of a right angle, they call it a half-mitre.

To describe such angles, they have an instrument called the mitre-square; with this they strike mitre-

MIXT, or MIXT BOBY, in chemistry, that which is compounded of different elements or principles.

Mixture, a compound or assemblage of several different bodies in the same mass. Simple mixture, consists only in the simple apposition of parts of different bodies to each other. Thus, when powders of different kinds are rubbed together, the mixture is only simple, and each of the powders retains its particular characters. In like manner, when oil and water are mixed together, though the parts of both are con-
There are 18 species, of which seven are native to the Eastern Mediterranean region. The plant is smooth and has a globular habit, with a thick, fleshy stem. The female capitulum is naked and powdery, and the proper form of this species is unknown. The growth is typically in clusters, with a sweet scent that attracts bees.

Mixture, in pharmacy, a medicine which differs from a julep in this respect, that it receives into its composition not only galls, extracts, and other substances, but also earths, powders, and such substances as cannot be dissolved.

Mizen, in the sea-language, is a particular mast or sail. The mizen-mast stands in the sternmost part of the ship. In some great ships there are two of these; when that next the main-mast is called the main-mizen, and that next the poop the bonaventure mizen.

Mizraim, or Misraim, the dual name of Egypt, used in scripture to denote the Higher and Lower Egypt, which see. It sometimes occurs singular, Major: 2 Kings xix. 16; I Kings viii. 4, Micah viii. 16.

Mnemosyne (fab. hitt.); one of the Hyades, daughter of Mnemosyne and Uranus. She received into her memory all things; and then throw hurdles before them, to prevent their progress in science.

MniuM, marshmoss; a genus of the natural order of musci, belonging to the cryptogamia class of plants. The anthera is ocreaceous; the calyptra smooth; the female caputulums naked and powdery, remote. There are 18 species, of which seven are natives of Britain; but none have any remarkable property except the two following. 1. The symphytrum is an elegant moss, frequent in bogs and on the borders of cold springs. It is two to four inches high; the stalks are simple at the base, and covered with a humble down; but higher up are red, and divided into several round, fingle, taper branches, which proceed nearly from the same point. The leaves are not more than 1/14 of an inch long, lanceolate and acute, of a white green colour; and so thinly set, that the red stalk appears between them. This moss, as it may be seen at a considerable distance, is a good mark to lead to the discovery of clear and cold springs. Linnæus informs us, that the Laplanders are well acquainted with this sign. Dr Withering informs us, that wherever this moss grows, a spring of fresh water may be found without much digging. 2. The hygrometricum grows in woods, heaths, garden-walks, walls, old trees, decayed wood, and where coals or cinders have been laid. It is fleshy, hath tips ineradly egg-shaped, nodding, and bright yellow. If the fruit-stalk is moistened at the base with a little water or steam, the head makes three or four revolutions: if the head is moistened, it turns back again.

MOA (anc. geog.), a country of Arabia Petraea; so called from Moab the son of Lot, to whom the city of this country was allotted by divine appointment, Deut. xii. 9. It was originally occupied by the Emim, a race of giants exterminated by the Moabites, ibid. Moab anciently lay to the south of Ammon, before Sihon the Amorite striped both nations of a part of their territory, afterwards occupied by the Israelites. Num. xxii. 4; and then Moab was bounded by the river Arnon to the north, the Lacus Arabum to the west, the brook Zared to the south, and the mountains Abaram to the east.

MOAT, or Drin, in fortification, a deep trench dug round the rampart of a fortified place, to prevent supplies. The brink of the moat, next the rampart, is called the 'garde; and the opposite one, the counter-garde.

A dry moat round a large place, with a strong garrison, is preferable to one full of water; because the passage may be disputed inch by inch, and the besiegers, when lodged in it, are continually exposed to the bombs, granades, and other fire-works, which are thrown incessantly from the rampart into their works. In the middle of dry moats, there is sometimes another smaller one, called counter-garde which is generally dug to deep till they find water to fill it.

The deep and broadest moats are accounted the best; but a deep one is preferable to a broad one: the ordinary breadth is about 20 fathoms, and the depth about 16.

To drain a moat that is full of water, they dig a trench deeper than the level of the water, to let it run off; and then throw hurdles upon the mud and slime, covering them with earth or bundles of reeds, to make a sure and firm passage.

MOATAZALITES, or SEPARATISTS, a religious sect among the Turks, who deny all forms and qualities in the Divine Being; or who divide God of his attributes.

There are two opinions among the Turanian divines concerning God. The first admits metaphorical forms of attributes; such as God has wisdom, by which he is wise; power, by which he is powerful; eternity, by which he is eternal, &c. The second allows God to be wise, powerful, eternal; but will not allow any form or quality in God, for fear of admitting a multiplicity. Those who follow this latter opinion are called Moatazalites; they who follow the former, Sephatites.

The Moatazalites also believed that the word of God was created in fullæs, as the schoolmen term it; and to confute of letters and sounds; copies thereof being written in books to express or imitate the original; they denied absolute predetermination, and affirmed that man is a free agent. This fact is said to have first invented the scholastic divinity, and is subdivided into no less than 20 inferior sects, which mutually brand one another with infidelity.

MOBILE, moveable; any thing susceptible of motion, or that is disposed to be moved either by itself or by some other prior mobile or mover.

Primi Monat, in the ancient astronomy, was the ninth heaven or sphere, imagined above thence of the planets and fixed stars. This was supposed to be the first
MOC

first mover, and to carry all the lower spheres round
along with it; by its rapidity communicating to them
a motion whereby they revolved in 24 hours. But
the diurnal revolution of the planets is now accounted
for without the affilance of any such primus mobile.

Perpetual Motion. See Perpetual Motion.

MOCCHO, Mocco, or Mokha; by some supposed to be
the Mofa or Musa of Ptolemy, is a port and town
on the Red Sea, of considerable trade; contains about
10,000 inhabitants, Jews, Armenians, and Mohom-
mediuns; is surrounded with walls after the ancient man-
er; has four gates and four towers, the last mounted
with cannon, but there is no ditch. It gives name
to a kingdom extending along the most southern coast
of Arabia; of which that part which lies next the sea
is a dry barren desert, in some places 10 or 12 leagues
over; but bounded by mountains, which being well
watered, enjoy an almost perpetual-spring; and be-
side coffee, the peculiar produce of this country,
yields corn, grapes, myrrh, frankincense, caftilla, balm,
gums of several sorts, mangos, dates, pomegranates,
c. The weather here is so hot and sultry in sum-
mer, especially when the south wind blows, that it
would be insupportable, if it was not mitigated by
the cool breezes that generally blow from the
summers of England; and it is very feldom
fentimented to view at a great
distance. They are from
this difference between the mode and the
tone, that the latter only determines the principal
found, and indicates the place which is most proper to
be occupied by that syllable which ought to determine
the accent of it, whereas the former regulates
the thirds, and modifies the whole scale agreeably to its
fundamental founds.

Our modes are not, like those of the ancients, cha-
racterized
MOD

The major mode is immediately generated by the
resonance of founding bodies, which exhibit the third
major of the fundamental found: but the minor mode
is not the product of nature; it is only found by
analogy and invention. This is equally true upon the
system of Sig. Tartini as upon that of M. Rameau.

This last author, in his various and successive
publications, has explained the origin of this minor mode
in different ways, of which his interpreter M. d'A-
lembert was satisfied with none. It is for this rea-
son that he has founded this origin on a different
principle, which cannot be better explained than in
the words of that eminent geometrician. See Music,
Art. 28, 29, 30, and 31.

When the mode is once determined, every note
in the scale assumes a name expressive of its relation
to the fundamental found, and peculiar to the place
which it occupies in that particular mode. We subjoin
the names of all the notes significant of their relative
values and places in each particular mode, taking the
octave of ut as an example of the major mode, and of
la as an example of the minor.

<table>
<thead>
<tr>
<th>Major</th>
<th>Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ut re mi fa sol la</td>
<td>fa sol la</td>
</tr>
</tbody>
</table>

It is necessary to remark, that when the seventh
note is only a femitone distant from the highest
in the octave, that is to say, when it forms a third major
with the dominant, as $f$ natural in the major mode, or
sol sharp in the minor, that seventh found is then
a $f$ major, because it discovers the tonic and
renders the tone appreciable.

Nor does each gradation only assume that name
which is suitable to it; but the nature of each interval
is determined according to its relation to the mode.
The rules establisbed for this are as follow:

1. The second note must form a second major above
the tonic, the fourth note and the dominant should
form a fourth and fifth exactly true; and this equally
in both modes.

2. In the major mode, the mediant or third, the
fifth and the seventh from the tonic, should always be
major; for by this the mode is characterized. For
the same reason these three intervals ought always to
be minor in the minor mode: nevertheless, as it is
necessary that the sensible note should likewise there
be perceived, which cannot be effectuated without a
false relation whilst the fifth note still remains minor;
this occasions exceptions, of which in the course of
the air or harmony care must be taken. But it is always
necessary that the clef, with its transpositions, should
preserve all the intervals, as determined with relation
to the tonic, according to the species of the mode. For
this a general rule will be found at the word Clef in

As all the natural chords in the octave of ut give,
with relation to that tonic, all the intervals preferred
for the major mode, and as the caile is the same with
the octave of la for the minor mode, the preceding
example, which was only given that we might have an
opportunity of naming the notes, may likewise serve
as a formula for the rule of the intervals in each mode.

This rule is not, as one might imagine, establis-
hed upon principles that are merely arbitrary: it has its
source in the generation of harmony, at least in a
certain degree. If you give a perfect major chord
to the tonic, to the dominant, and the sub-dominant,
you will have all the sounds of the diatonic scale for
the major mode: to obtain that of the minor, leaving
still its third major to the dominant, give a third
minor to the other two chords. Such is the analogy
of the mode.

As this mixture of major and minor chords intro-
duces into the minor mode a false relation between
the fifth and the sensible note, to avoid this false relation,
they sometimes give the third major to the fourth
note in ascent, or the third minor to the dominant in
defending chiefly by inverting the chords; but these
in this case are licences.

There are properly no more than two modes, as we
have seen: but there are twelve different sounds in
the octave which may be made fundamental sounds,
and of consequence form as many keys or tones; and
as each of these tones are susceptible of the major or
minor mode, music may be composed in twenty-four
modes or manners. Nay, in the manner of writing
music, there are even thirty-four passable modes: but
in practice ten are excluded; which when thoroughly
examined are nothing else but a repetition of the other
ten, under relations much more difficult, in which all
the chords must change their names, and where it
must cost any one some trouble to know what he is
about. Such is the major mode upon a note raised
above its natural pitch by a semitone, and the minor
mode upon a note depressed by a semitone. Thus,
instead of composing upon sol sharp with a third minor,
it is much more eligible to operate upon la flat, which
will give you an opportunity to employ the same
tones; and instead of composing upon re flat with a
third minor, you will find it more convenient to choose
ut sharp for the same reason; viz. on one hand to
avoid a fa with a double sharp, which would be
equivalent to a $f$ natural; and on the other hand a $f$
with a double flat, which would become a $a$ natural.

The composer does not always continue in the same
mode, nor in the same key, in which he has begun an
air; but, whether to alter the expression or introduce
variety, modes and keys are frequently changed, ac-
cording to the analogy of harmony; yet always re-
turning to those which have been first heard: this is
called modulation.

From
From thence arises a new division of modality into such as are principal and such as are relative: the principal is that in which the piece begins and ends; the relative modes are such as the composer interweaves with the principal in the flow of the harmony. (See Modulation).

Others have proposed a third species, which they call a mixed mode, because it participates the modulation of both the others, or rather because it is composed of them; a mixture which they did not reckon an inconvenience, but rather an advantage, as it increases the variety, and gives the composer a greater latitude both in air and harmony.

This new mode, not being found by the analysis of the three chords like the two former, is not determined, like them, by harmonics essential to the mode, but by an entire scale which is peculiar to itself, as well in rising as descending; so that in the two modes abovementioned the scale is investigated by the chords; and in this mixed mode the chords are investigated by the scale. The following notes exhibit the form of this scale in succession, as well rising as descending:

\[
\text{mi fa sol la si ut re mi.}
\]

Of which the essential difference is, as to the melody, in the position of the two semitones; of which the first is found between the fifth and the second note, and the last between the fifth and the sixth; and, with respect to the harmony, the difference consists in this, that upon its tonic it carries a third minor in the beginning, and major in ending, in the accompaniment of this scale, as well in rising as descending, such as it has been given by those who composed it, and executed at a spiritual concert, May 30, 1751.

They object to its inventor. That his mode has neither chords nor harmony essential to itself, nor cadencies which are peculiar to it, and which sufficiently distinguish it from the major or minor mode. He answers to this. That the distinction of his mode is left in harmony than in melody, and left even in the mode itself than in the modulation; that in its beginning it is distinguished from the major mode by its third minor, and in its end from the minor mode by its plagal cadence. To which his opponents reply, That a modulation which is not exclusive cannot be sufficient to establish a mode; and that his mode is not to be considered as an essential difference of its own, but to be taken. If this is done, and more water added to thin it, it may be rendered much harder than if the water is made use of. In making either moulds or models, however, we must be careful not to make the mixture too thick at first; for if this is done, and more water added to thin it, the composition must always prove brittle and of a bad quality.

The particular manner of making models (or casts, as they are also called) depends on the form of the subject to be taken. The process is easy, where the parts are elevated only in a flight degree, or where they form only a right or obtuse angle with the principal surface from which they proceed; but where the parts project in smaller angles or form curves inclined towards the principal surface, the work is more difficult. This observation, however, holds good only with regard to hard and inflexible bodies: for such as are soft may often be freed from the mould, even though they have the shape last mentioned. But
though this be the use of the soft original substance, it is not so with the inflexible model when once it is cast.

The moulds are to be made of various degrees of thickness, according to the size of the model to be cast; and may be from half an inch to an inch, or, if very large, an inch and an half. Where a number of models are to be taken from one mould, it will likewise be necessary to have it of a stronger contexture than where only a few are required, for very obvious reasons.

It is much more easy to make a mould for any soft substance than a rigid one, as in any of the viscer of the animal body; for the fluidity of the mixture makes it easily accommodate itself to the projective parts of the substance; and as it is necessary to inflate these substances, they may be very readily extracted again by letting out the air which distended them.

When a model is to be taken, the surface of the original is first to be greased, in order to prevent the plaster from sticking to it; but if the substance itself is slippery, as is the case with the internal parts of the human body, this need not be done: when necessary, it may be laid over with linseed oil by means of a cloth, to prevent the plaster sticking to it; then surround the original with a frame or ridge of glazier's putty, at such a distance from it as will admit the plaster to rest upon the table on all sides of the subject for about an inch, or as much as is sufficient to give the proper degree of strength to the mould. A sufficient quantity of plaster is then to be poured over as uniformly as possible over the whole substance, until it be everywhere covered so as to give a proper substance to the mould, which may vary in proportion to the size. The whole must then be suffered to remain in this condition till the plaster has attained, its hardmess; when the frame is taken away, the mould may be inverted, and the subject removed from it; and when the plaster is thoroughly dry let it be well seasoned.

Having formed and seasoned the moulds, they must next be prepared for the casts by greasing the inside of them with a mixture of olive oil and lard in equal parts, and then filled with fine fluid plaster, and the plane of the mould formed by its rolling on the surface of the table covered to a sufficient thickness with coarse plaster, to form a strong basis or support for the cast where this support is requisite, as particularly the case where the thin and membranous parts of the body are to be represented. After the plaster is poured into the mould, it must be suffered to stand until it has acquired the greatest degree of hardmess it will receive: after which the mould must be removed: but this will be attended with some difficulty when the shape of the subject is unfavourable; and in some cases the mould must be separated by means of a small mallet and chisel. If by these instruments any parts of the model should be broken off, they may be cemented by making the two surfaces to be applied to each other quite wet; then interposing between them a little liquid plaster; and lastly, the joint smoothed after being thoroughly dry. Any small holes that may be made in the mould can be filled up with liquid plaster, after the sides of them have been thoroughly wetted, and smoothed over with the edge of a knife.

In many cases it is altogether impracticable to prepare a mould of one piece for a whole subject; and therefore it must be considered how this can be done in such a manner as to divide the mould into the fewest pieces. This may be effected by making every piece cover as much of the pattern as possible, without surrounding such projecting parts, or running into such hollows as would not admit a separation of the mould. It is impossible, however, to give any particular directions in this matter which can hold good in every instance, the number of pieces of which the mould is to consist being always determined from the shape of the pattern. Thus the mould of the human calculus will require no more than three pieces, but that of an os femoris could scarce have fewer than ten or twelve.

Where any internal pieces are required, they are first to be made, and then the outer pieces after the former have become hard.

To make a mould upon an hard and dry substance, we must, in the first place, rub the surface of it smoothly over with the mixture of oil and lard above mentioned. Such hollows as require internal pieces are then to be filled up with fluid plaster; and while it continues in this state, a wire loop must be introduced into it, by which, when hardened, it can be pulled off. The plaster should be somewhat raised in a pyramidal form round this wire, and afterwards cut smooth with a knife or yet in its soft state; preserving two or three angular ridges from the loop to the outer edge, that it may fix the more readily in the outer piece of the mould to be afterwards made upon it. Let the outer piece then be well greased, to prevent the second piece from adhering; the loop being inclosed with some glazier's putty, both to prevent the second piece from adhering and to preserve an hollow place for the cord.

To form the second or outside piece, mix a quantity of plaster proportioned to the extent of surface it is to cover and the intended thickness of the mould: when it is just beginning to thicken, or assumes such a consistence as not to run off very easily, spread it over the internal piece or pieces as well as the pattern, taking care at the same time not to go too far lest it should not deliver safely; and as the plaster becomes more tenacious, add more upon the pattern until it has become sufficiently thick, keeping the edges square and smooth like the edge of a board. The plaster should be spread equally upon all parts, which is best done by a painter's pallet-knife or apothecary's bolus-knife; but for this the instrument should be somewhat less pliable than it is commonly made.

When the outside piece is hardened, the edges are to be pared smooth, and newly made square with a small pointed knife. Little holes of a conical shape are to be made with the point of a knife about an inch distant from one another, according to the size of the piece. These are designed to receive the fluid plaster in forming the adjacent parts of the mould, and occasion points corresponding to the hollows; and are intended to preserve the edges of the different pieces readily in their proper relative situations. The third piece is then to be formed in a manner similar to the second.
Taking the upper part of the fore-head, and spreading it over the eyes, which are to be kept close, that the plaster may not come in contact with the globe; yet not closed so strongly as to cause any unnatural wrinkles. Cover then the nose and ears, plugging first up the meatus auditorii with cotton, and the nostrils with a small quantity of tow rolled up, of a proper size, to exclude the plaster. During the time that the nose is thus stopped, the person is to breathe through the mouth; in this state the fluid plaster is to be brought down low enough to cover the upper lip, observing to leave the rolls of tow projecting out of the plaster. When the operation is thus far carried on, the plaster must be suffer'd to harden; after which the tow may be withdrawn, and the nostrils left free and open for breathing. The mouth is then to be closed in its natural position, and the plaster brought down to the extremity of the chin. Begin then to cover that part of the face which is to be represented, and spread the plaster to the outsides of the arms and upwards, in such a manner as to meet and join that which is previously laid on the face: when the whole of the mass has acquired its due hardnes, it is to be cautiously lifted, without breaking or giving pain to the person. After the mould is contracted, it must be seasoned in the manner already directed; and when the mould is cast, it is to be separated from the model by means of a small mallet and chisel. The eyes, which are necessarily shown closed, are to be carved, so that the eye-lids may be represented in an elevated posture; the nostrils hollow'd out, and the back part of the head, from which, on account of the hair, no mould can be taken, must be finished according to the skill of the artist. The edges of the model are then to be neatly smoothed off and the bust fixed on its pedestal.

The method of making models in the plaster of Paris is undoubtedly the most easy way of obtaining them. When models, however, are made of such large objects that the model itself must be of considerable size, it is vain to attempt making it in the way above described. Such models must be constructed by the hand with some soft substance, as wax, clay, putty, &c. and it being necessary to keep all the proportions with mathematical exactness, the construction of a single model of this kind must be a work of great labour and expence as well as of time.

Of all those which have been undertaken by human industry, however, perhaps the most remarkable is that constructed by General Ptolemy, to represent the mountainous parts of Switzerland. It is composed of 142 compartments, of different sizes and forms, respectively numbered, and so artfully put together, that they can be separated and replaced with the greatest ease. The model itself is 204 feet long and 12 broad, and formed on a scale which represents two English miles and a quarter by an English foot; comprehending part of the cantons of Zug, Zurich, Schwitz, Underwalden, Lucerne, Berne, and a small part of the mountains of Glarus; in all, an extent of country of 18 leagues in length and 12 in breadth. The highest point of the model, from the level of the centre (which is the lake of Lucerne), is about ten inches; and as the most elevated mountain represented therein rises 1475 toiles.
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MODELLA. To 940 f 9 feet above the lake of Lucerne, at a gross calculation, the height of an inch in the model is about 900 feet. The whole is painted of different colours, in such a manner as to represent objects as they exist in nature; and so exactly is this done, that not only the woods of oak, beech, pine, and other trees, are distinguished, but even the strata of the several rocks are marked, each being laped upon the spot, and formed of granite, gravel, or such other substances as compose the natural mountain. So minute also is the accuracy of the plan, that it comprises not only all the mountains, lakes, rivers, towns, villages, and forests, but every cottage, bridge, torrent, road, and even every path is distinctly marked.

The principal materials employed in the construction of this extraordinary model, is a mixture of charcoal, lime, clay, a little pitch, with a thin coat of wax; and so hard that it may be trod upon without any damage. It was begun in the year 1766, at which time the general was about 50 years of age, and it employed him till the month of August 1785; during which time the top of the spot, extended to 1400 feet above the level of the Mediterranea.

MODELLA, a duchy of Italy, bounded on the north by Tuscany and the republic of Lucca, on the north by the duchy of Mantua, on the east by the Bologna and the territories of the church, and on the west by the duchy of Parma, extending in length from south to north about 56 English miles, and in breadth between 24 and 36, and yielding plenty of corn, wine, and fruits, with mineral waters. In some places also petroleum is skimmed off the surface of the water of deep wells made on purpose; and in others is found a kind of earth or tophus, which, when pulverised, is said to be an excellent remedy against fevers, dysesthesia, and hypochondriac disorders. The country of La Saffa affords several kinds of petroleums. The principal rivers are the Croffolo, Secchia, and Panaro. The family of Este, dukes of Modena, is very ancient. They had their name from Este, a small city in the district of Parma. In 1753, a duke was appointed imperial vicar-general, field-marshall, and governor, of the Milanese during the minority of the archduke Peter Leopold, who was declared governor-general of the Austrian Lombardy. The duke, though a vassal of the empire, had an unlimited power within his own dominions.

MODENA, an ancient city, in Latin Mutina, which gives name to a duchy of Italy, and is its capital. It stands 26 miles east of Parma, 44 almost south of Mantua, and 20 west of Bologna; and is a pretty large and populous, but not a handsome city. It is much celebrated by Roman authors for its grandeur and opulence; but it was a great sufferer by the siege it underwent during the troubles of the triumvirate. It hath long been the usual residence of the dukes; and is also the see of a bishop, who is suffragan to the archbishop of Bologna. Mr Keyfier says, that when Decius Brutus was besieged here by Mark Antony, Hirtius the conful made use of carrier-pigeons; and that, even at this day, pigeons are trained up at Modena to carry letters and bring back answers. This city hath given birth to several celebrated persons, particularly Tasso the poet, Correggio the great painter, Signorus the civilian and historian, da Vignola the architect, and Montecucchi the imperial general. The tutelary saint of it is named Gennianus. The ducal palace is a very noble edifice, in which, among the other fine pictures, the birth of Christ by Correggio, called la Nativé Felice, is much celebrated. The only manufacture for which this city is noted, is that of masts, of which great numbers are exported. The churches of the Jesuits, of the Theatines, and of St Dominic, are well worth viewing. In the college of St Carlo Borromeo between 70 and 80 young noblemen are continually maintained, and instructed both in the sciences and gentle exercises. St Beatrix, who was of the family of Este, is said to knock always at the gate of the palace three days before any of the family dies. Before most of the houses are covered walks or porticos, as at Bologna. The city is fortified, and on its south side it has the citadel.

MODERATION, in ethics, is a virtue consisting in the proper government of our appetites, passions, and pursuits, with respect to honours, riches, and pleasures; and in this sense it is synonymous with temperance; it is also often used to denote candour.

MODERATOR, in the schools, the person who presides at a dispute, or in a public assembly: thus the president of the annual assembly of the church of Scotland is styled moderator.

MODERN, something new, or of our time; in opposition to what is antique or ancient.

MODERN Authors, according to Naude, are all those who have wrote since Boethius. The modern philosophy commences with Galileo; the modern astronomy with Copernicus.

MODESTY, in ethics, is sometimes used to denote humility; and sometimes to express chaffity, or purity of sentiments and manners.—Modesty, in this last sense, and as particularly applied to women, is defined by the authors of the Encyclopédie Méthodique, as a natural, chary, and homely flame; a secret fear; a feeling
feeling on account of what may be accompanied with disgrace. Women who profess only the remains of a
специфическому modesty, make but feeble efforts to refist: those who have obliterated every trace of modesty from
their countenance, soon extinguish it completely in their soul, and throw aside for ever the veil of decency. She, on the contrary, who truly professes modesty, pauses over in silence attempts against her honour, and
forbears speaking of those from whom she has received an outrage, when in doing so the must reveal actions and expressions that might give alarm to virtue.

The idea of modesty is not a chimera, a popular prejudice, or an illusion arising from laws and education.
Nature, which speaks the same language to all men, has, with the unanimous consent of nations, annexed contempt to female incontinence. To refist and to attack are laws of her appointment: and while the bel lows defires on both parties, they are in the one accompanied with boldneis, in the other with flame. To individuals she has allotted long spaces of time for the purposes of self-preservation, and but moments for the propagation of their species. What arms more gentle than Modesty could she have put into the hands of that sex which she designed to make refi

If it were the custom for both sexes to make and receive advances indiscriminately, vain importunity would not be prevented: the fire of passion would never be stifled, but languish in tedious liberty; the most amiable of all feelings would scarcely warm the human breast; its object would with difficulty be attained. That obstacle which seems to remove this object to a distance, in fact brings it nearer. The veil of shame only makes the fires more attractive. Modesty kindles that flame which it endeavours to suppress: its fears, its evaions, its caution, its timid avowals, its pleasing and affecting finesse, speak more plainly what it wishes to conceal, than passion can do without it: it is Modesty, in short, which enhaces the value of a favour, and mitigates the pain of a refulal.

Since modesty is the secret fear of ignominy; and since all nations, ancient or modern, have confided the obligation of its laws; it must be absurd to violate them in the punishment of crimes, which should always have for its object the re-establishment of order. Was it the intention of those oriental nations, who when he does not express concerning the tu

Exposed women to elephants, trained for an abominable species of punishment, to violate one law by the obfervation of another? By an ancient practice among the Romans, a girl could not be put to death before she was marriageable. Tiberius found means to evade this law by ordering them to be violated by the executioner previous to the infliction of punishment; the refinement of a cruel tyrant, who sacrificed the morals to the customs of his people! When the legislature of Japan caused women to be exposed naked in the market-places, and obliged them to walk on all-fours like brutes, modesty was shocked: but when it wanted to force a mother—when it wanted to compel a son—nature received an outrage.

Such is the influence of climate in other countries, that the physical part of love poiffesse an almost irresistible force. The refilience is feeble; the attack is accompanied with a certainty of success. This is the

cafe at Patana, at Bantam, and in the small kingdoms on the coast of Guinea. When the women in these
countries (fays Mr Smith) meet with a man, they lay hold of him, and threaten to inform their husbands if he defpies their favours. But here the fexes seem to have abolished the laws peculiar to each. It is fortunate to live in a temperate climate like ours, where that fex which poiffesses the moft powerful charms exerts them to embellifh society; and where modest women, while they referve themselves for the pleasures of one, contribute to the amufement of all.

MODIFICATION, in philosophy, that which modifies a thing, or gives it this or that manner of being. Quantity and quality are accidents which modify all bodies.

Decree of Modification, in Scots law, a decree ascertaining the extent of a minister’s stipend, without proportioning it among the persons liable in payment.

MODILLIONS, in architecture, ornaments in the cornice of the Ionic, Corinthian, and Composite columns.

MODIUS, a Roman dry measure for all sorts of grain, containing 32 hemine, or 16 sextarii, or one-third of the amphora, amounting to an English peck. See Measure.

MODREVIUS (Andreas Frichius), secretary to Sigismund Augustus king of Poland, acquired considerable reputation by his learning and works. He broke off from the Roman church, favoured the Lutherans and Anti-trinitarians, and took great pains in order to unite all Christian societies under the same communion. Grotius has placed him in the class of the reconcilers of the different schemes of religion. His principal work is intituled, De republica emm-
danda.

MODULATION, the art of forming any thing to certain proportion.

MODULATION, in reading, or speaking. See Reading.

MODULATION, in music, derived from the Latin modularis. This word in our language is susceptible of several different significations. It frequently means no more than an air, or a number of musical sounds properly connected and arranged. Thus it answers to what Mr Malcolm understands by the word tone, when he does not expressly treat concerning the turning of instruments. Thus likewise it expresses the French word chant; for which reason, in the article Music, we have frequently expressed the one word by the other. But the precise and technical accception to which it ought to be confined, is the art of composing melody or harmony agreeably to the laws prescribed by any particular key, that of changing the key, or of regularly and legitimately passing from one key to another. In what remains to be said upon the subject we follow Rouffeau.

Modulation (fays he) is properly the manner of apearthing and managing the modes; but at this time the word most frequently signifies the art of conducting the harmony and the air successively through several modes, in a manner agreeable to the ear and conformed to rules.

If the different modes be produced by harmony, from whence likewise must spring the laws of modulation.
The laws are simple in conception, but difficult in practice. We proceed therefore to show what they are.

To modulate properly in the same key, it is necessary, 1. To run through all the sounds of it in an agreeable air, frequently repeating the sounds which are most essential to it, and dwelling upon these sounds with the most remarkable emphasis; that is to say, that the chord containing the sensible notes, and that of the tonic, should frequently be heard in it, but under different appearances, and obtained by different procedures to prevent monotony. 2. That repose or cadences should only be established upon these two chords: the greatest liberty, however, which ought to be taken with the rule is, that a cadence or repose may be established on the chord of the sub-dominant. 3. In short, that none of the sounds of the mode ought ever to be altered; for without quitting it we cannot introduce a sharp or a flat which does not belong to it, nor abstract any one which in reality does belong to it.

But passing from one mode to another, we must consult analogy, we must consider the relations which a key bears to the other notes in the series, and to the number of sounds common to both the modes, that from whence we pass, and that into which we enter.

If we pass from a mode major, whether we consider the fifth from the key as having the most simple relation with it except that of the octave, or whether we consider it as the first found which enters into the harmonies of the same key, we shall always find, that this fifth, which is the dominant of the mode, is the chord upon which we may establish the modulation most analogous to that of the principal key.

This dominant, which constitutes one of the harmonics of the first key, makes also one of its own peculiar key, of which it is the fundamental found. There is then a connection between these two chords. Besides, that same dominant carrying, as well as the tonic, a perfect chord major upon the principle of resonance, these two sounds are only different one from the other by the diapason, which passing from the key to the dominant is the fifth superadded, and when ascending from the dominant to the key is the seventh. Now these two chords, thus distinguished by the diapason which is suitable to each, by the founds which compose them when ranged in order, form precisely the octave, or the diatonic scale, which we call a gamut, which determines the mode.

This same series of the key, altered only by a sharp, forms the scale belonging to the mode of the dominant; which shows how striking the analogy is between these two tones, and gives the easiest opportunity of passing from one to the other by means of one single alteration alone. The mode then of the dominant is the fifth which presents itself after that of the key in the order of modulations.

The same simplicity of relations which we find between a tonic and its dominant, is likewise found between the same tonic and its sub-dominant: for that fifth, in ascending, which is formed by the dominant with the tonic, is likewise formed by the sub-dominant in descending: but that sub-dominant does not form a fifth with the tonic, except by inversion; it is directly a fourth, if we take that tonic below, as it ought to be; and which fixes the degree of their relations: for in this sense the fourth, whose ratio is 3 to 4, immediately follows the fifth, whose ratio is 2 to 3. So that, if that sub-dominant does not enter into the chord of the tonic, in return the tonic enters into its perfect chord. For let ut mi fol be the chord of the tonic, that of the sub-dominant shall be fa la ut: thus it is the ut which here forms the connection, and the two other sounds of this new chord, are exactly the two dissonances of the preceding. Besides, we need not alter more sounds for this new mode than for that of the dominant; they are both, in one and the other quite the same chords of the principal mode, except one. And a flat to the sensible note fi or B, and all the notes in the mode of ut or C will serve for that of fa or E. The mode of the sub-dominant then is scarcely less analogous to the principal mode than that of the dominant.

It ought likewise to be remarked, that after having made use of the first modulation in order to pass from a principal mode ut or C, to that of the dominant fol or G, we are obliged to make use of the second to return to the principal mode: for if fol or C be the dominant in the mode of ut or C, ut is the sub-dominant in the mode of fol: thus one of these modulations is no less necessary than the other.

The third sound which enters into the chord of the tonic is that of a third formed by its mediant; and after the preceding, it is likewise the most simple of relations. Here then is a new modulation which presents itself, and which is so much the more analogous, because, two of the sounds of the principal tonic enter likewise into the minor chord of its mediant: for the former chord being ut mi fol, the latter must be mi fol fi, where it may be perceived that mi and fol are common. But what renders this modulation a little more remote, is the number of sounds which are necessary to be altered, even for the minor mode, which is most suitable to this mi. In the article Music (234.) will be found a table for all the modes; and Rousseau, in his Musical Dictionary, has given the formula of a scale both for the major and minor: now, by applying this formula to the minor mode, we find nothing in reality, but the fourth found fa heightened by a sharp in ascending; but in rising, we find two others which are altered, viz. the principal tonic ut, and its second re, which here becomes a sensible note; it is certain that the alteration of so few sounds, and particularly of the tonic, must remove the mode and weaken the analogy.

If we should invert the third as we have inverted the fifth, and take that third below the tonic on the sixth note la, which ought here to be called a sub-mediant, or the mediant below, we shall form upon this note la a modulation more analogous to the principal tone than that of mi: for as the perfect chord of this sub-mediant is la ut mi, there once more we find, as in that of the mediant, two of the sounds which enter into the chord of the tonic, viz. ut and mi: and moreover, since the scale of this new key is composed, at least in descending, of the same sounds with that of the principal key; and since it has only two sounds altered in ascending, that is to say, one fewer than the series of the
the mediant; it follows that the modulation of this
sixth note is preferable to that of the mediant: and by
so much the more, that there the principal tonic forms
one of the sounds essential to the mode: which is more
proper for approximating the idea of the modulation.
The mi may afterwards follow.
Here then are four sounds, mi fa fol la, upon each
of which we may modulate in passing from the major
mode of ut. Re and fi remain, which are the two
harmonics of the dominant. This last being a sen-
fible note, cannot become a tone by any proper mo-
dulation, at least it cannot immediately become one:
this would be an abrupt application of ideas too much
opposed to the same found, and would likewise be to
give it a harmony too remote from the principal found,
As to the second note re, we may likewise, by favour
of a consonant procedure in the fundamental scale, mo-
dulate upon it in a third minor: but this must be only
continued for an instant, that the audience may not
have time to forget the modulation of ut, which is it-
sel altered in that place: otherwise, instead of returning
immediately to ut, we must pass through interme-
diate modes, where we must run great hazard of de-
viation.
By following the same analogies, we may modulate
in the following order, to make our exit from a minor
mode; first upon the mediant, afterwards the domi-
nant, next the sub-dominant, then the sub-mediant, or
sixth note. The mode of each of these accessory keys is
determined by its mediant taken from the principal
found. For instance, issuing from the major mode of
ut, to modulate upon its mediant, we render the mode
of that mediant minor; because fi, the dominat of
the principal found, forms a third minor with that me-
diant, which is mi. On the contrary, in our egress
from the minor mode of la, we modulate upon its me-
diant ut in the major mode; because mi, the dominat
of the tone from whence we issue, forms a third major
with the key of that into which we enter, &c.
These rules, comprehended in one general formula,
import, that the modes of the dominant and of the
sub-dominant are like that of the tonic, and that the
mediant and the sixth note require a mode opposed.
We must, however, remark, that, by the right which
we have of passing from the major to the minor, and
vice versa, upon the same key, we may likewise change
the order of modes from one key to another: but
while we thus remove ourselves from the natural mo-
dulation, we must presently think of our return; for
it is a general rule, that every piece of music ought to
terminate in that key with which it began.
In his Musical Dictionary, plate B, fig. 6, and 7,
Rouffeau has collected in two examples which are very
short, all the modes to which we may immediately pass:
the first, in passing from the major mode; and the se-
cond, from the minor. Each note indicates a parti-
cular modulation: and the value of the notes in each
example likewise shows the relative duration suitable
to each of these modes, according to its relation with
the principal.
These immediate transitions from one mode to an-
other, furnish us with the means of passing by the same
rules to modes still more remote, and thence to return
to the principal mode, of which we never should
lofe sight. But it is not sufficient to know what course
we ought to pursue; we must likewise be acquainted
with the method of entering into it. A summary there-
fore of the precepts which are given in this department
shall immediately follow.
In melody, in order to discover and introduce the
modulation which we have chosen, nothing is necessary
but to render perceptible the alterations which it cau-
ses in the sounds of that mode from whence we issue, to
make them proper for the mode into which we enter.
Are we now in the major mode of ut? there needs no
more than to found the note fa sharp, that we may
discover the mode of the dominant; or a fi flat, that
we may shew the mode of the sub-dominant. After-
wards you may run over the sounds essential to the
mode in which we enter: if it is well chosen, your
modulation will always be just and regular.
In harmony, the difficulty is a little increased: for
as it is necessary that the change of modes should be
made at the same time through all the parts, care must
be taken of the harmony, and of the air, that we may
avoid pursuing different modulations at the same time.
Huygens has happily remarked, that the prohibition
of two sixths in immediate succession proceeds upon this
rule as its principle; in reality, between two parts it
is scarcely possible to form a number of just sixths in
uninterrupted succession without operating in two dif-

erent modes.
To introduce a mode, a great many pretend that it
is sufficient to form the perfect chord of its principal
found, and this is indispensable in order to produce the
mode. But it is certain, that the mode cannot be ex-
sactly determined but by the chord containing the sen-
fible note, or the dominant: we must then cause this
chord to be heard when we enter into a new modula-
tion. The most eligible rule would be, That in the
seventh, or minor dissonance, should always be prepa-
red, at least the first time in which it is heard; but this
method is not practicable in every admissible modula-
tion: and provided that the fundamental basins proceed
by consonant intervals, that the connection of harmony
be observed, the analogy of the mode pursed, and
dissolute relations avoided, the modulation will always be
approved. Composers prescribe as another rule, That
a mode should not be changed except after a perfect
cadence; but this interdict is useless, and no person
observes it.
All the possible methods of passing from one mode
to another, are reducible to five with respect to the
major mode, and to four with respect to the minor
which, in the Musical Dictionary, plate B, fig. 8. will
be found implied in a fundamental basis intended for
each modulation. If there be any other modulation
which cannot be resolved into some one of these five,
unless that modulation be enharmonic, it must infalli-

dibly be illegitimate. See ENHARMONIC.

MODULE, in architecture, a certain measure, or
bigness, taken at pleasure, for regulating the propor-
tions of columns, and the symmetry or disposition of
the whole building. Architects generally choose the

equidistance of the bottom of the column for their
module, and this they subdivide into parts or min-
utes.

MOEBIUS (Godfrey), professor of physic at Iena, was
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was born at Lauch in Thuringia in 1611. He became first physician to Frederic William elector of Brandenburg, to Augustus duke of Saxony, and to William duke of Saxe-Weimar. He wrote several medical works, which are esteemed; and died at Halle, in Saxony, in 1664.

MOENUS (Caicus), a celebrated Roman consul, conqueror of the ancient Latins, 38 B. C. He was the first who hung up the prows, &c. of the galleys he had taken at the naval engagement of Actium, upon the place where the tribunes harangued the people; from whence it was called the rostra.

MEONIA, or MEONIA. See MEONIA and LYDIA.

MESIA, or MYRIA, (anc. geog.) a country of Europe, extending from the confines of the Savus and the Danube to the shores of the Euxine. It was divided into Upper and Lower Mesia. Lower Mesia was on the borders of the Euxine, and comprehended that tract of country which received the name of Pontus from its vicinity to the sea. Upper Mesia lay beyond the other, in the inland country.

MOFFAT, a village of Scotland, in the shire of Annandale, 50 miles south-west of Edinburgh; famous for its sulphurous well, which has been in full estimation for near 150 years as a remedy in all cutaneous and scrophulous complaints; and for its chalybeate spring, perhaps the strongest in Britain, which was discovered about 45 years ago, and is of a very bracing quality. The place is chiefly supported by the company who resort thither for the benefit of their health, and contains many good and even elegant lodgings, with nothing remarkable. In his reign was discovered about 340 miles south-west of Edinburgh; famous for its sulphurous well, which has been in full estimation for near 150 years as a remedy in all cutaneous and scrophulous complaints; and for its chalybeate spring, perhaps the strongest in Britain, which was discovered about 45 years ago, and is of a very bracing quality. The place is chiefly supported by the company who resort thither for the benefit of their health, and contains many good and even elegant lodgings, with nothing remarkable.

MOFFETTA. See AMPSANCTI.

MOGODORE, or MOGADORE, a large, uniform, and well-built town in the kingdom of Morocco, situated about 350 miles south-west of Tangier on the Atlantic ocean, and surrounded on the land-side by deep and sandy bays. The European factory here consists of about a dozen mercantile houses of different nations, whose owners, from the protection granted them by the emperor, live in full security from the Moors, whom indeed they keep at a rigid distance. They export to America, mules; to Europe, Morocco leather, hides, gum arabic, gum sandarac, ostrich feathers, copper, wax, wool, elephant's teeth, fine mats, beautiful carpeting, dates, figs, raisins, olives, almonds, oil, &c. In return, they import timber, artillery of all kinds, gunpowder, woollen cloths, linens, lead, iron in bars, all kinds of hardware and trinkets, such as looking-glasses, snuff-boxes, watches, small knives, &c. tea, sugar, spices, and most of the useful articles which are not otherwise to be procured in this empire. The town is regularly fortified on the sea-side; and on the land, batteries are so placed as to prevent any incursion from the southern Arabs, who are of a turbulent disposition, and who, from the great wealth which is known to be always in Mogadore, would gladly avail themselves of any opportunity that offered to pillage the town. The enclosure, both by sea and land, consists of elegant stone arch-ways, with double gates. The market-place is handsomely built, with piazzas of the same materials; and at the water-port there is a custom house and powder magazine, both of which are neat stone buildings. Besides these public edifices, the emperor has a small but handsome palace for his personal residence. The streets of the town, though very narrow, are all in straight lines; and the houses, contrary to what we meet with in the other towns of the empire, are lofty and regular. The bay, which is little better than a road, and is very much exposed when the wind is north-west, is formed by a curve in the land, and a small island about a quarter of a mile from the shore.—Its entrance is defended by a fort well furnished with guns.

MOGULS, a celebrated nation of Asia, whose conquests formerly were the most rapid and extensive of any people recorded in history. They themselves deduce their origin from Japheth, or, as they call him, Japhes, the son of Noah. His son Turk, they say, was the first king, or khan, of those nations who are now known by the separate names of Turks Tartars, and Moguls; and the Tartars especially, affect that their proper designation is Turks. To this prince is attributed many of those inventions which barbarous nations commonly ascribe to their first sovereigns. He was succeeded by Tannak; in whose reign the whole power of Turk were divided into four large tribes, denominated the orde's of Erlat, Gialair, Kaugin, Berlais or Perlas; of which last came the famous Timur Beg, or Tamerlane.—From this time to that of Alanza Khan, we meet with nothing remarkable. In his reign the Turks being immersed in all kinds of luxury, universally apostatized into idolatry. Having two sons, Tartar and Mogul, he divided his dominions among them; and thus gave rise to the two empires of the Tartars and Moguls.

The two nations had not long existed before they began to make war upon each other, and after long contention, the event at last was, that Khan, emperor of the Moguls, was totally overthrown by Siuntz Almst ex-Khan, emperor of the Tartars; and so great was the terminated defeat, that the Mogul nation seems to have been almost exterminated. Only two of Khan's family survived this disaster. These were Kajen his eldest son, and Nagos his nephew, who were both of an age, and had both been married the same year. These two princes, with their wives, had been taken prisoners by Siuntz Khan, but found means to make their escape to their own country. Here they feized upon all the cattle which had not been carried off by the Tartars; which was easily done, as having none to dispute about the property with them; then stripping some of the slain, they took their clothes, and retired into the mountains. They passed several mountains without much difficulty; but at last advanced to the foot of one exceedingly high, which had no way over it but a very small path made by certain animals, called in the Tartar language, arilarna. This path they found themselves obliged to make use of, though it was too frightful, that only one could pass at a time, and he was in the most imminent danger of breaking his neck at the least fall. Step:

Having
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Having ascended the mountain on one side by this path, they defcended by the same on the other side; and were agreeably surprized to find themselves in a most delightful track, interspersed with rivulets and charming meadows, abounding with a vaft variety of delicious fruits, and inclofed on all sides by inaccessible mountains, in fuch a manner as to shelter them from all future purfuits of the Tartars. Here they lived fome time, and gave this beautiful country the name of Irgana-kon, in allufion to its situation; Irgana signifying, in the old language of the Moguls, a "valley," and Kon a "deep height."

In procfs of time these two families very much increafed. Kajam, whole polterity was the moft nume­rous, called his defcendants Kojath: but the people springing from Nagos were divided into two tribes; one of which received the appellation of Nagelger, and the other that of Durlandan.

These two Mogul princes and their defcendants li­ved in this place for more than 400 years; but the latter then finding it too narrow for them, meditated a return to the country from which their forefathers had been driven. For fome time, however, they found this impracticable, as the path that conduced their ance­tors had been long fince deftroyed. At laft they di­covered, that one part of the high mountain above-mentioned was not very thick in a certain place; and alfo, that it confined entirely of iron-ore. To this, having before set fire to a layer of wood, and another of charcoal, laid along the foot of the mountain, they applied 70 large bellows, and at laft melted the moun­tain in fafh a manner, that an opening was made large enough for a loaded camel to pafs; and through this paftage they all marched out with great joy.

The Moguls having thus left it as were from a new world, overthrew the Tartars in their turn; and continued to be a very confiderable nation till the time of their great hero Temujin, afterwards called Jenghis Khan, whom they extol in the moft extravagant manner. It is difficult, however, to fay, at the time Temujin made his appearance, how far the dominions of the Moguls extended, or in what elfimation they were held by their neighbours. It feems to be pretty certain, that great part of the vaft region now known by the name of Tartary, was then in a state of confider­able civilization, and likewise extremely populous, as we find mention made of many cities which the Mo­guls deftroyed; and the incredible multitudes whom they flaughrer, abundantly fhow the populousness of the country.

On the eft, the country of the Moguls and Tartars had the great defart which divides Tartary from China; on the weft, it had the empire of Karazm, founded by Mahmud Gazi; and on the fhore were the countries now known by the name of Indofhan, Siam, Pegu, Tenquin, and Cochin-China. Thus it comprehended the eftern part of modern Tartary, and all Siberia. This whole region was divided among a large number of Amacks, or tribes; who bad each, one or more khans, according as it was more or les numerous, or divided into branches. Among thefe, that of the Kara-its was the moft powerful; their prince afumed the title of Grand Khan, and among the reft, the Moguls were tributary to him; but, according to the Chinefe historians, both the one and the other were tributary to the emperor of Kitay or Katay. China was divided into two parts; the nine southern provinces were in the hands of the Chinese emperors of the Song dynasty, who kept their court at Hang-chew, the capital of the province of Chek­yang; the five northern provinces, excepting part of Shenü, were deftroyed by the Kin, a people of Eastern Tartary, from whom are defcended the Mancheh Tartars, at prefent masters of China. This vaft domi­nation was named Kitay or Katay, and was divided into two parts: that which belonged to China, was properly called Kitay; and the part which belonged to Tartary was called Karakhat, in which fome even include the territories of the Moguls, Karakit, and other tribes, which are the fubject of the prefent his­tory. The western part of the empire of Kitay was deftroyed by a Turkish prince, who had lately founded a new kingdom there, called Hya; whole capital city was Hyauchew, now Ninghya in Shenü, from whence the kingdom took its name. To the west of Hya lay Tangt; a country of great extent, and formerly very powerful; but at that time reduced to a low frate, and divided among many princes some of whom were fubjet to the emperor of Hya, and others to the em­peror of China. All Tartary to the weftward, as far as the Cafffnian fea, with the greater part of Little Buckharia, which then paffed under the general name of Turkeftan, was fubjet to Ghurkhan, Khurkhan, or Kavar Khan; to whom even the Gazi monarchs are faid to have been tributary.

Thus the Moguls, properly fO called, had but a very Defcent and birth of Temujin.

From whence they at laft defteat the Tartars.

Then was the Mogul dynasty, who kept their court in the hands of the Kins, a people of

State of Asia at the time of Jenghis Kahn.

Subjefts of his revolted fubjefts by means of Vang Khan.

This
This happened in the year 1201; but Vang Khan, instead of continuing the friend of Temujin, now became jealous, and resolved to destroy him by treachery. With this view he proposed a marriage between Temujin's son Juji and his own daughter, and another between Temujin's daughter and his own son. Temujin was invited to the camp of Vang Khan, in order to celebrate this double marriage; but, receiving intelligence of some evil intention against him, he excused himself to Vang Khan's messengers, and defrayed that the ceremony might be put off to some other time.

A few days after the departure of these messengers, Badu and Kihlik, two brothers, who kept the herds of one of Vang Khan's chief domestics, came and informed Temujin, that the grand Khan finding he had misled his aim, was resolved to set out instantly, and surprise him next morning, before he could suspect any danger. Temujin, alarmed at this intelligence, quit his camp in the night-time, and retired with the ceremony might be put off to some other time.

By this quarrel almost all the princes of Tartary were put in motion, some siding with Temujin, and others with Vang Khan. But at last fortune declared in favour of the former. Vang Khan was overthrown in a battle, when he had 4000 men; and obliged to fly for refuge to a prince named Tagyan Khan, who was Temujin's father-in-law, and his own enemy, and by whom he was ungenuinely put to death. Temujin immediately began to seize on his dominions, great part of which voluntarily submitted; but a confederacy was formed against him by a number of Vang Khan's tributaries, at the head of whom was Jamuka, a prince who had already distinguished himself by his enmity to Temujin; and even Tagyan Khan himself was drawn into the plot, through jealousy of his son-in-law's good fortune. But Temujin was well prepared; and in the year 1204 attacked Tagyan Khan, entirely routed his army, killed himself, and took Jamuka prisoner, whose head he caused instantly to be struck off; after which he marched against the other tribes who had conspired against him. Then he quickly reduced; took a city called Kafian, where he put all to the sword who had borne arms against him; and reduced all the Mogul tribes in 1205.

Temujin now, having none to oppose him, called a general diet, which he appointed to be held on the first day of the spring 1206; that is, on the day in which the sun entered Aries. To this diet were summoned all the great lords both Moguls and Tartars; and in the mean time to establish good order in the army, he divided his soldiers into bodies of 10,000, 1000, 100, and 10 men, with their respective officers, all subordinate to the generals, or those who commanded the bodies of 10,000; and these were to act under his own sons. On the day of holding the diet, the princes of the blood and great lords appeared dressed in white. Temujin, dressed in the same manner, with his crown on his head, sat down on his throne, and was complimented by the whole assembly, who wished him the continuance of his health and prosperity. After this they confirmed the Mogul empire to him and his successors, adding all those kingdoms which he had subdued, the descendants of whom were deprived of all right or title to them; and after this he was proclaimed emperor with much ceremony. During this inauguration, a pretended prophet declared that he came from God to tell the assembly, that from thenceforth Temujin should assume the name of Jenghis Khan, or the Most Great Khan of Khans; prophesying also, that all his posterity should be Khans from generation to generation. This prophecy, which was no doubt owing to Temujin himself, had a surprising effect on his subjects, who from that time concluded that all the world belonged of right to them, and even thought it a crime against heaven for any body to attempt to resist them.

Jenghis Khan having now reduced under his subjection all the wandering tribes of Moguls and Tartars, began to think of reducing those countries to the south and south west of his own, where the inhabitants were much more civilized than his own subjects; and the countries being full of fortified cities, he must of course expect to meet with more resistance. He began with the emperor of Hya, whose dominions he invaded in 1209, who at last submitted to become his tributary. But in the mean time Jenghis Khan himself was supposed to be tributary to the emperor of Kitay; who, in 1210, sent him an officer, demanding the customary tribute. This was refused, with the utmost indignation, and a war was commenced, which ended not but with the dissolution of the empire of Kitay, as mentioned under the article CHINA.

In the year 1216, Jenghis Khan resolved to carry his arms westward, and therefore left his general Muchuli to pursue his conquests in Kitay. In his journey westward he overthrew an army of 300,000 Tartars who had revolted against him; and, in 1218, sent embassadors desiring an alliance with Mohammed Karazm Shah, emperor of Gazna. His embassador was haughtily treated: however, the alliance was concluded; but soon after broken through the treachery, as it is said, of the Karazmian monarch's subjects. This brought on a war attended with the most dreadful devastations, and which ended with the entire destruction of the empire of Karazm or Gazna, as related under the article Gazna.

After the reduction of Karazm, part of the Moguls broke into Iran or Persia, where also they made large conquests, while others of their armies invaded Georgia and the countries to the west; all this time committing such enormities, that the Chinese historians say both men and spirits burnt with indignation. In 1225, Jenghis Khan returned to Hya, where he made war on the emperor for having sheltered some of his enemies. The event was, that the emperor was slain, and his kingdom conquered, or rather destroyed; which, however, was the last exploit of this most cruel conqueror, who died in 1227, as he marched to complete the destruction of the Chinefe.

The Mogul empire, at the death of Jenghis Khan, extended over a prodigious tract of country, being of his empire more than 1800 leagues in length from east to west, and upwards of 1000 in breadth from north to south.
Mogul empire.

Its princes, however, were still inaffable, and pushed on their conquests on all sides. Oktay was acknowledged emperor after Jenghiz Khan had and under his immediate government Mogultejan (the country of the Moguls properly so called), Kayy, and the countries eastward to the Tartarian sea. Jazagul his brother governed under him a great part of the western conquests. The country of the Kipjacks, and others to the east and north-east, north and north-west, was governed by Batu or Patu the son of Juj, who had been killed in the wars; while Tuli or Toley, another son of Jenghiz Khan, had Khorasan, Persia, and what part of India was conquered. On the east side the Mogul arms were still attended with success; not only the empire of Kayy, but the southern part of China, was conquered, as already related under that article n° 24—42. On the west side matters continued much in the same way till the year 1254, when Mughul, or Merkho, the fourth khan of the Moguls, (the name which was afterwards killed at a siege in China*), raised a great army, which he gave to his brother Hulagu, or Hulagui, to extend his dominions eastward. In 1255 he entered Iran, where he suppressed the Ilmashans or Afsalians, of whom an account is given under the article Assassins; and two years afterwards he advanced to Bagdad, which he took, and cruelly put the khalif to death, treating the city with no more lenity than the Moguls usually treated those which fell into their hands. Every thing was put to fire and sword; and in the city and its neighbourhood the number of slain, it is said, amounted to 1,500,000. The next year he invaded Syria; the city of Damascus was delivered up, and, as it made no resistance, the inhabitants were spared; but Aleppo being taken by storm, a greater slaughter ensued there than had taken place at Bagdad, not even the children in their cradles being spared. Some cities of this country revolted the next year, or the year after; but falling again into the hands of the Moguls, they were plundered, and the inhabitants butchered without mercy, or carried into slavery.

Hulagu died in 1264, and at his death we may fix the greatest extent of the Mogul empire. It now comprehended the whole of the continent of Asia excepting part of Indostan, Siam, Pegu, Cochinchina and a few of the countries of Lesser Asia, which had not been attacked by them; and during all these vast conquests no Mogul army had ever been conquered, except one by Jalolidin, as mentioned under the article Gahna.—From this period, however, the empire began to decline. The ambition of the khans having prompted them to invade the kingdoms of Japan and Cochinchina, they were miserably disappointed in their attempts, and lost a great number of men. The fame had succés attended them in Indostan; and in a short time this mighty empire broke into several smaller ones. The governors of Persia being of the family of Jenghiz Khan, owned no allegiance to any superior; those of Tartary did the same. The Chinese throwed off the yoke; and thus the continent of Asia wore much the same face that it had done before Jenghiz Khan began his conquests.

The successors of Hulagu reigned in Persia till the year 1335; but that year Abulfid Khan, the eighth from Hulagu, dying, the affairs of that country fell into confusion for want of a prince of the race of Jenghiz Khan to succeed to the throne. The empire, therefore, was divided among a great number of petty princes, who fought against each other almost without intermission, till, in the year 1359, Timur Bek, or Tamerlane, one of these princes, having conquered a Tartaran number of others, was crowned at Balkh, with the crowned pomegranate title of Sahib Karan; that is, "the emperor of the world." As he had just before taken that city, and destroyed one of his most formidable rivals who had flnt himself up in it, the new emperor began his reign with beheading some of the inhabitants, imprisoning others, burning their houses, and selling the women and children for slaves. In 1370 he crossed the Sihun, made war on the Gata, and attacked Karazam. Next year he granted a peace to his enemies; but two years after, he again invaded the country of the Gataes, and by the year 1379 had fully conquered the country as well as Korazan; and from that time he continued to extend his conquests in much the same manner as Jenghiz Khan had done, though with less cruelty.—In 1387 he had reduced Armenia, Georgia, and all Persia; the conquest of which last was completed by the reduction of Ispahan, 70,000 of the inhabitants of which were slaughtered on account of a faction raised by some raih or evil disposed persons.

After the reduction of Persia, Timur turned his arms northward and westward, subduing all the countries to the Euphrates. He took the city of Bagdad; subdued Syria; and having ravaged great part of Ruffia, returned to Persia in 1396, where he splendidly feated his whole army. In 1398 he invaded Indostan, crossed the Indus on the 17th of September, reduced several fortresses, and made a vast number of captives. However, as he was afraid that, in case of any emergency, these prisoners might take part with the enemy; he gave orders to his soldiers to put all their Indian flames to death; and, in consequence of this inhuman order, more than 100,000 of these poor wretches were slaughtered in less than an hour.

In the beginning of the year 1399, Timur was met by the Indian army; whom, after a desperate battle, he defeated with great slaughter, and soon after took the city of Delhi, the capital of the country. Here he seated himself on the throne of the Indian emperors, and here the tharifs, kadis, and principal inhabitants of the city, came to make their submission, and begged for mercy. The tame elephants and rhinoceroses likewise were brought to kneel before him as they had been accustomed to do to the Indian emperors, and made a great cry as if they implored his clemency. These war elephants, 120 in number, were, at his return, sent to Samaracnd, and to the province where his sons resided. After this, at the request of the lords of the court, Timur made a great feast, at which he distributed presents to the princes and principal officers.

Delhi at this time consisted of three cities, called The city of Seyri, Old Delhi, and Jehan Penah. Seyri was sur: Delhi de-mounted with a wall in form of a circle. Old Delhi was the fame, but much larger, lying south-west of the other. These two parts were joined on each side by a wall; and the third, lying between them, was called ed. Jehan Penah, which was larger than Old Delhi. Penah...
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The cause of this quarrel at first was, that Bajazet had demanded tribute from a prince who was under Timur's protection, and is said to have returned an insulting answer to the Tartar ambassadors who were sent to him on that account. Timur, however, who was an enthusiastic in the cause of Mahometanism, and considered Bajazet as engaged in the cause of heaven when besieging a Christian city, was very unwilling to disturb him in so pious a work; and therefore undertook several expeditions against the princes of Syria and Georgia, in order to give the Turkish monarch time to cool and return to reason. Among other places, he again invested the city of Bagdad which had cast off its allegiance to him; and having taken it by form, made such a dreadful massacre of the inhabitants, that 120 towers were erected with the heads of the slain. In the mean time Bajazet continued to give fresh provocation, by protecting one Kara Yufef a robber, who had even insulted the caravan of Mecca; so that Timur at length resolved to make war upon him. The sultan, however, foreseeing the danger of bringing such a formidable enemy as he felt himself, thought proper to ask pardon, by a letter, for what was past, and promise obedience to Timur's will for the future. This embassy was graciously received; and Timur returned for answer, that he would forbear hostilities, provided Bajazet would either put Kara Yufef to death, send him to the Tartar camp, or expel him out of his dominions. Along with the Turkish ambassadors he sent one of his own; telling Bajazet that he would march into the confines of Anatolia, and there wait his final answer.

Though Bajazet had seemed at first willing to come to an agreement with Timur, and to dread his superior power; yet he now behaved in such an unsatisfactory manner, that the Tartar monarch desired him to prepare for war; upon which he raised the siege of Constaninople, and having met Timur with an army greatly inferior to the Tartars, was utterly defeated and taken prisoner. According to some accounts, he was treated with great humanity and honour; while others inform us, that he was shut up in an iron cage, against which he dashed out his brains the following year. At any rate, it is certain that he was not restored to liberty, but died in confinement.

This victory was followed, by the submission of many places of the Lesser Asia to Timur; the Greek emperor owned himself his tributary, as did also the sultan of Egypt. After this Timur once more returned to Georgia, which he cruelly ravaged; after which he marched to Samarcand, where he arrived in the year 1405. Here, being now an old man, this mighty conqueror began to look forward to that state which at one time or other is the dread of all living creatures; and Timur, in order to quiet the remembrance of his own confidence, came to the following curious resolution, which he communicated to his intimate friends namely, that "as the vaft conquests he had made were not obtained without some violence, which had occasioned the destruction of a great number of God's creatures, he was resolved, by way of atonement for his past crimes, to perform some good action; namely, to make war on the infidels, and exterminate the idolaters of China." This atonement however, he did not live to accomplish; for he died the same year.
MOGULS, year of a burning fever, in the 71st year of his age and 36th of his reign.

On the death of Timur, his empire fell immediately into great disorder, and the civil wars continued for five or six years; but at last peace was restored, by the settlement of Shah Rukh, Timur's son, on the throne. He did not, however, enjoy the empire in its full extent, or indeed much above one half of it; having only Karazm, Khorasan, Kandahar, Persia, and part of Indostan. Neither was he able, though a brave and warlike prince, to extend his dominions, though he transmitted them to his son Ulug Beg. He proved a wise and learned monarch; and is famous for the astronomical tables which he caused to be composed, and which are well known at this day. He was killed in 1448 by his son Abdollah, who five months after was put to death by his own soldiers. After the death of Abdollah, Abdollah, a grandson of Shah Rukh, seized the throne; but, after reigning one year, was expelled by Abuhaddh Mirza, the grandson of Miran Shah the son of Timur. His reign was one continued scene of wars and tumults; till at last he was defeated and taken prisoner by one Haflan Beg, who put him to death in 1468. From this time we may look upon the empire of Timur as entirely dissolved, though his descendants still reigned in Persia and Indostan, the latter of which is still known by the name of the Mogul empire.

On the death of the abovementioned monarch, his son Babur or Babor succeeded him, but was soon driven out by the Ulbek Tartars; after which he retired some time in Gazna, whence he made incursions into Hindostan, and at length became master of the whole empire, excepting the kingdoms of Dekan, Guzerat, and Bengal. For the transactions subsequent to this period, see the articles Hindostan and India. What remains to be supplied here is an account of the revolution that has lately happened at Delhi the capital of the Mogul empire.

Gholam Khadur, author of the revolution, was the son of Zobada Khan. His father disinfanted him, and drove him from his presence on account of his vices and crimes. Shah Allum, the king of Delhi, took him under his protection, treated him as his own son, and conferred on him the first title in the kingdom, Amere ul Omrau. He lived with the king, and raised a body of about 5000 troops of his own countrymen the Moguls, which he commanded. Gholam Khadur was of a passionate temper, haughty, cruel, ungrateful, and debauched. In the latter end of the year 1788, the king had formed suspicions that some of the neighbouring rajahs (princes) would make an attempt to plunder and destroy his territories. These suspicions were verified by the approach of a considerable army towards his capital, commanded by Ismael Beg Khan, and assisted by Scindia. Gholam Khadur told the king on this, that he had nothing to fear; for that he had an army sufficiently strong to oppose the enemy: that all the king had to do was to march out with his troops, give them a supply of cash, and he would lay his head on the enemy's being overcome. The king on this replied, that he had no money to carry on the war. Gholam Khadur said, that this objection would soon be obviated, as he (Gholam Khadur) would advance the necessary supply of cash, and that all his majesty had to do was to head the army. "This (said he) will animate them and give them confidence; the presence of a monarch is above half the battle."

The king agreed in appearance, and requested Gholam Khadur to assemble the army, pay their arrears, and inform them of his intentions. Gholam Khadur retired contented: but great was his astonishment, when he intercepted the next day a letter from the king to Scindia, directing him to make as much haste as possible, and destroy Gholam Khadur; for, says he, Khadur wishes me to act contrary to my wishes, and oppose you. On this discovery, Gholam Khadur marched out with his Moguls, crost the Jumna, and encamped on the other side opposite the fort of Delhi. He sent to the king the intercepted letter, and asked him if his conduct did not deserve to be punished by the loss of his throne? He began to besiege the fort, and carried it in a few days. He entered the palace in arms; flew to the king's chamber; insulted the old man in the most barbarous manner; knocked him down, and, kneeling on his breast, with his knife took out one of his eyes, and he ordered a servant of the king's to take out the other.

After this he gave up the palace to pillage, and went to the king's zazana (the residence of his women); where he insulted the ladies, and tore their jewels from their noses and ears, and off their arms and legs. As he had lived with the king, he was well acquainted with the different places where the king's treasures were hid; he dug up the floor of the king's own bed-room, and found there two chests, containing in specie 120,000 gold mohurs, or L. 192,000 sterling; this he took, and vam furms more. To get at the hidden jewels of the women, he practised one of the most villainous schemes that ever was thought of. The third day after these horrid cruelties, he ordered that all the king's ladies and daughters should come and pay their respects to him, and promised to set those free who could please him by their appearance and drees. The innocent, unthinking women, brought out their jewels, and adorned themselves in their richest attire to please this savage. Gholam Khadur commanded them to be conveyed into a hall, where he had prepared common drees for them; these drees he made them put on by the ladies, and taking possession of their rich drees and jewels, sent the women home to the palace to lament their loss and curse his treachery. Gholam Khadur did not even stop here; but insulted the princesses, by making them dance and sing. The most beautiful of the king's daughters, Mobarak ual Moulk, was brought to this tyrant to gratify his lust; but the refusals, and is said to have stabbed herself in order to avoid force.

Scindia soon after this came to the assistance of the king, rather to make him his prey. Gholam Khadur fled and took refuge in the fort of Agra, a large city about 150 miles from Delhi. Scindia's troops besieged him there. Perceiving at last that he must be taken if continued in the fort, he took the advantage of a dark night, stuffed his faddle with a large flock of precious stones, took a few followers, and fled from the fort towards Persia. Unluckily for him, he fell off his horse the second night after his flight; by
MOHAIL, or MOEIL, one of the Comorra islands in the Indian sea, between the north end of the island of Madagascar and the continent of Africa. The inland parts are mountainous and woody; but the lands adjoining to the sea are watered by several fine streams which descend from the mountains; and the grass is green all the year, so that it affords a moat delightful habitation. There are plenty of provisions of all kinds; and the East India ships of different nations sometimes touch here for refreshment.

MOHIOF, a large and strong city of Poland, in the province of Lithuania, and palatinate of Mičiūnai. It is well built, populous, and has a considerable trade. Near this place the Swedes obtained a great victory over the Russians in 1707.

MOIDOIRE, a Portuguese gold coin, value 1l. 7s. Sterling.

MOINE (Medietas), the half of any thing.

MOINE (Peter le), was born at Chaumont in Balligni, A.D. 1602, and died at Paris August 22, 1672, aged 70. He joined the society of Jesuits, and enjoyed several offices among them. He is chiefly known by his verses, which were collected into one volume folio in 1671. Father le Moine is the first of the French poets belonging to that famous society, who acquired reputation by this species of writing. It cannot be denied that this poet possessed genius and fancy; but his imagination was un Governed, which is particularly the case in his poem of Saint Louis. De-
incréased, but not equally. Hence, according to Dr.
Bryan Robinson, we learn, that to keep a body of
the same weight in wet weather as in dry, either
the quantity of food must be increased, or the proportion
of the meat to the drink increased; and both these may
be done by lessening the drink without making any
change in the meat.

The instrument used for determining the degree of
moisture in the air, is called an hygrometer. See Hy-
grometer.

MOIVRE (Abraham), was born at Vitri in Cham-
pagne, A. D. 1667. His father was a surgeon. At
the revolution of the edict of Nantes, he determined to
fly into England rather than abandon the religion
of his fathers. Before he left France, he had begun the
study of Mathematics; and having perfected him-
self in that science in London, he was obliged, by the
means of his circumstances, to teach it. Newton’s
principia, which accidentally fell into his hands, 
shocked him how little progress he had made in a science
of which he thought himself master. From this work
he acquired a knowledge of the geometry of in-
finites with as great facility as he had learned the ele-
mentary geometry; and in a short time he was
fit to be ranked with the most celebrated mathemati-
cians. His successes in these studies procured him a
seat in the Royal Society of London and in the
Academy of Sciences at Paris. His merit was so well
understood in the former, that he was thought capa-
cible of deciding in the famous dispute between Leib-
iniz and Newton concerning the differential calculus.
—He published a Treatise on Chances in 1718,
—and another on annuities in 1733; both extreme-
ly accurate. The Philosophical Transactions con-
tain many interesting memoirs of his composition.—
Some of them treat of the method of fluxions; others
are on the lunula of Hippocrates; others on physical
astronomy, in which he resolved many important prob-
lems; and others, in short, on the analysis of the
games of chance, in which he followed a different
course from that of Montmort. Towards the close of
his life he lost his sight and hearing; and the demand
for sleep became so great that he required 20 hours
of it in a day. He died at London, 1754, aged 87.
His knowledge was not confined to mathematics;
but he retained to the last a taste for polite literature.
He was intimately acquainted with the best authors
of antiquity; and he was frequently consulted about
difficult passages in their works. Rabeilais and Mo-
lere were his favourite French authors; he had them
by heart; and he one day observed to one of his ac-
quaintances, “that he would rather have been
Molyer than Newton.” He recited whole scenes of the Mi-
flandre; with that delicacy and force with which he
remembered to have heard them recited at Paris 70
years before, by Molière’s own company. The char-
acter indeed was somewhat similar to his own. He
judged severely of mankind; and could never conceal
his disfavour at the conversation of a fool, nor his aves-
tion to cunning and dissimulation. He was free from
the affectation of science; and no one could know him
to be a mathematician but from the accuracy of his thoughts.
His conversation was general and
instructive. Whatever he said was well digested and
clearly expressed. His style possessed more strength
and solidity than ornament and animation; but he
was always correct, as he bestowed as much pains
on his sentences as on his calculations. He could never
endure any bold assertions or indecent witfiscisms against
religion. “I show you that I am a Christian (said
he one day to a person who thought to pay him a
compliment by observing that mathematicians were
attached to no religion), by forgiving the speech you
have now made.” The practice of giving emails to
servants was not laid aside in his time; and, on this
account, when a nobleman asked him why he did not
dine oftener with his lord (replied he), I cannot afford it.

MOLA (Pietro Francia), an eminent painter,
was born, according to most authors, at Lugano, a
city belonging to the Swiss, in the year 1609.
Others affirm, that the place of his birth was Colda,
in the district of Como. He was at first the disciple
of Giuseppe d’Arpino, and afterwards of Albano.
When he quitted the school of the latter, he went
to Venice, and studied avidly the pictures of Ti-
tian, Tintoretto, Bafan, and Paolo Veronese.
He painted historical subjects and landscapes with great
success; but his genius seemed more particularly adapted
to the latter. His pictures, in both styles, are spoken of with the warmest commendations. He
died in 1665.—He had a brother, Giovanni Battista,
who was also a painter, and of some merit, but very
inferior to that of the older.

MOLA, an ancient town of Italy, in the kingdom
of Naples, and in the Terra di Lavoro, where they
pretend to have found the ruins of Cicero’s house. It is
situated on the gulf of Venice, in E. Long. 17. 50. N. Lat.
41° 5’.
MOLASES (Salt Cake), in antiquity, was barley parch-
ed, and afterwards ground to meal or flour, then mixed
with salt and frankincense, with the addition of a
little water. Thus prepared, it was sprinkled between
the horns of the victim before it was killed in sacri-
fice. This act was called immolation, and was common to the Greeks as well as Romans; with this difference, that
the mola of the Romans was of wheat. The Greeks
called it μαθωματα.

MOLARES, or Dentes molares, in anatomy, the
large teeth, called in English the grinders. See An-
atomy, p. 27.

MOLASSES, or Molasses. See MOLasses.

MOLDAVIA, a province of Turkey in Europe,
bounded on the north-east by the river Niester, which
divides it from Poland; on the east, by Besjarabia; on
the south by the Danube, which parts it from Bulga-
ria; and on the west, by Walachia and Transylvania; it
being 240 miles in length and 150 in breadth. “It
lies in a great art and fruitful soil, producing corn,
wine, rich pastures, a good breed of horses, oxen,
sheep, plenty of game, fish, fowl, honey, wax, and all
European fruits. Its principal rivers are the Danube,
Niester, Pruth, Bardalac, and Ceret. The inhabi-
Gents are Christians of the Greek church, and Jassy
is the principal town. It has been tributary to the Turks
since the year 1574; who appoint a prince who is
a native of the country, but have no regard to his be-
ing of the principal families. They pay a large yearly
tribute, besides which, they are obliged to raise a great
body of horse at their own expense.

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MOLE, a river in Surry, which has taken its name from running underground. It first disappears at Boxhill, near Dorking, in the county of Surry, and emerges again near Leatherhead.

MOLE, in zoology. See TALPA.

Moles in the fields may be destroyed by taking a head or two of garlic, onion or leek, and putting it into their holes; on which they will run out as if frightened, and you may kill them with a spear or dog. Or pounded hellebore, white or black, with wheat, the white of an egg, milk, and sweet-wine, or methyglin, may be made into a paste, and pellets as big as a small nut may be put into their holes: the moles will eat this with pleasure, and will be killed by it. In places where you would not dig nor break much, the fuming their holes with brimstone, garlic or other unfavourable things, drives them away; and if you put a dead mole into a common haunt, it will make them absolutely forswear it.

Or take a mole-phear or staff, and where you see them cast, go lightly but not on the side betwixt them and the wind, left they perceive you; and at the first or second putting up of the earth, strike them with your mole-staff downright, and mark which way the earth falls most: if the casts towards the left hand, strike somewhat on the right hand; and if on the contrary, to the casting up of the plain ground, strike down, and there let it remain; then take out the tongue in the staff, and with the spattle, or flat edge, dig round about your grain to the end thereof, to see if you have killed her; and if you have miffed her, leave open the hole and step aside a little, and perhaps the will come to flop the hole again, for they love but very little air; and then strike her again; but if you miss her, pour into the hole two gallons of water, and that will make her to come out for fear of drowning: mind them going out of a morning to feed or coming home when fed, and you may take a great many.

Mole, in midwifery, a mass of fleshy matter, of a spherical figure generated in the uterus, and sometimes mistaken for a child. See MIDWIFERY.

Mole, or Mark. See NAVIS.

Mole, in architecture, a massive work formed of large stones laid in the sea by means of coffin dams, extended either in a right line or an arch of a circle, before a port, which it serves to close; to defend the vessels in it from the impetuosity of the waves, and to prevent the passage of ships without leave. Thus we say the mole of the harbour of Meffaia, &c.

Mole is sometimes also used to signify the harbour itself.

MOLES (moleS) among the Romans, was also used for a kind of mafulium, built in manner of a round tower on a square base, inflate, encompassed with columns, and covered with a dome.—The mole of the emperor Adrian, now the castle of St Angelo, was the greatest and most flatly of all the moles. It was crowned with a brazen pine apple, wherein was a golden urn containing the ashes of the emperor.

Mole-cricket, in zoology. See GRILLO-TALPA.

MOLE-HILL. Thee little hillocks of earth are a very great prejudice to the pasture lands, not only in wasting so much of the land as they cover, but in hindering the scythe in mowing. In the west of England they use a peculiar instrument for the breaking up of these; it is a flat board, very thick, and of about eight inches in diameter, into which there is fastened a perpendicular handle of three or four feet long. It has four broad and sharp iron teeth at the front, which readily cut through the hill, and spread the earth it confines of; and behind there is a large knob proper for breaking the clods with, if there are any. Some use a spade, or other common instrument in the place of this, but not so well. This however, a much better instrument even than this, for destroying these hills where they are in very great numbers. This is a kind of horse-machine; it has a sharp iron about three feet over, and with a strong back.—It is about four or five inches broad, and has two long handles for a horse to be harnessed to, and a cross-bar of iron to strengthen it at the bottom of the handles, reaching from the one handle to the other. The middle of this cross-bar is furnished with one, two, or more sharp pieces of iron like small plough-shares, to cut the mole-hills into two, three or more parts. The iron behind is of a semicircular figure. A single horse is harnessed to this machine, and a boy must be employed to drive it, and a man to hold and guide it; the sharp irons or shares are the first things that meet the hill, they run through it, break its texture, and cut it into several parts; and the circular iron following immediately behind them, cuts up the whole by the roots, and leaves the land level. This instrument will destroy as many mole-hills in one day as a common labourer can in eight, and would be of very great advantage to the kingdom if brought into general use. It is to be observed, that this leaving a naked space in the place of every hill, it will be necessary to go over the land, and sow them with hay seed, otherwise these spots will want the produce of grass the first years. The farmers in some parts of England are not willing to destroy the mole-hills, but let them stand from year to year, supposing that they get some ground by them; but the advantage by this means is so little, that it does not balance the unprofitableness and damage to the mowing.

MOLESWORTH (Robert), Viscount Moleworth, an eminent statesman and polite writer, born at Dublin in 1656, where his father was a merchant. He was attained by King James for his activity on the prince of Orange's invasion; but the latter, when he was settled on the throne, called up Mr Moleworth into the privy-council, and sent him envoy-extraordinary to the court of Denmark. Here he resided above three years, and then returned upon some dispute, without an audience of leave. Upon his return, he drew up his Account of Denmark, a work well known, in which he represented that government as arbitrary; and hence gave great offence to George prince of Denmark. The Danish envoy presented a Memorial to King William concerning it; and then furnished materials for an answer, which was executed by Dr William King. Mr Moleworth was member of the houses of commons in both kingdoms; King George I. made him a commissioner of trade and plantations, and advanced him to the peerage of Ireland, by the title of Baron Philigbow, and Viscount Moleworth of Swords.
MOLIERE (John Baptift), a famous French co­median, whose true name was Poquelin, which for some reason or other he funk for that of Moliere. He was the fon of a valet de chambre, and was born at Paris about the year 1620. He went through the study of the clasfies under the Jesuit Molina, and was designed for the bar; but at his quitting the law­schools, he made choice of the actor’s profeflion. From the prodigious fondnefs he had had for the drama, his whole study and application being di­rected to the stage, he continued till his death to ex­hibit plays, which were greatly applauded. It is said the firit motive of his going upon the stage was to en­joy the company of an actress for whom he had con­trasted a violent fondnefs. His comedies are highly ef­teemed. And it is no wonder he fo juftly repre­fented domellic feuds, and the torment of jealous hub­bands, or of those who have reafon to be fo, it being af­ferted that no man ever experienced all this more than Moliere, who was very unhappy in his wife. His laft comedy was La Malade imaginaire, which was brought on the stage in 1673; and Moliere died on the fourth night of its representation; fonie fay in ac­ting the very part of the pretended dead man, which gave fonie exercife for the weaks of the time; but ac­­cording to others he died in his bed that night, from the burfting of a vein in his lungs by coughing. The king, as a laft mark of his favour, prevailed with the archbishop of Paris to fuffer him to be buried in con­fecrated ground; though he had irritatcd the clergy by his Tartuff. The moft efteemed editions of his works are that of Amdterdam, 5 vols 12mo, 1692; and that of Paris, 6 vols 4to, 1734.

MOLINA (Lewis), a Spanifh lawyer, who was employed by Philip II. king of Spain in the councils of the Indies and of Caftrile. He is the author of a learned tratfie concerning the entails of the ancient ef­­tates of the Spanifh nobility, entitled, De Hifpano­­rum Primagenatorum Origine et Natura, publifhed in 1603, in folio. This book is likewife applicable to feveral provinces in France. Lewis Molina muft not be confounded with John Molina, a Spanifh historian; author of Croni. a antiqua d’Arragon, publifhed in 1524, in folio; and also of De las Cajas memorables d’Eftagna, in folio. The firft work appeared at Valanz, and the fecond at Accoli.

MOLINAEUS. See MOLIN.

MOLINISTS, in eccle­fiafical history, a fect in the Romifh church, who follow the doctrine and fen­timents of the Jesuit Molina, relating to fuffifent and ef­­ficient grace. He taught that the operations of divine grace were entirely confluent with the freedom of human will; and he introduced a new kind of hypo­­thefis to remove the difficulties attending the doctrines of predetermination and liberty, and to reconcile the jar­ring opinions of Aug itchines, Thomifts, Semi-Pelagi­ans, and other contentious divines. He affirmed, that the decree of predetermination to eternal glory was founded upon a previous knowledge and confideration of the merits of the elect; that the grace from whose operation these merits are derived, is not efficacious by its own intrinsic power only, but also by the con­tent of our own will, and because it is adminiftered in those circumstances, in which the Deity, by that branch of his knowledge which is called fientia media, forces that it will be efficacious. The kind of preference, denominated in the schools fientia media, is that fore­knowledge of future contingents that arifes from an acquaintance with the nature and faculties of rational beings, of the circumstances in which they fhall be placed, of the objects that fhall be prefented to them, and of the influence which their circumstances and ob­jects must have on their actions.

MOLINOS (Michael,) a Spanifh prieft, who en­deavoured to spread new doctrines in Italy. He was born in the diftrict of Saragofa in 1627; and entered into prieft’s orders, though he never held any eccle­fiafical benefice. He was a man of good fenfe and learning, and his life was exemplary; though instead of pra­ctifing aifterities, he gave himself up to contemplation and mystical devotion. He wrote a book intituled, II Guida Spirituale, containing his peculiar notions, which was greedily read both in Italy and Spain. His followers are called Quietifs; because his chief prin­ciple was, that men ought to annullate themselves in order to be united to God, and afterwards remain in quietness of mind, without being troubled for what fhall happen to the body. He was taken up in 1687; and his 68 propositions were examined by the pope and inquisitors, who decreed that his doctrine was false and pernicious, and that his books should be burned. He was forced to recant his errors publicly in the Do­minicains church, and was condemned to perpetual imprifonment. He was 60 years old when he was taken, and had been spreading his doctrine 22 years be­fore. He died in prifon in 1692.

MOLINOSTETS, a fect among the Romanists, who adhere to the doctrine of Molinos. These are the fame with what are other­wise called Quietifs.

MOLLOY (Charles, Esq.), descended from a good family in the kingdom of Ireland, was born in the city of Dublin, and received part of his education at Trinity college there, of which he afterwards became a fellow. At his firft coming to England he entered himself of the Middle Temple, and was sup­posed to have had a very confiderable hand in the writing of a periodical paper called “Foggs’s Journal,” as also fince that time to have been almoft the solo author of another well-known paper, intituled “Common Sense.” All these papers give testimony of ftrong abilities, great depth of understanding, and clearneas of reasoning. Dr king was a confiderable writer in the latter, as were lords Chesterfield and Lyttleton. Our author had large offers made him to write in de­fence of Sir Richard Walpole, but these he rejected; notwithstanding which, at the great change in the mini­stry in 1742, he was entirely neglected, as well as his fellow labourer Amherf, who conducd “The Cafe­man.” Mr Molloy, however, having married a lady of fortune, was in circumstances which enabled him to treat the ingratitude of his patriotic friends with the contempt it deferred. He lived many years after this period, dying to lately as July 16. 1787.
MOLLUGO, AFRICAN CHICKWEED: A genus of the trigynia order, belonging to the triandria clas of plants; and in the natural method ranking under the 22d order, Caryophylleæ. The calyx is pentaphylalous; there is no corolla; the capsule is trilocular, and trivalved. Its characters are these: The emplacement of the flower is composed of five oblong small leaves, coloured on their infides, and permanent; the flower has five oval petals shorter than the emplacement; and three trilly flamma, which stand near the style, terminated by single summit; it has an oval germens, having three furrows, supporting three very small cells. The germens becomes an oval capsule with three cells, filled with small kidney-flaved seeds. There are several species, few of which are admitted into gardens. Miller reckons two and Linneæus five species. This plant is said to have an aperitive virtue.

MOLUSCA, in the Linnaean sytem, is the denomination of the second genus of vermes or worms. They are simple naked animals, not included in a shell, but furnished with limbs, and comprehend eighteen subordinate genera, and one hundred and ten species. MOLO, a philosopher of Rhodes, called also Apollonius. Some are of opinion that Apollonius and Molo are two different persons, who both visited Rhodes, and there opened a school; but Molo came some time after Apollonius. Molo are two different persons, who dedicated their children to him, by making them pass through the fire, by way of sacrifice to this god. There is some probability that the Hebrews were to the fire, by way of sacrifice to this god. There is some probability that the Hebrews were dedicated to their god Moloch.

Moloch of the Ammonites.

Moloch was likewise called Milkom; as appears from what is said of Solomon, that he went after Ahabthor the abomination of the Zidonians, and Milkom the abomination of the Ammonites.

MOLOSSES, MOLASSES, or Molasses, that gross fluid matter remaining of sugar after refining, and which no boiling will bring to a confection more solid than that of syrup; hence also called syrup of sugar.

Properly, molasses are only the sediment of one kind of sugar called chyres, or brown sugar, which is the refuse of other sugars not to be whitened or reduced into loaves.

Molasses are much used in Holland for the preparation of tobacco, and also among poor people instead of sugar. There is a kind of brandy or spirit made of molasses; but by some held exceedingly unwholesome. See below.

Artificial Molasses. There has been found a method of making molasses from apples without the addition of sugar. The apple that succeeds best in this operation is a summer sweeting of a middle size, pleasant to the taste, and so full of juice that seven buffets will yield a barrel of cyder.

The manner of making it is this: the apples are to be ground and pressed, then the juice is to be boiled in a large copper, till three quarters of it be evaporated; this will be done with a moderate fire in about six hours, with the quantity of juice abovementioned, by this time it will be of the confection and taste as well as of the colour of molasses.

This new molasses serves to all the purposes of the common kind, and it is of great use in preparing cider. Two quarts of it, put into a barrel of racked cider, will preserve it, and give it an agreeable colour.

The invention of this kind of molasses was owing to Mr. Chander of Woodlock in New England, who living at a distance from the sea, and where the common molasses was very dear and scarce, provided this for the supply of his own family, and soon made the practice among people of the neighbourhood. It is to be observed, that this sort of apple, the sweeting, is of great use in making cyder, one of the very best kinds we know being made of it. The people in New-England also feed their hogs with the fallings of the orchards of these apples; and the consequences of this is, that their pork is the finest in the world.

Molasses Spirit; a very clean and pure spirit, much used in England, and made from molasses or common treacle dissolved in water, and fermented in the same manner as malt or the common malt-spirit. See Distillation, No 10.

Molasses spirit coming dearer than that of malt, it is frequently met with badly adulterated with a mixture of that spirit, and indeed seldom is to be bought without some dash of it. Many have a way of mixing malt in the fermenting liquor; by this the yield of the whole is greatly increased, and the maker may allure the buyer that the spirit is pure as it ran from the worm.

In most of the nice cafes in our compound distillery,
lery, the molosses-spirit supplies the place of a pure and clean spirit. Our cinnamon, citron, and other fine cordial waters, are made with it; for the malt spirit would impart to them a very disagreeable flavour.

Molosses spirit gives a yellow taint to the hands or other substances dipped into it; and may therefore be of use in dyeing. It is possible also that the vinegar-makers may find use for it in their way; but the most advantageous of all its uses is to the distiller himself; a quantity of it added to new treacle intended for fermentation will be of great use in the process, and increase very considerably the quantity of spirit; but the proportion in regard to the new matter must not be too great.

MOLOSSE, a people of Epirus, who inhabited that part of the country which was called Molossia or Molossus, from king Molosses, a son of Pyrrhus and Andromache. This country had the bay of Ambracia on the south, and the country of the Perrhebeans on the east. The dogs of the place were famous, and received the name of Molossus among the Romans. Dodona was the capital of the country, according to some writers. Others, however, reckon it as the chief city of Thebria.

MOLOSSUS, in the Greek and Latin poetry, a foot consisting of three long syllables. As audiri, cantabant, sapiam.

It takes its name either from a dance in use among the people called Molossi or Epirotes; or from the temple of Jupiter Molossus, where odes were sung, in which this foot had a great share; or else because the march of the Molossi, when they went to the combat, was composed of these feet, or had the cadence thereof. The same foot was also called among the ancients, Vertumus, exstipites, hippus, & canius.

MOLSA (Francis Maria), an eminent poet of the 16th century, was born at Modena. He gained so prodigious a reputation by his Latin and Italian poetry, that, as Paul Jovius tells us, "for 30 years together the patrons of wit at Rome strove to promote him." If he had behaved with the least prudence, he might easily have raised himself to considerable preferments and fortunes in the world; but he managed so ill that it was not possible to serve him. He was entirely debauched, and at the same time devoid of all prudence and decency in the management of his pleasures. Hence he defroyed his reputation, and put an absolute stop to the progress of his fortunes. He died, in 1544, of the French disease. Mofs was a great orator as well as a great poet. He met once with a favourable opportunity of displaying his talent this way; for having seen the people of Rome highly incensed against Lorenzo de Medicis, who had struck off the heads of a great number of ancient statues, he accused him of that action, and (according to Paul Jovius) made so lively an oration upon it, that he perfectly overwhelmed him with confusion and despair: and it was generally believed that Lorenzo de Medicis was so confounded at the insinu- mery with which he was branded in that oration, that, in order to efface it, he resolved to remove the city of Florence to its liberty, by assassinating Alexander de Medicis his near relation, which he did in 1537.

MOLSA (Tarquinia), daughter of Camillo Mols, knight of the order of St James of Spain, and granddaughter of Francis Maria Molis, was one of the most accomplished ladies that ever appeared in the world; wit, learning, beauty, and virtue, all uniting, in her a most extraordinary degree. Her father observing, while she was yet very young, the goodness and excellence of her genius, procured her the best masters in every branch of literature and science. Lazzaro Labadini, a celebrated grammarian of those times, taught her polite literature; and her Latin compositions in prose and verse show that she attained the art of writing, well, and composing correctly. She became learned in Aristotle under Camillo Corentan. Anthony Guarini the mathematician taught her the doctrine of the sphere; the learned poetry under Francis Patricius the famous philosopher; and logic and philosophy under P. Latoni, who also instructed her thoroughly in the Greek tongue. The rabbi Abraham taught her the principles of the Hebrew language; and John Matier Barbier formed her in the polite of the Tuscan tongue; in which she has not only written a great number of easy and elegant verses, but likewise several letters and other pieces, which are in high esteem with the polite and learned in Italy. Besides her original works, she has translated several things from Greek and Latin in a manner which shows her to have understood those languages as well as her own. Afterwards she learned music, as a relaxation and diversion from her more serious studies; and in this art she acquired a celebrated grammarian, Marier Barbier formed her in the Tuscan tongue; in which she has not taught her the principles of the Latin, and received the name of Molossa among the Romans. Dodona was the capital of the country, according to some writers. Others, however, reckon it as the chief city of Thesprotia.

MOLSOUS, in botany: A genus of the gymnoperidia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order, Verticillatae. The calyx is campanulated, gradually widening larger than the corolla, and spinous.

MOLUCAS, or Moluccas Islands, in the East Indian sea under the line; of which there are five principal, namely, Ternate, Timor, Machian, Motry, and Bachian. The largest of them is hardly 30 miles in circumference. They produce neither corn, rice, nor cattle, except...
MOLYBDENA, in natural history, the name of a genus of crystals of a cubic form, or composed of fixed sides, at right angles, like a dye.

MOLYN (Peter), called Tempeia and Pietro Mulier, an eminent painter, was born at Haarlem, in 1637. According to some authors, he was the disciple of Snyders, whose manner of painting he at first imitated. But his genius led him to the study of natural subjects; and he so far excelled in painting tempests, storms at sea, and shipwrecks, that he was called by way of distinction Tempeia. His pictures are very rare, and held in the greatest estimation. The name of Pietro Mulier, or du Mulieribus, was given him on account of having carried his wife to be a nun, in order to marry a young lady of Genoa with whom he was in love. But this vil- lanous transaction being discovered, he was seized, imprisoned, and capitally condemned. However, the greatness of his merit as an artist occasioned a mitigation of the sentence; but he was still detained in prison, where he diligently followed his profession, and would have continued there in all probability for life, had he not met with an opportunity of escaping to Placentia, at the time Louis XIV. bombarded the city of Genoa, after he had been in confinement 16 years. To this artist are attributed several very neat prints, executed with the graver only, in a style greatly resembling that of John Vander Veldt. They confit chiefly of candle-light pieces and dark subjects. M. Heinekin mentions Peter Molyn the elder, who was a native of Holland, and a painter; but not so eminent as Tempeia. Some suppose the prints abovementioned ought to be ascribed to the latter; as, though very neatly executed, they are laboured heavy performances, and not equal in any degree to what one might expect from the hand of an artist of so much repute as Tempeia.

MOLYNEUX (William), an excellent mathematician and astronomer, was born at Dublin in 1656, and admitted into the university of that city; which when he left, he carried with him a testimonial drawn up in an uncommon form, and in the strongest terms, signifying the high opinion conceived of his genius, the profity of his nature, and the remarkable progress he had made in letters. In 1675, he entered in the middle-temple, where he spent three years in the study of the laws of his country; but the best of his genius lay strongly toward mathematics and philosophical studies; and even at the university he conceived a dislike to scholastic learning, and fell into the methods of Lord Bacon. Returning to Ireland in June 1678, he shortly after married Lucy the daughter of Sir William Domvile the king's attorney-general. Being master of an easy fortune, he continued to indulge himself in prosecuting such branches of natural and experimental philosophy as were most agreeable to his fancy; wherein astronomy having the greatest share, he began, about 1681, a literary correspondence with Flamsteed the king's astronomer, which he kept up for several years. In 1683, he formed a design of erecting a philosophical society, at Dublin, in imitation of theirs.
MOLYNEUX (Samuel) son of the former, was born at Chelten in July 1689; and educated with great care by his father, according to the plan laid down by Locke upon that subject. When his father died, he fell under the management of his uncle, Dr. Thomas Molyneux, an excellent scholar and physician at Dublin, and also an intimate friend of Mr. Locke; who executed his trust so well, that Mr. Molyneux became afterwards a most polished and accomplished gentleman, and was made secretary to his late majesty when he was prince of Wales. Astronomy being his favourite study, as it had been his father's, he projected many schemes for the advancement of it, and was particularly employed in the years 1723, 1724, and 1725, in perfecting the method of making telescopes; one of which, of his own making, he had presented to John V. king of Portugal. In the midst of these thoughts being appointed a commissioner of the admiralty, he became so engaged in public affairs, that he had not leisure to pursue these enquiries any further; and gave his papers to Dr. Robert Smith, professor of astronomy at Cambridge, whom he invited to make use of his house and apparatus of instruments, in order to finish what he had left imperfect. Mr. Molyneux dying soon after, Dr. Smith lost the opportunity, yet, supplying what was wanting from Mr. Huygens and others, he published the whole in his "Complete Treatise of Optics."

MOMBAZA, or MOMBAZA, a town of Africa, in an island of the same name, with a castle and fort; seated on the eastern coast, opposite to the country of Momboza in Zanguebar, 70 miles south of Melinda, and subject to Portugal. E. Long. 48°. N. Lat. 14.°. 44.°.

MOMBAZA, a country of Africa in Zanguebar, subject to the Portuguese, from whence they export slaves, gold, ivory, rice, flax, and other provisions, with which they supply the settlements in Brazil. The king of this country being a Christian, had a quarrel with the Portuguese governor, took the castle by assault, turned Mahometan, and murdered all the Christians, in 1631; but in 1729 they became masters of the territory again.

MOMENT, in the doctrine of time, an instant, or the most minute and indivisible part of duration.

MOMENTUM, in mechanics, signifies the same with impetus, or the quantity of motion in a moving body; which is always equal to the quantity of matter multiplied into the velocity; or, which is the same thing, it may be considered as a rectangle under the quantity of matter and velocity. See MECHANICS.

MOMORDICA, male BALSAM APPLE: a genus of the syngeinia order, belonging to the moloniea, class of plants; and in the natural method ranking under the 34th order, Cucurbttaceae. The male calyx is quinquifet; the corolla quinquepartite; the filaments are five in number. The female calyx is trifid; the corolla quinquepartite; the stily trifid; the fruit is an apple parting at the base with a spring. The moft remarkable species are, 1. The ballamina, or male balsam apple. This is a native of Asia; and has a trailing stalk like those of the cucumber or melon, with smooth leaves, cut into several segments, and spreading open like a hand. The fruit is oval, ending in acute points, having several deep angles, with sharp tubercles placed on their edges. It changes to a red or purplish colour when ripe, opening with an elasticity; and throwing out its seeds. 2. The chelenifer, wild or spurious cucumber, has a large fleshy root, somewhat like briony, from whence comes forth every spring several thick, rough, trailing stalks, dividing into many branches, and extending every way two or three feet; these are garnished with thick, rough, almost heart-shaped leaves of a grey colour,
coloured, standing upon long footstalks. The flowers come out from the wings of the footstalks: these are male and female, growing at different places on the same plant like those of the common cucumber; but they are much less, of a pale yellow colour, with a greenish bottom; the male flowers stand upon thick, short, footstalks, but the female flowers fit upon the young fruit; which, after the flower is faded, grows of an oval form, an inch and a half long; swelling like a cucumber, of a grey colour like the leaves, and covered over with short prickles. This species has one of its names from the property of calling out its seeds, together with the viscid juice in which the seeds are lodged, with a violent force, if touched when ripe.

Use. The first species is famous in Syria for curing wounds. The natives cut open the unripe fruit, and infuse it in sweet oil, which they expose to the sun for some days, until it becomes red; and then preserve it for use. Dropped on cotton, and applied to a sore or a wound, the Sycrians reckon it the best vulnerary mountainous plant like arbours or bowers. The elaterium of the plant is common. It is usually brought to Britain from Spain and the southern parts of France, where the plant is common. It is brought to Britain in small, flat, whitish lumps, or cakes, that are dry, and break easily between the fingers. It is of an acid, nauseous, bitter taste, and has a strong offensive smell when newly made; but the same, as well as its other properties, it loses after being kept for some time. It is used, for arbours four members to parliament. It is a borough, and returns two members to parliament: patron Lord Clermont. It gives title of baron to the family of Blayney, and has six fairs. It was anciently called Mainchen. An abbey was founded here in a very early age, of which Moe− londis, the son of Aodh was abbot. In 1462, a monastery for conventual Franciscans was erected on the site of this abbey, which was granted on the general suppression of monasteries to Edward Withe, and a cafile has been since erected on the site by Edward Lord Blayney.

MONA, two islands of this name in the sea lying between Britain and Ireland. The one described by Caesar, as situated in the mid-passage between both islands, and stretching out in length from south to north. Called Mona (Poletomey); Monapia, or Monabia (Plym). Supposed to be the Isle of Man. Another Mona, (Tacitus) an island more to the south, and of greater breadth; situated on the coast of the Orkneys, from which it is separated by a narrow strait. The ancient seat of the Druids. Now called Anglesey, the island of the Angles or English.

MON, an island of the Baltic Sea, south-west of the island of Zealand, subject to Denmark. E. Long. 12° 30'. N. Lat. 55° 00'.
Monarchy, and the imminent danger of his employing that strength to
improvident or oppressive purposes. As a democracy
is the best calculated to direct the end of a law, and
an aristocracy to invent the means by which that end
shall be obtained, a monarchy is most fit for carrying
those means into execution.

The most ancient monarchy was that of the Assyrians, which
was founded four years after the deluge. We
tually reckon four grand or universal monarchies; the
Assyrian, Persian, Grecian, and Roman; though Augustine makes them but two, viz. those of Baby-
on and Rome. Belus is placed at the head of the
series of Assyrian kings who reigned at Babylon, and is
by profane authors esteemed the founder of it, and
by some the same whom the scriptures call Nimrod. The
principal Assyrian kings after Belus were Ninus, who
built Nineveh, and removed the feast of empire to it;
Semiramis, who, disguising her sex, took possession of the kingdom instead of her son, and was killed
and succeeded by her son Ninus; and Sardanapalus,
the last of the Assyrian monarchs, and more effeminate than a woman. After his death the Assyrian empire
was split into three separate kingdoms, viz. the Median, Assyrian, and Babylonian. The first king of the
Median kingdom was Arbaces; and this kingdom
lasted till the time of Atyages, who was subdued and
divested of his kingdom by Cyrus.

In the time of Cyrus there arose a new and second monarchy called the Persian, which flourished upwards of
200 years from Cyrus, whose reign began A. M. 3468,
to Darius Codomannus, who was conquered by Alex-
ander, and the empire translated to the Greeks, A. M.
3674.-The first monarch was Cyrus, founder of the empire.
2. Cambyses, the son of Cyrus. 3. Smer-
dis. 4. Darius, the son of Hytaipis, who reigned
541 years before Christ. 5. Xerxes, who reigned 485
years before Christ. 6. Artaxerxes Longimanus, who
reigned 464 years before Christ. 7. Xerxes the second.
8. Ochus, or Darius, called Nothus, 424
years before Christ. 9. Artaxerxes Mnemon, 405
years before Christ. 10. Artaxerxes Ochus, 359 years
before Christ. 11. Arsies, 338 years before Christ.
12. Darius Codomannus, 336 years before Christ, who
was defeated by Alexander the Great, and de-
prived of his kingdom and life about 331 years before Christ; the dominion of Persia after his death
was translated to the Greeks.

The third monarchy was the Grecian. As Alexander,
when he died, did not declare who should succeed him, there started up as many kings as there were commanders. At first they governed the provinces that were divided among them under
the title of viceroys; but when the family of Alexander the Great was extinct, they took upon them the name of kings. Hence, in process of time, the whole empire of Alexander produced four distinct kingdoms, viz. 1. The Macedonian; the kings of which, after
Alexander, were Antipater, Clistander, Demetrios Poliorcetes, Seleucus Nicanor, Meleager, Antigonus Dafon, Philip, and Perrheus, under whom
the Macedonian kingdom was reduced to the form of a Roman province. 2. The Asiatic kingdom, which
upon the death of Alexander fell to Antigonus, compr-
inger that country now called Natolia, together with
some other regions beyond Mount Taurus. From this kingdom proceeded two letter ones, viz. that of
Pergamus, whose last king, Attalus, apointed the Ro-
man people to be his heir; and Pontus, reduced by the
Romans into the form of a province, when they had
subdued the last king, Mithridates. 3. The Syrian
of whose twenty-two kings the most celebrated were,
Seleucus Nicainor, founder of the kingdom; Antiochus
Euseb; Antiochus the Great; Antiochus Epiphanes;
and Tigranes, who was conquered by the Romans
under Pompy, and Syria reduced into the form of a Roman province. 4. The Egyptian which formed by the Greeks in Egypt, and flourished near
240 years under 12 kings, the principal of whom were,
Ptolemy Lagus, its founder; Ptolemy Philadelphia,
founder of the Alexandrian library; and queen Cleop-
atra, who was overcome by Augustus, in conse-
quency of which Egypt was added to the dominion of the
Romans.

The fourth monarchy was the Roman, which
lasted 244 years, from the building of the city until
the time when the royal power was abrogated. The
kings of Rome were. Romulus, its founder; Numi
Pomponius; Tullus Holitius; Aucus Martius; Tar-
quinius Priscus; Servius Tullius; and Tarquin the
Proud, who was banished, and with whom terminated
the regal power.

There seems in reality no necessity to make the
Medes, Persians, and Greeks, succeed to the whole
power of the Assyrians, to multiply the number of the monarchies. It was the same empire still; and
the several changes that happened in it did not constitute different monarchies. Thus the Babylonian
empire was successively governed by princes of different
nations, yet without any new monarchy being formed thereby. Rome, therefore, may be said to have im-
mediately succeeded Babylon in the empire of the
world. See Empire.

Of monarchies some are absolute and despotic, where
the will of the monarch is uncontrollable; others are
limited, where the prince's authority is restrained by
laws, and part of the supreme power lodged in other
hands, as in Britain. See Government.

Some monarchies again are hereditary, where the
succession devolves immediately from father to son;
and others are elective, where, on the death of the
monarch, his successor is appointed by election, as in
Poland.

Fifth-Monarchy Men, in the ecclesiastical history of England, were a set of crot-on-headed and turbulent enthusiasts who arose in the time of Cromwell, and
who expected Christ's sudden appearance upon earth
to establish a new kingdom; and, acting in conseq-quence of this allusion, aimed at the subversion of all human government.

MONARDA, Indian horehound, in botany: A
genus of the monogynia order, belonging to the dian-
dria class of plants; and in the natural method rank-
ing under the 42d order, Portulacaceae. The corolla is
unequal, with the upper lip linear, involving the fila-
ments; there are four seeds. The most remarkable
species is the zeylanica, a native of the East Indies.
It rises with an herbaceous, four-cornered, hoary stalk,
and bears leaves that are entire, nearly heart-shaped,
woolly, deep notched on the edges, and having foot-
flakes. The flowers, which are purplish and fragrant,
surround the stalk in whorls, each whorl containing
about 14 flowers: and are succeeded by four small
D d kidney
MONASTERY is only properly applied to the houses of monks, mendicant friars, and nuns. The rest are more properly called religious houses. For the origin of monasteries, see Monastic and Monk.

The houses belonging to the several religious orders which obtained in England and Wales were, cathedrals, colleges, abbeys, priories, preceptories, commanderies, hospitals, friaries, hermitages, chantries, and free chapels. These were under the direction and management of various officers. The dissolution of houses of this kind began so early as 1312, when the Templars were suppressed; and in 1323 their lands, churches, advowsons, and liberties, in England, were given by 17 Ed. II. st. 5, to the prior and brethren of the hospital of St John at Jerusalem. In the years 1399, 1437, 1441, 1459, 1497, 1505, 1508, and 1515, several other houses were dissolved, and their revenues settled on different colleges in Oxford and Cambridge. Soon after the last period, Cardinal Wolsey, by licence of the king and pope, obtained a dissolution of above 30 religious houses for the founding and endowing his colleges at Oxford and Cambridge. About the same time a bull was granted by the same pope to Cardinal Wolsey to suppress monasteries, where there were not above six monks, to the value of 8,000 ducats a-year, for endowing Windsor and King's College in Cambridge; and two other bulls were granted to Cardinals Wolsey and Campeius, where there were left from twelve monks, and to annex them to the greater monasteries; and another bull to the same cardinals to inquire about abbeys to be suppressed in order to be made cathedrals. Although nothing appears to have been done in consequence of these bulls, the motive which induced Wolsey and many others to suppress these houses was the desire of promoting learning; and Archbishop Cranmer engaged in it with a view of carrying on the Reformation. There were other causes that concurred to bring on their ruin: many of the religious were loose and vicious; the monks were generally thought to be in their hearts attached to the pope's supremacy; their revenues were not employed according to the intent of the donors; many charities in images, reigns of miracles, and counterfeit relics, had been discovered, which bought the monks into disgrace; the Observant friars had opposed the king's divorce from Queen Catherine; and these circumstances operated, in concurrence with the king's want of a supply and the people's desire to save their money, to forward a motion in parliament, that in order to support the king's state and supply his wants, all the religious houses might be conferred upon the crown which were not able to spend above £. 200 a-year; and an act was passed for that purpose 27 Hen. VIII. c. 28. By this act about 380 houses were dissolved, and a revenue of £. 30,000 or £. 32,000 a-year came to the crown; besides about £. 100,000 in plate and jewels. The suppression of these houses occasioned discontent, and at length an open rebellion: when this was appeased, the king resolved to suppress the rest of the monasteries, and appointed a new visitation; which caused the greater abbeys to be surrendered apace; and it was enacted by 31 Hen. VIII. c. 13, that all monasteries, &c. which have been surrendered since the 4th of February, in the 27th year of his majesty's reign, and which hereafter shall be rendered, shall be vested in the king.

The knights of St John of Jerusalem were also suppressed by the 32 Hen. VIII. c. 34. The suppression of these greater houses by these two acts produced a revenue to the king of above £. 100,000 a-year besides a large sum in plate and jewels. The last act of dissolution in this king's reign was the act of 37 Hen. VIII. c. 4. for dissolving colleges, free chapels, chaplains, &c. which act was farther enforced by 1 Edward VI. c. 14. By this act were suppressed 90 colleges, 110 hospitals, and 2,374 chaplains and free chapels. The number of houses and places suppressed from first to last, so far as any calculations appear to have been made, seems to be as follows:

...
Of greater monasteries, of which we have the valuation, - - 374
Of greater monasteries, - - 186
Belonging to the hospitals, - - 48
Colleges, - - 90
Hospitals, - - 110
Chancies and free chapels, - - 2374

Total 3182

Besides the friars houses and those suppressed by Wolsey, and many small houses of which we have no particular account.

The sum total of the clear yearly revenue of the several houses at the time of their dissolution, of which we have any account, seems to be as follows:

Of the greater monasteries, L. 104,919 - 13 3½
Of all those of the lesser monasteries of which we have the valuation, - - 29,702 - 1 10½
Knights hospitallers head house in London, - - 2385 - 12 8
We have the valuation of only 28 of their houses in the country, - - 3026 - 9 5
Friars houses of which we have the valuation, - - 751 - 2 0½

Total L. 140,764 - 19 3½

If proper allowances are made for the lesser monasteries and houses not included in this estimate, and for the plate, &c. which came into the hands of the king by the dissolution, and for the value of money at that time, which was at least fix times as much as at present, and also consider that the estimate of the lands was generally supposed to be much under the real worth, we must conclude their whole revenues to have been immense.

It does not appear that any computation hath been made of the number of persons contained in the religious houses.

Those of the lesser monasteries dissolved by 27 Hen. VIII. were reckoned at about 10,000
If we suppose the colleges and hospitals to have contained a proportionable number, these will make about 5347
If we reckon the number in the greater monasteries, according to the proportion of their revenues, they will be about 35,000; but as probably they had larger allowances in proportion to their number than those of the lesser monasteries, if we abate upon that account 5000, they will then be 30,000
One for each chantry and free chapel, - - 2374

Total 47,721

But as there were probably more than one person to officiate in several of the free chapels, and there were other houses which are not included within this calculation, perhaps they may be computed in one general estimate at about 50,000. As there were pensions paid to almost all those of the greater monasteries, the king did not immediately come into the full enjoyment of their whole revenues: however, by means of what he did receive, he founded six new bishoprics, viz. those of Westminster (which was changed by Queen Elisabeth into a deanery, with twelve prebends and a school), Peterborough, Chester, Gloucester, Bristol, and Oxford. And in eight other sees he founded deaneries and chapters, by converting the prioris and monks into deans and prebendaries, viz. Canterbury, Winchester, Durham, Worcester, Rochester, Norwich, Ely, and Carlisle. He founded also the colleges of Christ-church in Oxford and Trinity in Cambridge, and founded King's college there. He likewise founded professorships of divinity, law, physic, and of the Hebrew and Greek tongues, in both the said universities. He gave the house of Grey-frars and St Bartholomew's hospital to the city of London, and a perpetual pension to the poor knights of Windsor, and laid out great sums in building and fortifying many ports in the channel. It is observable, upon the whole, that the dissolution of these houses was an act, not of the church, but of the state; in the period preceding the Reformation, by a king and parliament of the Roman catholic communion in all points except the king's supremacy; to which the pope himself, by his bulls and licences, had led the way.

MONASTIC, something belonging to monks, or the monkish life. The monastic profession is a kind of civil death, which in all worldly matters has the same effect with the natural death. The council of Trent, &c. fix sixteen years for the age at which a person may be admitted into the monastical state.

St Anthony is the person who, in the fourth century, first instituted the monastic life; as St Pachomius, in the same century, is said to have first set on foot the cenobitic life, i.e. regular communities of religious. In a short time the deserts of Egypt became inhabited with a set of friars, who took upon them the monastic profession. St Basil carried the monkish humour into the east, where he composed a rule which afterwards obtained through a great part of the west.

In the 11th century the monastic discipline was grown very remiss. St Odo first began to retrieve it in the monastery of Cluny; that monastery, by the conditions of its erection, was put under the immediate protection of the holy see; with a prohibition to all powers, both secular and ecclesiastical, to disturb the monks in the possession of their effects or the election of their abbot. In virtue hereof they pleaded an exemption from the jurisdiction of the bishop, and extended this privilege to all the houses dependent on Cluny. This made the first congregation of several houses under one chief immediately subject to the pope, so as to constitute one body, or, as they now call it, one religious order. Till then, each monastery was independent and subject to the bishop. See Monx.

MONCAON, or MONZON, a town of Portugal, in the province of Entre-Douro-de-Minho, with a strong castle. The Spaniards have several times attempted to take it, but in vain. W. Long. 8. 2. N. Lat. 41. 52.

MONCON, or MONZON, a strong town of Spain, in the kingdom of Arragon. It was taken by the French in 1642, but the Spaniards retook it the following year. It is seated at the confluence of the rivers Sota and Cinca E. Long. 0. 19. N. Lat. 41. 43.

MONCRIF (François Augustin Paradis de), fe-
secretary to M. le comte de Clermont, reader to the queen, one of the 40 of the French academy, and a member of the academies of Nanci, and Berlin, was born at Paris of respectable parents, A. D. 1687, and died there, Nov. 12, 1770, aged 83.

Avec des murs digues de l'age d'or,
Il fut un ami fort, un auteur agréable ;
Il mourut vieux comme Nellor,
Mais il fit moins bravard et beaucoup plus aimable.

Such was Monceiff. He possessed an elegant mind, an engaging perfon, an unceasing desire to please, and a gentle, equable, and obliging temper. The advantage of reading in a very superior and interesting manner, of singing tender airs, and of composing agreeable couples, soon procured him a great number of friends, and many of these of the first rank. He asked permission to accompany a celebrated minifter, who was banifhed in 1757; but though his defer-terred attachment was highly admired, he was only allowed to go every year to express his gratitude to him in his retreat. He was never ashamed of the poverty of his relations, but affifed them and brought them forward by his influence at court. He had been at first a fencing-maftcr; and it is faid that he forefaw he would be obliged to employ his fword in defence of his works. Moft of them needed not this precaution. The principal are, 1. Eflai fur la neceffité et fur les moyens de plaire, in 12mo. This production is written in a lively ingenious manner, is full of excellent maxims, and has gone through many editions. In the prefent age, a greater fhare of argument would be expected; but the chief merit of the work is, that, unlike the productions of many moralifts, it contains nothing which the author himfelf did not reduce to open trade with their friends, and many of these of the firft rank. He daries that way of finging tender airs, and of making part of different performances into which he was admitted. 2. Les Ames rivales, an agreeable little romance, in which there occur fe-veral ingenious observations on French manners; the Alderera, a comedy of but ordinary merit: Pages diverfes, full of delicacy (his Romances and his Regainement iniutl are particularly diftinguifh'd for smooth verification, elegant reflections, and pleasing narration); and fome differtations which' display confiderable wit and information. These pieces are to be found in the miscellaneous works of the author, publifhed at Paris 1743, in 12mo. 3. Some little pieces of one act; which make part of different operas, called the Fragmens, Zelindor, Jennes Ainosia, the Genius tutelaires, and the Sibyle. He was devoted to lyric poetry, and cultivated it with fucces. In this species of writing we have from his pen the Empire de L'Amour, a ballet; the Trophée; the Ames reunis, a ballet which was never acted; and Enfoine, a heroic pastoral. 4. L'Histoire des Cloptts, a thrilling performance, too fervently confidered at the time, and now almost wholly fallen into oblivion. This work gave the Comte d'Argenfon an opportunity of being witty at the author's expence. When Voltaire retired into Prufiia, Monceiff applied to the minifter for the vacant place of hifioriographer: "Hiftropgrapher (said the Comte d'Argenfon), vous voulez fans dette dire hifioriographe." His works were collected, in 1761, into 4 vols, 12mo.

MONDA, or MUNDA (arc. geog.), a river of Lu-

MONDAY, the second day of the week, so called as being anciently facred to the moon; g. d. moon-day.

MONDOVI, a confiderable town of Italy, in Piedmont; with a caftle, university, and bishopp's fee. It is the largest and moft populous town of Piedmont, and is feated in E. Long. 8. 15. N. Lat. 44. 23.

MONEMUGI, an empire in the south of Africa, has Zanguebar on the eaf, Monomotapa on the north, Mutamba and Makoko on the west, and Abyssinia on the north and partly to the eaf, though its boundaries that way cannot be ascertained. It is divided into the kingdoms of Mujaco, Makoko or Anko, G兄弟, Cambate, and Afoa, aged of Monemugi. This latl lies in the middle of the torrid zone, and about the equinoctial line south of Makoko, west of Zanguebar, north of Monemotapa, and eaf of Congo and of the northern parts of Monomotopa. To ascertain its extent, is too difficult a task, being a country fo little frequented. The country known, abounds with gold, silver, copper mines, and elephants. The natives clothe themselves in filkis and cottons, which they buy of strangers and wear collars of transparent amber-beads, brought them from Cambaya: which beads serve also instead of money; gold and silver being too common, and of little value among them.

Their monarch always endeavours to be at peace with the princes round about him, and to keep an open trade with Quitoa, Melinda, and Mambaza, on the eaf, and with Congo on the west, from which places the black merchants retort with gold for goods. The Portuguese merchants report, that on the eaf side of Monemugi there is a great lake full of small islands, abounding with all sorts of fowl and cattle, and inhabited by negroes. They relate also, that on the main-land eafward they heard fometimes the ringing of bells, and that one could obferve buildings very much like churches; and that from these parts came men of a brown and tawny complexion, who traded with those islanders, and with the people of Monemugi.

This country of Monemugi affords alo abundance of palm-wine and oil, and fuch great plenty of honey, that above half of it is left, the black not being able to confume it. The air is generally very unwholefome, and excessively hot, which is the reafon why no Christians undertake to travel in this empire. De Lille gives the division of this country as follows: The Maracates, the Mefleagues, the kingdom of the B Ugas, the kingdom of Maili, and that of Maravi. But we are not acquainted with any particulars relating to these nations or kingdoms.

MONETARIUS, or Moneyer, a name which antiquaries and medalifrs give to thofe who struck the ancient coins or monies.

Many of the old Roman, &c. coins have the name of the monetarius, either written at length or at leaft the initial letters of it. See Medal.

MONEY,
Money.

Money, a piece of matter, commonly metal, to which public authority has affixed a certain value and weight to serve as a medium in commerce. See Coin, Commerce, and Medals; also the article Bank.

Money is usually divided into real or effective, and imaginary, or money of account.

I. Real Money.

1. History of Real Money. Real money includes all coins, or species of gold, silver, copper, and the like; which have course in common, and do really exist. Such are guineas, pfifoles, pieces of eight, ducats, &c.

Real money, civilians observe, has three essential qualities, viz., matter, form, and weight or value.

For the matter, copper is that thought to have been first coined; afterwards silver; and lastly gold, as being the most beautiful, scarce, cleanly, divisible, and pure of all metals.

The degrees of goodness are expressed in gold by carats; and in silver by pennyweights, &c. For there are several reasons for not coining them pure and without alloy, viz. the great loss and expense in refining them, the necessity of hardening them to make them more durable, and the scarcity of gold and silver in most countries. See Alloy.

Among the ancient Britons, iron rings, or as some say, iron plates were used for money; among the Lacedemonians, iron bars quench'd with vinegar, that they might not serve for any other use. Seneca observes, that there was anciently stamp'd money of leather, corium forma publica impressum. And the same thing was put in practice by Frederic II. at the siege of Milan; to say nothing of an old tradition among ourselves, that in the confused times of the barons wars the like was done in England: but the Hollanders, we know, coined great quantities of plate-board in the year 1574.

As to the form of money, it had been more various than the matter. Under this are comprehended the weight, figure, impression, and value.

For the impression, the Jews, though they deftined images, yet stamp'd on the one side of their thekels the golden pot which had the manna, and on the other Aaron's rod. The Dardans stamp'd two cocks fighting. The Athenians stamp'd their coins with an owl, or an ox; whence the proverb on bribed lawyers, Bu in lingua. They of Egypt, with a tortoise; whence that other saying, Viridam et spicantam vincunt sordidus.

Among the Romans, the monetariifrom sometimes impressed the images of men that had been eminent in their families on the coins: but no living man's head was ever stamp'd on a Roman coin till after the fall of the commonwealth. From that time they bore the emperor's head on one side. From this time the practice of stamping the prince's image on coins has obtained among all civilized nations; the Turks and other Mahometans alone excepted, who, in deftination of images, inscribe only the prince's name, with the year of the transmigration of their prophet.

As to the figure it is either round, as in Britain; multangular or irregular, as in Spain; square, as in some parts of the Indies; or nearly globular, as in most of the rest.

After the arrival of the Romans in Britain, the Britons imitated them, coining both gold and silver with the images of their kings stamp'd on them. When the Romans had subdued the kings of the Britons, they also suppress'd their coins, and brought in their own; which were current there from the time of Claudius to that of Valentine the younger, about the space of 500 years.

Mr. Camden observes, that the most ancient English coin he had known was that of Ethelbert king of Kent, the first Christian king in the island: in whole time all money-accounts begin to pass by the names of pounds, shillings, pence, and maunces. Pence seems borrowed from the Latin pecaunia, or rather from ponde, on account of its full weight, which was about three pence Sterling. These were coarsely stamp'd with the king's image on the one side, and either the mint-marter's, or the city's where it was coin'd, on the other. Five of these pence made their shilling, probably so called from feelingus, which the Romans used for the fourth part of an ounce. Forty of these shillings made their pound; and 400 of these pounds were a legate, or a portion for a king's daughter, as appears by the last will of king Alfred. By the nuns they translated all sums of money in their old English testament; talents by pandes; Judas's thirty pieces of silver by thyrig feelingus; tribute-money, by penining; the mite by foarthling.

But it must be observed, that they had no other real money, but pence only; the rest being imaginary monies, i.e. names of numbers or weights. Thirty of these pence made a mance, which some take to be the same with a mark; mance, as appears by an old MS. was quinta part unica. These mances or munces were reckon'd both in gold and silver. For in the year 660 we read that the king of the West Saxons oblig'd the Kentishmen to buy their peace at the price of 30,000 mances of gold. In the notes on King Canute's laws, we find this definition, that manca was as much as a mark of silver, and mance a square piece of gold, valued at 30 pence.

The Danes introduced a way of reckoning money by ores, per oras; mentioned in Domesday-book; but whether they were a several coin, or a certain sum, does not plainly appear. This however, may be gathered from the Abbey-book of Burton, that 20 ores were equivalent to two marks. They had also a gold coin called byzantine, or benant, as being coined at Constantinople, then called Byzantium. The value of which coin is not only now lost, but was so entirely forgot even in the time of King Edward III. that whereas the bishop of Norwich was fined a byzantine of gold to pay the abbot of St. Edmund's Bury for infringing his liberties (as it had been enacted by parliament in the time of the conqueror), no man then living could tell how much it was; so it was referred to the king to rate how much he should pay. Which is the more unaccountable, because but 100 years before, 200,000 bezants were exacted by the goldun for the ransom of St. Louis of France; which were then valued at 100,000 livres.

Though the coinage of money be a special prerogative of the king, yet the ancient Saxon princes communicated it to their subjects: insomuch that in every good town there was at least one mint; but at London
In the time of King Richard I. money coined in the east parts of Germany came in special request in England on account of its purity, and was called easterling money, as all the inhabitants of those parts were called Esterlings. And fiercely after some of those people skilled in coinage were sent for hither to bring the coin to perfection; which since has been called sterlings. See Sterling.

King Edward I. with a weight of the measure of an ell by the length of his arm, herein imitating Charles the Great, was the first also who established a certain standard for the coin, which is expressed to this effect by Greg. Rockley, mayor of London, and mint-master.—"A pound of money contained twelve ounces; in a pound there ought to be eleven ounces, two easterlings, and one farthing; the rest alloy. The said pound ought to weigh twenty thistles and three pence in account and weight. The ounce ought to weigh twenty pence, and a penny twenty-four grains and a half. Note, that eleven ounces two-pence sterling ought to be of pure silver, called leafsilver; and the minter must add of other weight seventeen-pence half-penny farthing, if the silver be so pure."

About the year 1320, the States of Europe first began to coin gold; and among the rest, the king Edward III. The first pieces he coined were called florines, as being coined by Florence; afterwards he coined nobles; then rote-nobles, current at 6s. and 8d. half-nobles called half-pence, at 3d. and 4d. a gold, and quarters at 20d. called farthings of gold. The succeeding kings coined rote-nobles, and double rote-nobles, great sovereigns, and half Henry nobles, angels, and thistles.

King James I. coined units, double crowns, Britain crowns; then crowns, half-crowns, &c.

2. Comparative value of Money and Commodities at different periods. The English money, though the same names do by no means correspond with the same quantity of precious metal as formerly, has not changed so much as the money of most other countries. From the time of William the Conqueror, the proportion between the pound, the shilling, and the penny, seems to have been uniformly the same as at present.

Edward III. as already mentioned, was the first of the English Kings that coined any gold; and no copper was coined by authority before James I. Thefe pieces were not called farthings, but farthing tokens, and all people were at liberty to take or refuse them. Before the time of Edward III. gold was exchanged, like any other commodity, by its weight; and before the time of James I. copper was stamped by any one person who chose to do it.

In the year 612 and 727, an ewe and lamb were rated at 1 s. Saxon money till a forintight after Easter.

Between the years 900 and 1000, two hydes of land, each containing about 120 acres, were sold for 100 shillings. In 1000, by King Ethelred's laws, a horse was rated at 30s. a mare, or a colt of a year old, at 20s. a mule, or young as, at 12s. an ox at 30s. a cow at 24s. a swine at 6d. a sheep at 1s. In 1043, a quarter of wheat was sold for 60d. Hence it is computed, that in the Saxon times there was ten times less money in proportion to commodities, than at present. Their nominal specie, therefore being about three times higher than ours, the price of every thing, according to our present language, must be reckoned thirty times cheaper than it is now.

In the reign of William the Conqueror, commodities were ten times cheaper than they are at present; from which we cannot help forming a very high idea of the wealth and power of that king; for his revenue was L. 400,000 per annum, every pound being equal to what weight of silver, consequently the whole may be estimated at L. 1,200,000 of the present computation; a sum which, considering the different value of money between that period and the present, was equivalent to L. 12,000,000 of modern estimation.

The most necessary commodities do not seem to have advanced their price from William the Conqueror to Richard I.

The price of corn in the reign of Henry III. was near half the mean price in our times. Bishop Fleetwood has shown, that in the year 1240, which was in this reign, L. 4:13:9, was worth about L. 50 of our present money. About the latter end of this reign, Robert de Hay, rector of Souleard, agreed to receive 100 s. to purchase to himself and succesor the annual rent of 5 s. in full compensation of an acre of corn.

Butchers meat, in the time of the great scarcity in the reign of Edward II. was, by a parliamentary ordinance, sold three times cheaper than our mean price at present; poultry somewhat lower, because being no way considered as a delicacy, it has risen beyond its proportion. The mean price of corn at this period was half the present value, and the mean price of cattle one-eighth.

In the next reign, which was that of Edward III. the most necessary commodities were in general about three or four times cheaper than they are at present. In those times, knights, who served on horseback in the army, had 2 s. a-day, and a foot archer 6d. which laid would now be equal to a crown a day. This pay has continued nearly the same nominally (only that in the time of the commonwealth the pay of the horse was advanced to 2 s. 6d. and that of the foot to s. though it was reduced again at the Restoration), but foldiers were proportionably of a better rank formerly.

In the time of Henry VI. corn was about half its present value, other commodities much cheaper. Bishop Fleetwood has determined, from a most accurate consideration of every circumstance, that L. 3 in this reign was equivalent to L. 25 or L. 30 now.

In the time of Henry VII. many commodities were three times as cheap here, and in all Europe, as they are at present, there having been a great increase of gold and silver in Europe since his time, occasioned by the discovery of America.
The commodities whose price has risen the most since before the time of Henry VII. are butchers meat, fowls, and fish, especially the latter. And the reason why corn was always much dearer in proportion to other eatables, according to their prices at present, is, that in early times agriculture was little underfoot. It required more labour and expense, and was more precarious, than it is at present. Indeed notwithstanding the high price of corn in the times we are speaking of, the raising of it to little answered the expense, that agriculture was almost universally quitted for grazing; which was more profitable, notwithstanding the low price of butchers meat. So that there was constant occasion for statues to refrain grazing, and to promote agriculture; and no effectual remedy was found till the bounty upon the exportation of corn; since which, about ten times more corn has been raised in this country than before.

The price of corn in the time of James I. and consequently that of other necessaries of life, was not lower, but rather higher, than at present; wool is now two thirds of the value it was then; the finer manufactures having sunk in price by the progress of art and industry, notwithstanding the increase of money. Butchers meat was higher than at present. Prince Henry made an allowance of near 4d. per pound for all the beef and mutton used in his family. This may be true with respect to London; but the price of butchers meat in the country, which does not even now much exceed this price at a medium, has certainly greatly increased of late years, and particularly in the northern counties.

The prices of commodities are higher in England than in France; besides that the poor people of France live upon much less than the poor in England, and their armies are maintained at less expense. It is computed by Mr. Hume, that a British army of 20,000 men is maintained at near as great an expense as 60,000 in France, and that the English fleet, in the war of 1744, required as much money to support it as all the Roman legions in the time of the emperors. However, all that we can conclude from this is, that money is much more plentiful in Europe at present than it was in the Roman empire.

In the 18th century the common interest which the Jews had for their money, Voltaire says, was 20 per cent. But with regard to this, we must consider the great contempt that nation was always held in, the large contributions they were frequently obliged to pay, the risk they run of never receiving the principal, the frequent confiscations of all their effects, and the violent persecutions to which they were exposed; in which circumstances it was impossible for them to lend money at all unless for most extravagant interest, and much disproportioned to its real value. Before the discovery of America and the plantation of the colonies, the interest of money was generally 12 per cent. all over Europe; and it has been growing gradually less since that time, till it is now generally about four or five.

When sums of money are paid to be raised by a whole people, in order to form a just estimate of it, we must take into consideration not only the quantity of the precious metal according to the standard of the coin, and the proportion of the quantity of coin to the commodities, but a the number and riches of the people who raise it; for populous and rich countries will much more easily raise any certain sum of money than one that is thinly inhabited, and chiefly by poor people. This circumstance greatly adds to our surprize at the vast sums of money raised by William the Conqueror, who had a revenue nearly in value equal to L12,000,000 of our money (allowance being made for the standard of coin and the proportion it bore to commodities), from a country not near to populous or rich as England is at present. Indeed, the accounts historians give us of the revenues of this prince, and the treasure he left behind him, are barely credible.

II. IMAGINARY Money or Money of account, is that which has never existed, or at least which does not exist in real specie, but is a denomination invented or retained to facilitate the stating of accounts, by keeping them still on a fixed footing, not to be changed, like current coin, which the authority of the sovereign raises or lowers according to the exigencies of the state. Of which kind are pounds, livres, marks, maravedies, &c. See the annexed Table, where the fictitious money is diligently indexed by a dagger (†).

Money of Account among the Ancients:—1. The Greeks reckoned their sums of money by drachmas, minae, and talenta. The drachma was equal to 7½ d. Sterling; 100 drachmas made the mene, equal to 3l. 4s. 7d. Sterling; 60 minae made the talent, equal to 103s. 15d. Sterling; hence 100 talents mounted to 1537s. 6d. Sterling. The mene and talentum, indeed, were different in different provinces: their proportions in Attic drachmas are as follow. The Syrian mene contained 25 Attic drachmas; the Ptolemaic 33; the Antiochic and Eubæan 100; the Babylonic 116; the greater Attic and Tyrian 133; the Aeginean and Rhodian 166. The Syrian talent contained 15 Attic minae; the Ptolemaic 20; the Antiochic 60; the Eubæan 60; the Babylonic 70; the greater Attic and Tyrian 80; the Aeginean, and Rhodian 100.

2. Roman moneys of account were the sestertius and as. The sestertius was equal to 1d. 3½ d. Sterling. One thousand of these sestertia made the decies sestertii (the adverb centes centena millia nummum) equal to 8l. 12s. 5d. Sterling. One thousand of these sestertia made the decies sestertii, equal to 8l. 12s. 4d. Sterling. The decies sestertii, they also called decies centena millia nummum. Centes sestertii, or centes. HS, were equal to 80,729l. 3r. 4d. Millies HS to 805,291l. 13r. 4d. Millies; censes HS to 888,920l. 15s. 8d.

Theory of Money.

1. Of Artificial or Material Money.

I. As far back as our accounts of the transactions of mankind reach, we find they had adopted the precious metals, that is, silver and gold, as the common measure of value, and as the adequate equivalent for every thing alienable.

The metals are admirably adapted for this purpose: they are perfectly homogeneous; when pure, they
I. Money. 

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Money, or the medium of exchange, is by comparison the most perfect, most determinate, and most universal measure of value. It consists of precious metals, or their compounds, and is of the same nature which have suffered no alteration. Thus, if the foot of measure was altered at once over all England, by adding to it, or taking from it, any proportional part, of its standard length, the alteration would be best discovered by comparing the new foot with that of Paris, or of any other country, which had suffered no alteration. Just so, if the pound Sterling, which is the English unit, shall be found any how changed, and if the variation it has met with be difficult to ascertain because of a complication of circumstances, the best way to discover it, will be to compare the former and the present value of it with the money of other nations which has suffered no variation. This the course of exchange will perform with the greatest exactness.

II. The two metals being pitched upon as the most proper substances for realizing the ideal scale of money, those who undertake the operation of adjusting a standard, must constantly keep in their eye the nature and qualities of a scale, as well as the principles upon which it is formed.

The unit of the scale must constantly be the same, although realized in the metals, or the whole operation fails in the most essential part. This realizing the unit is like adjusting a pair of compasses to a geometrical scale, where the smallest deviation from the exact opening once given must occasion an incorrect measure. The metals, therefore, are to money what a pair of compasses is to a geometrical scale.

This operation of adjusting the metals to the money of account implies an exact and determinate proportion of both metals to the money-unit, realized in all the species and denominations of coin, adjusted to that standard.

The smallest particle of either metal added to, or taken away from, any coins, which represent certain determinate parts of the scale, overthrows the whole system of material money. And if, notwithstanding such variation, these coins continue to bear the same denominations as before, this will as effectually destroy their usefulness in measuring the value of things, as it would overturn the usefulness of a pair of compasses, to suffer the opening to vary, after it is adjusted to the scale representing feet, toises, miles or leagues, by which the distances upon the plan are to be measured.

III. Debating the standard is a good term; because it conveys a clear and distinct idea. It is diminishing the weight of the pure metal contained in that denomination by which a nation reckons, and which we have called the money unit. Raising the standard requires no farther definition, being the direct contrary.

IV. Altering the standard (that is, raising or debasing the value of the money-unit) is like altering the national measures of weights. This is best discovered by comparing the thing altered with things of the same nature which have suffered no alteration. Thus, if the foot of measure was altered at once over all England, by adding to it, or taking from it, any proportional part, of its standard length, the alteration would be best discovered by comparing the new foot with that of Paris, or of any other country, which had suffered no alteration. Just so, if the pound Sterling, which is the English unit, shall be found any how changed, and if the variation it has met with be difficult to ascertain because of a complication of circumstances, the best way to discover it, will be to compare the former and the present value of it with the money of other nations which has suffered no variation. This the course of exchange will perform with the greatest exactness.

V. Artificers pretend, that the precious metals, when absolutely pure from any mixture, are not of sufficient hardness to constitute a solid and lasting coin. They are found also in the mints mixed with other metals of a ruder nature; and the bringing them to a state of perfect purity occasion unnecessary expense. To avoid, therefore, the inconvenience of employing them in all their purity, people have adopted the expedient of mixing them with a determinate proportion of other metals, which hurts neither their fluidity, malleability, beauty, or lustre. This metal is called alloy; and, being considered only as a support to the principal metal, is accounted of no value in itself. So that eleven ounces of gold, when mixed with one ounce of silver acquires, by that addition no augmentation of value whatever.

This being the case, we shall, as much as possible, overlook the existence of alloy, in speaking of money in order to render language less subject to ambiguity.

2. Inca pacities of the Metals to perform the office of an invariable Measure of Value.

I. Were there but one species of such a substance as we have represented gold and silver to be; were there but one metal possessing the qualities of purity, divisibility, and durability; the inconveniences in the use of it for money would be fewer by far than they are found to be as matters stand. Such a metal might then, by an unlimited division into parts exactly equal, be made to serve as a tolerably steady and univer almeasure. But the rivalry between the metals, and the perfect equality which is found between all their physical qualities, so far as regards purity and divisibility, render them so equally well adapted to serve as the common measure of value, that they are universally admitted to pass current as money.

What is the consequence of this? that the one measures the value of the other, as well as that of every other thing. Now the moment any measure begins to be measured by another, whose proportion to it is not physically, perpetually, and invariably the same, all the usefulness of such a measure is lost. An example will make this plain.

A foot of measure is a determinate length. An English foot may be compared with the Paris foot, or with that of the Rhine; that is to say, it may be measured by them; and the proportion between their lengths

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Money. lengths may be expressed in numbers; which proportion will be the same perpetually. The measuring the one by the other will occasion no uncertainty; and we may speak of length by Paris feet, and be perfectly well understood by others who are used to measure by the English foot, or by the foot of the Rhine.

But suppose that a youth of 12 years old takes it into his head to measure from time to time, as he advances in age, by the length of his own foot, and that he divides this growing foot into inches and decimals: what can be learned from his account of measures? As he increases in years, his foot, inches, and subdivisions, will be gradually lengthening; and were every man to follow his example, and measure by his own foot, then the foot of a measure now established would totally cease to be of any utility.

This is just the case with the two metals. There is no determinate invariable proportion between their value; and the consequence of this is, that when they are both taken for measuring the value of other things, the things to be measured, like lengths to be measured by the young man’s foot, without changing their relative proportion between themselves, change, however, with respect to the denominations of both their measures. An example will make this plain.

Let us suppose an ox to be worth 3000 pounds of weight of wheat, and the one and the other to be worth an ounce of gold, and an ounce of gold to be worth exactly 15 ounces of silver: if the case should happen, that the proportional value between gold and silver should come to be as 14 to 1, would not the ox, and consequently the wheat, be estimated at less in silver, and more in gold, than formerly? Further, would it be in the power of any state to prevent this variation in the measure of the value of oxen and wheat, without putting into the unit of their money less silver and more gold than formerly?

If therefore any particular state should fix the standard of the unit of their money at one species of the metals, while in fact both the one and the other are actually employed in measuring value; does not such a state resemble the young man who measures all by his growing foot? For if silver, for example, be retained as the standard, while it is gaining upon gold one fifteenth additional value; and if gold continue all the while to determine the value of things as well as silver; it is plain, that, to all intents and purposes, this silver measure is lengthening daily like the young man’s foot, since the same weight of it must become every day equivalent to more and more of the same commodity; notwithstanding that we suppose the fame proportion to subsist, without the least variation, between that commodity and every other species of things alienable.

Buying and selling are purely conventional, and no man is obliged to give his merchandise at what may be supposed to be the proportion of its worth. The use, therefore, of an universal measure, is to mark, not only the relative value of the things to which it is applied as a measure, but to discover in an infant the proportion between the value of those, and of every other commodity valued by a determinate measure in all the countries of the world.

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raising or debaseing the standard of the coin, according as they find it most for their present and temporary interest.

3. Methods which may be proposed for lessening the several inconveniences to which material money is liable.

The inconveniences from the variation in the relative value of the metals to one another, may in some measure be obviated by the following expedients.

1st. By considering one only as the standard, and leaving the other to seek its own value like any other commodity.

2nd. By considering one only as the standard, and fixing the value of the other from time to time by authority, according as the market-price of the metals shall vary.

3rd. By fixing the standard of the unit according to the mean proportion of the metals, attaching it to neither; regulating the coin accordingly; and upon every considerable variation in the proportion between them, either to make a new coinage, or to raise the denomination of one of the species, and lower it in the other, in order to preserve the unit exactly in the mean proportion between the gold and silver.

4th. To have two units and two standards, one of gold and one of silver, and to allow every body to fluctuate in either.

5th. Or last of all, to oblige all debtors to pay one half in gold, and one half in the silver standard.

4. Variations to which the Value of the Money-unit is expos'd from every Disorder in the Coin.

Let us suppose, at present, the only disorder to consist in a want of the due proportion between the gold and silver in the coin.

This proportion can only be established by the market-price of the metals; because an augmentation and rise in the demand for gold or silver has the effect of augmenting the value of the metal demanded. Let us suppose, that to-day one pound of gold may buy fifteen pounds of silver: If to-morrow there be a high demand for silver, a competition among merchants to have silver for gold will ensue; they will contend who shall get the silver at the rate of 15 pounds for one of gold; this will raise the price of it; and in proportion to their views of profit, some will accept of less than the 15 pounds. This is plainly a rise in the silver more properly than a fall in the gold; because it is the competition for the silver which has occasioned the variation in the former proportion between the metals.

Let us now suppose, that a state, having with great exactness examined the proportion of the metals in the market, and having determined the precise quantity of each for realising or representing the money-unit, shall execute a most exact coinage of gold and silver coin. As long as that proportion continues unvaried in the market, no inconvenience can result from that quarter in making use of metals for money of account.

But let us suppose the proportion to change; that the silver, for example, shall rise in its value with regard to gold: will it not follow, from that moment, that the unit realized in the silver, will become of more value than the unit realized in the gold-coin?

But as the law has ordered them to pass as equivalents for one another, and as debtors have always the option of paying in what legal coin they think fit, will they not choose to pay in gold? and will not then the silver coin be melted down or exported, in order to be sold as bullion, above the value it bears when it circulates in coin? Will not this paying in gold also really diminish the value of the money-unit, since upon this variation every thing must fall for more gold than before, as we have already observed.

Consequently, merchandise, which have not varied in their relative value to any other thing but to gold and silver, must be measured by the mean proportion of the metals; and the application of any other measure to them is altering the standard. If they are measured by the gold, the standard is debased; if by silver, it is raised.

If, to prevent the inconvenience of melting down the silver, the state shall give up affixing the value of their unit to both species at once, and shall fix it to one, leaving the other to seek its price as any other commodity; in that case, no doubt, the melting down of the coin will be prevented; but will this ever retrieve the value of the money-unit to its former standard? Would it, for example, in the foregoing supposition, raise the debased value of the money-unit in the gold coin, if that species were declared to be the standard? It would indeed render silver coin purely a merchandise, and, by allowing it to seek its value, would certainly prevent it from being melted down as before; because the pieces would rise conventionally in their denomination; or an aqua, as it is called, would be taken in payments made in silver; but the gold would not, on that account, rise in its value, or begin to purchase any more merchandise than before. Were therefore the standard fixed to the gold, would not this be an arbitrary and a violent revolution in the value of the money-unit, and a debasement of the standard?

If, on the other hand, the state should fix the standard to the silver, which we suppose to have risen in its value, would that ever sink the advanced value which the silver coin had gained above the worth of the former standard unit? and would not this be a violent and an arbitrary revolution in the value of the money-unit, and a raising of the standard?

The only expedient, therefore, is, in such a case, to fix the numerary unit to neither of the metals, but to contrive a way to make it fluctuate in a mean proportion between them; which is in effect the introduction of a pure ideal money of account.

The regulation of fixing the unit by the mean proportion, ought to take place at the instant the standard unit is fixed with exactness both to the gold and silver. If it be introduced long after the market-proportion between the metals has deviated from the proportion established in the coin; and if the new regulation is made to have a retrospect, with regard to the acquitting of permanent contracts entered into while the value of the money-unit had attached itself to the lowest currency in consequence of the principle above laid
6. Of the Disorder in the British Coin, so far as it occasions the melting down or the exporting of the Specie.

The defects in the British coin are three.

10s. The proportion between the gold and silver is found to be as 1 to 15 3/5, whereas the market price may be supposed to be nearly as 1 to 14 1/2.

2do. Great part of the current money is worn and light.

3rd, From the second defect proceeds the third, to wit, that there are several currencies in circulation which pass for the same value, without being of the same weight.

4th. From all these defects results the least and greatest inconvenience, to wit, that some innovation must be made, in order to set matters on a right foot.

The English, besides the unit of their money which they call the pound Sterling, have also the unit of their weight for weighing the precious metals.

This is called the pound troy, and consists of 12 ounces, every ounce of 20 penny-weights, and every penny-weight of 24 grains. The pound troy, therefore, consists of 240 penny-weights and 5760 grains.

The fineness of the silver is reckoned by the number of ounces and penny-weights of the pure metal in the pound troy of the composed mafs; or, in other words, the pound troy, which contains 5760 grains of standard silver, contains 5328 grains of fine silver, and 432 grains of copper, called alloy.

Thus standard silver is 11 ounces 2 penny-weights of fine silver in the pound troy to 18 penny-weights copper, or 111 parts fine silver to 9 parts alloy.

Standard gold is 11 ounces fine to 1 ounce silver or copper employed for alloy, which together make the pound troy; consequently, the pound troy of standard gold contains 5280 grains fine, and 480 grains alloy, which alloy is reckoned of its own value.

This pound of standard silver is ordered, by statute of the 43d of Elizabeth, to be coined into 62 shillings, 20 of which make the pound sterling; consequently the 20 shillings contain 1718.7 grains of fine silver, and 1858.06 standard silver.

The pound troy of standard gold, 1/5 fine, is ordered, by an act of king Charles II. to be cut into 44½ guineas; that is to say, every guinea contains 129.43 grains of standard gold, and 118.644 of fine gold;
The coinage in England is entirely defrayed at the expense of the state. The mint price for the metals is the very same with the price of the coin. Whoever carries to the mint an ounce of standard silver, receives for it in silver coin 5s. 2d. or 6s. 6d.; whoever carries an ounce of standard gold receives in gold coin 3l. 17s. 10d. the one and the other making exactly an ounce of the same fineness with the bullion. Coin, therefore, can have no value in the market above bullion; consequently, no loss can be incurred by those who melt it down.

When the guinea was first struck, the government (not inclining to fix the pound Sterling to the gold coin of the nation) fixed the guinea at 20 shillings, (which was then below its proportion to the silver), leaving it to seek its own price above that value, according to the course of the market.

By this regulation no harm was done to the English silver standard; because the guinea, at 118.644 grains fine silver, paid for more, than 20 shillings, or 171.87 grains fine silver, no debtor would pay with gold below its standard value; and whatever it was received for above that price was purely conventional.

Accordingly guineas fought their own price until the year 1728, then they were fixed a new, not below their value as at first, but at what was then reckoned their exact value, according to the proportion of the metals, viz. at 21 shillings; and at this they were ordered to pass current in all payments.

This operation had the effect of making the gold a standard as well as the silver. Debtors then paid indifferently in gold as well as in silver, because they were supposed to be of the same intrinsic as well as current value; in which case no inconvenience could follow upon this regulation. But in time silver came to be more demanded: the making of plate began to prevail more than formerly, and the exportation of silver to the East Indies increasing yearly, made the demand for it greater, or perhaps brought its quantity to be proportionably less than before. This changed the proportion of the metals; and by slow degrees they have come from that of 1 to 15.2 (the proportion they were supposed to have when the guineas were fixed and made a lawful money at 21 shillings) to that of 14.5, the present supposed proportion.

The consequence of this has been, that the same guinea which was worth 1804.5 grains fine silver, at the time it was fixed at 21 s. is now worth no more than 1719.9 grains of fine silver according to the proportion of 14.5 to 1.

Consequently debtors, who have always the option of the legal species in paying their debts, will pay pounds sterling no more in silver but in gold; and as the gold pounds they pay in are not intrinsically worth the silver pounds they paid in formerly according to the statute of Elizabith, it follows that the pound Sterling in silver is really no more the standard, hence nobody will pay at that rate, and hence nobody can be compelled to do it.

Besides this want of proportion between the metals, the silver coined before the reign of George I. is now become light by circulation; and the guineas coined by all the princes since Charles II. pass by tale, though many of them are considerably diminished in their weight.

Let us now examine what profit the want of proportion and the want of weight in the coin can afford to the money-jobbers in melting it down or exporting it.

Did every body consider coin only as the measure for reckoning value, without attending to its value as a metal, the deviations of gold and silver coin from perfect exactness, either as to proportion or weight, would occasion little inconvenience.

Great numbers, indeed, in every modern society, consider coin in no other light than that of money of account; and have great difficulty to comprehend what difference any one can find between a light Guinea and a heavy one, or what inconvenience there can possibly result from a guinea's being some grains of fine gold too light to be worth 21 shillings standard weight. And did every one think in the same way, there would be no occasion for coin of the precious metals at all; leather, copper, iron, or paper, would serve for commerce as well as gold and silver.

But although there be many who look no farther than at the stamp on the coin, there are others whose sole business it is to examine its intrinsic worth as a commodity, and to profit of every irregularity in the weight and proportion of metals.

By the very institution of coinage, it is implied, that every piece of the same metal, and same denomination with regard to the money-unit, shall pass current for the same value.

It is, therefore, the employment of money-jobbers, to examine, with a scrupulous exactness, the precise weight of every piece of coin which comes into their hands.

The first object of their attention is, the price of the metals in the market: a jobber finds, at present, that with 14.5 pounds of fine silver bullion, he can buy one pound of fine gold bullion.

He therefore buys up with gold coin all the new silver as fast as it is coined, of which he can get at the rate of 15.2 pounds for one in gold; these 15.2 pounds silver coin he melts down into bullion, and converts that back into gold bullion, giving at the rate of only 14.5 pounds for one.

By this operation he remains with the value of 78 of one pound weight of silver bullion clear profit upon the 153 pounds he bought; which 78 is really lost by the man who inadvertently coined silver at the mint, and gave it to the money-jobber for his gold. Thus the state loses the expense of the coinage, and the public the convenience of change for their guineas.

But here it may be asked, Why should the money-jobber melt down the silver coin? can he not buy gold with it as well without melting it down? He cannot; because when it is in coin he cannot avail himself of its being new and weighty. Coin goes by tale, not by weight; therefore, were he to come to market with his new silver coin, gold bullion being sold at the mint price, we shall suppose, viz. at 3l. 17s. 10d. Sterling money by ounce, he would be obliged to pay the price of what he brought with heavy money, which he can equally do with light.

He therefore melts down the new silver coin, and sells
fells it for bullion, at so many pence an ounce; the price of which bullion is, in the English market, always above the price of silver at the mint, for the reasons now to be given.

When you sell standard-silver bullion at the mint, you are to be paid in weighty money: that is, you receive for your bullion the very same weight in standard coin; the coinage cost nothing; but when you sell bullion in the market, you are paid in worn-out silver, in gold, in bank-notes, in short, in every species of lawful current money. Now all these payments have some defect: the silver you are paid with is worn and light; the gold you are paid with is over-rated, and perhaps also light; and the bank-notes must have the same value with the specie with which the bank pays them; that is, with light silver or over-rated gold.

It is for these reasons, that silver bullion, which is bought by the mint at 5s. 2d. per ounce of heavy silver money, may be bought at market at 65 pence the ounce in light silver, over-rated gold, or bank-notes, which is the same thing.

Further, we have seen how the imposition of coinage has the effect of raising coin above the value of bullion, by adding a value to it which it had not as a metal.

Just so, when the unit is once affixed to certain determined quantities of both metals, if one of the metals should afterwards rise in value in the market, the coin made of that metal must lose a part of its value as coin, although it retains it as a metal. Consequently, as in the first case it acquired an additional value by being coined, it must now acquire an additional value by being melted down. From this we may conclude, that when the standard is affixed to both the metals in the coin, and when the proportion of that value is not made to follow the price of the market, that species which rises in the market is melted down, and the bullion is sold for a price much exceeding the mint price as the metal has risen in its value.

If, therefore, in England, the price of silver bullion is found to be at 65 pence the ounce, while at the mint it is rated at 62; this proves that silver has risen 2s. above the proportion observed in the coin, and that all coin of standard weight may consequently be melted down with a profit of 2s. But as there are several other circumstances to be attended to, which regulate and influence the price of bullion, we shall here pass them in review, the better to discover the nature of this disorder in the English coin, and the advantages which money-jobbers may draw from it.

The price of bullion, like that of every other merchandise, is regulated by the value of the money it is paid with.

If bullion, therefore, sells in England for 65 pence an ounce, paid in silver coin, it must sell for 65 shillings the pound troy: that is to say, the shillings it is commonly paid with do not exceed the weight of 2/5 of a pound troy; for if the 65 shillings with which the pound of bullion is paid weighed more than a pound troy, it would be a shorter and better way for him who wants bullion to melt down the shillings and make use of the metal, than to go to market with them in order to get less.

We may, therefore, be very certain, that no man will buy silver bullion at 65 pence an ounce, with any shilling which weighs above 2/5 of a pound troy.

We have gone upon the supposition that the ordinary price of bullion in the English market is 65 pence per ounce. This has been done upon the authority of some late writers on this subject: it is now proper to point out the causes which may make it deviate from that value.

I. It may vary, and certainly will vary, in the price, according as the currency is better or worse. When the expences of a war, or a wrong balance of trade, have carried off a great many heavy guineas, it is natural that bullion should rise; because then it will be paid for more commonly in light gold and silver; that is to say, with pounds Sterling, below the value of 113 grains fine gold, the worth of the pound Sterling in new guineas.

II. This wrong balance of trade, or a demand for bullion abroad, becoming very great, may occasion a scarcity of the metals in the market, as well as a scarcity of the coin; consequently, an advanced price must be given for it in proportion to the greatness and height of the demand. In this case, both the specie and the bullion must be bought with paper. But the rise in the price of bullion proceeds from the demand for the metals and the competition between merchants to procure them, and not because the paper given as the price is at all of inferior value to the specie. The least discredit of this kind would not tend to diminish the value of the paper: it would annihilate it at once. Therefore, since the metals must be had, and that the paper cannot supply the want of them when they are to be exported, the price rises in proportion to the difficulties in finding metals elsewhere than in the English market.

III. A sudden call for bullion, for the making of plate. A goldsmith can well afford to give 67 pence for an ounce of silver, that is to say, he can afford to give one pound of gold for 14 pounds of silver, and perhaps for less, notwithstanding that what he gives is more than the ordinary proportion between the metals, because he indemnifies himself amply by the price of his workmanship; just as a tavern-keeper will pay any price for a fine fish, because, like the goldsmith, he buys for other people.

IV. The mint price has as great an effect in bringing down the price of bullion, as exchange has in raising it. In countries where the metals in the coin are justly proportioned, where all the currencies are of legal weight, and where coinage is imposed, the operations of trade make the price of bullion constantly to fluctuate between the value of the coin and the mint price of the metals.

Now let us suppose that the current price of silver bullion in the market is 65 pence the ounce, paid in lawful money, no matter of what weight or of what metal. Upon this the money-jobber falls to work. All shillings which are above 2/5 of a pound troy, he throws into his melting-pot, and sells them as bullion for 65s. per ounce; all those which are below that weight he carries to market, and buys bullion with them at 65s. per ounce.

What is the consequence of this?

That those who sell the bullion, finding the shillings which the money-jobber pays with perhaps not above 2/5 of
Money.

\( \frac{1}{2} \) of a pound troy, they on their side raise the price of their bullion to 66d. the ounce.

This makes new work for the money-jobber; for he must always gain. He now weighs all shillings as they come to hand; and as formerly he threw into his melting-pot those only which were worth more than \( \frac{1}{2} \) of a pound troy, he now throws in all that are in value above \( \frac{1}{2} \). He then sells the melted shillings at 66d. the ounce, and buys bullion with the light ones at the same price.

This is the consequence of ever permitting any species of coin to pass by the authority of the stamp, without controlling it at the same time by the weight: and this is the manner in which money-jobbers gain by the currency of light money.

It is no argument against this exposition of the matter to say, that silver bullion is seldom bought with silver coin; because the pence in new guineas are worth no more than the pence of shillings of 65 in the pound troy: that is to say, that 240 pence contained in \( \frac{1}{2} \) of a new guinea, and 240 pence contained in 28 shillings of 65 to the pound troy, differ no more on the intrinsic value than 0.83 of a grain of fine silver upon the whole, which is a mere trifle.

Whenever, therefore, shillings come below the weight of \( \frac{1}{2} \) of a pound troy, then there is an advantage in changing them for new guineas; and when that is the case, the new guineas will be melted down, and profit will be found in selling them for bullion, upon the principles we have just been explaining.

We have already given a specimen of the domestic operations of the money-jobbers; but these are not the most prejudicial to national concerns. The jobbers may be supposed to be Englishmen; and in that case the profit they make remains at home: but whenever there is a call for bullion to pay the balance of trade, it is evident that this will be paid in silver coin; never in gold, if heavy silver can be got; and this again carries away the silver coin, and renders it at home so rare, that great inconveniences are found for want of the leffer denominations of it. The loss however here is confined to an inconvenience; because the balance of trade being a debt which must be paid, we do not consider the exportation of the silver for that purpose as any consequence of the disorder of the coin. But besides this exportation which is necessary, there are others which are arbitrary, and which are made only with a view to profit of the wrong proportion.

When the money-jobbers find difficulty in carrying on the traffic we have described, in the English market, because of the competition among themselves, they carry the silver coin of the country, and sell it abroad for gold, upon the same principles that the East India company send silver to China in order to purchase gold.

It may be demanded, What hurt this trade can do to Britain, since those who export silver bring back the same value in gold? Were this trade carried on by natives, there would be no loss; because they would bring home gold for the whole intrinsic value of the silver. But if we suppose foreigners finding over gold to be coined at the English mint, and changing the gold into English silver coin, and then carrying off this coin, it is plain that they must gain the difference, as well as the money-jobbers. But it may be answered, That having given gold for silver at the rate of the mint, they have given value for what they have received. Very right; but so did Sir Hans Sloane, when he paid five guineas for an overgrown toad: he got value for his money: but it was value only to himself. Just so, whenever the English government shall be obliged to restore the proportion of the metals (as they must do), this operation will annihilate that imaginary value which they have hitherto set upon gold; which imagination is the only thing which renders the exchange of their silver against the foreign gold equal.

But it is farther objected, that foreigners cannot carry off the heavy silver; because there is none to carry off. Very true; but then they have carried off a great quantity already; or if the English Jews have been too sharp to allow such a profit to fall to strangers, (which may or may not have been the case), then this disorder is an effectual stop to any more coinage of silver for circulation.

7. Of the disorder in the British Coin, so far as it affects the Value of the Pound Sterling Currency.

From what has been said, it is evident, that there must be found in England two legal pounds Sterling of different values; the one worth 113 grains of fine gold, the other worth 1718.7 grains of fine silver. We call them different; because these two portions of the precious metals are of different values all over Europe.

But besides these two different pounds Sterling, which the change in the proportion of the metals have created, the other defects of the circulating coin produce similar effects. The guineas coined by all the princes since the time of Charles II. have been of the same standard weight and fineness, 44\( \frac{1}{4} \) in a pound troy of standard gold \( \frac{2}{4} \) fine; these have been constantly wearing ever since they have been coined; and in proportion to their wearing they are of less value.

If therefore, the new guineas are below the value of a pound Sterling in silver, standard weight, the old must be of less value still. Here then is another currency, that is, another pound Sterling: or indeed more properly speaking, there are as many different pounds Sterling as there are guineas of different weights. This is not all; the money-jobbers having carried off all the weighty silver, that which is worn with use and reduced even below the standard of gold, forms one currency more, and totally destroys all determinate proportion between the money-unit and the currencies which are supposed to represent it.

It may be asked, how, at this rate, any silver has remained in England? It is answered, that the few weighty shillings which still remain in circulation, have marvellously escaped the hands of the money-jobbers, and as to the rest, the rubbing and wearing of these pieces has done what the state might have done; that is to say, it has reduced them to their due proportion with the lightest gold.

The disorder, therefore, of the English coin has rendered the standard of a pound Sterling quite uncertain. To say that it is 1718.7 grains of fine silver, is quite ideal. Who are paid in such pounds? To say that it is 113 grains of pure gold, may also not be true; because there are many currencies worse than the new guineas.
What then is the consequence of all this disorder? What effect has it upon the current value of a pound Sterling? And which way can the value of that be determined?

The operations of trade bring value to an equation, notwithstanding the greatest irregularities possible; and so in fact a pound Sterling has acquired a determinate value over all the world by the means of foreign exchange. This is a kind of ideal scale for measuring the British coin, although it has not all the properties of that described above.

Exchange considers the pound Sterling as a value determined according to the combination of the values of all the different currencies, in proportion as payments are made in the one or the other; and as debtors generally take care to pay in the worst species they can, it consequently follows, that the value of the pound Sterling should fall to that of the lowest currency.

Were there a sufficient quantity of worn gold and silver to acquit all bills of exchange, the pound Sterling would come down to the value of them; but if the new gold be also necessary for that purpose, the value of it must be proportionally greater.

All these combinations are liquidated and compensated with one another, by the operations of trade and exchange: and the pound Sterling, which is so different in itself, becomes thereby, in the eyes of commerce a determinate unit; subject, however to variations, from which it never can be exempted.

Exchange, therefore, is one of the best measures for valuing a pound Sterling, present currency. Here occurs a question:

Does the great quantity of paper-money in England tend to diminish the value of the pound Sterling?

We answer in the negative. Paper money is just as good as gold or silver money, and no better. The variation of the standard, as we have already said, must influence the interests of debtors and creditors proportionately everywhere. From this it follows that all augmentation of the value of the money-unit in the species must hurt the debtors in the paper money; and all diminutions, on the other hand, must hurt the creditors in the paper money as well as everywhere else. The payments, therefore, made in paper money, never can contribute to the regulation of the standard of the pound Sterling; it is the species received in liquidation of that paper money which alone can contribute to mark the value of the British unit; because it is affixed to nothing else.

From this we may draw a principle, "That in countries where the money-unit is entirely affixed to the coin, the actual value of it is not according to the legal standard of that coin, but according to the mean proportion of the actual worth of these currencies in which debts are paid.

From this we see the reason why the exchange between England and all other trading towns in Europe has long appeared so unfavourable. People calculate the real par, upon the supposition that a pound Sterling is worth 1718.7 grains Troy of fine silver, when in fact the currency is not perhaps worth 1638, the value of a new guinea in silver, at the market proportion of 1 to 14.5: that is to say, the currency is but 95.3 per cent. of the silver standard of the 43d of Elizabeth.

No wonder then if the exchange be thought unfavourable.

From the principle we have just laid down, we may gather a confirmation of what we advanced concerning the exchange of the advanced price of bullion in the English market.

When people buy bullion with current money at a determinate price, that operation, in conjunction with the course of exchange, ought naturally to mark the actual value of the pound Sterling with great exactness.

If therefore the price of standard bullion in the English market, when no demand is found for the exportation of the metals, that is to say, when paper is found for paper upon exchange, and when merchants abroad in these matters judge exchange (that is, remittances) to be at par, if then silver bullion cannot be bought at a lower price than 65 pence the ounce, it is evident that this bullion might be bought with 65 pence in shillings, of which 65 might be coined out of the pound troy English standard silver; since 65 shillings imply 65 shillings for the 12 ounces of pound Troy.

This plainly shows how standard silver bullion should fall for 65 pence the ounce, in a country where the ounce of standard silver in the coin is worth no more than 62; and were the market-price of bullion to stand uniformly at 65 pence per ounce, that would show the value of the pound Sterling to be tolerably fixed. All the heavy silver coin is now carried off; because it was intrinsically worth more than the gold it passed for in currency. The silver therefore which remains is worn down to the market proportion of the metals, that is to say, when paper is remittances) to be at par, if then silver bullion should fall at above 65 pence per ounce. If therefore such bullion fells for 65 pence, the shillings with which it is bought must weigh no more than 88.64 grains standard silver; that is, they must lose 4.29 grains, and are reduced to 1/3 of a pound troy.

But it is not necessary that bullion be bought with shillings; no fluctuation of price is ever made farther than as so many pence Sterling per ounce. Does not this virtually determine the mean value of that money unit; would he not understand the value of it far better from that circumstance than by the course.
What everybody knows to be meant by the common phrase, influenced by extraordinary demand, (such as for the course of any exchange, or for making an extraordinary provision of plate, but when it stands at what every body knows to be meant by the common market price, is a very tolerable measure of the value of the actual money-standard in any country.

If it be therefore true, that a pound Sterling cannot purchase above 1638 grains of fine silver bullion, it will require not a little logic to prove that it is really, or has been for these many years, worth any more; notwithstanding that the standard weight of it in England is regulated by the laws of the kingdom at 1718.7 grains of fine silver.

If to this valuation of the pound Sterling drawn from the price of bullion, we add the other drawn from the course of exchange; and by this we find, that when paper is found for paper upon exchange, a pound Sterling cannot purchase above 1638 grains of fine silver in any country of Europe; upon these two authorities we may very safely conclude, as to the matter of fact at least, that the pound Sterling is not worth more, either in London or in any other trading city; and if this be the case, it is just worth 20 shillings of 65 to the pound troy.

If therefore the mint were to coin shillings at that rate, and pay for silver bullion at the market price, that is, at the rate of 65 pence per ounce in those new coined shillings, they would be in proportion to the gold; silver would be carried to the mint equally with gold; and would be as little subject to be exported or melted down.

It may be inquired in this place, how far the coinage the pound troy into 65 shillings is contrary to the laws of England?

The moment a statute pronounces a certain quantity of gold to be worth a certain quantity of silver, and orders those respective quantities of each metal to be received as equivalents of each other, and as lawful money in payments, that moment gold is made a standard as much as silver. If therefore too small a quantity of gold be ordered or permitted to be considered as an equivalent for the unit, the silver standard is from that moment debased; or indeed more properly speaking, all silver money is from that moment protracted; for who, from that time, will ever pay in silver, when he can pay cheaper in gold? Gold, therefore, by such a law, is made the standard, and all declarations to the contrary are against the matter of fact.

Were the king, therefore, to coin shillings at 65 shillings in the pound, it would be the duty of the commonwealth to send up the coinage to the weight of 65 and 3d. for which he would commit no adulteration upon the standard, the adulteration is already committed. The standard has defecned to what it is by flow degrees, and by the operation of political causes only; and nothing prevents it from falling lower but the standard of the gold coin. Let guineas be now let to seek their value as they did formerly, and let light silver continue to go by tale, we shall see the guineas up to 30 shillings in 20 years time, as was the case in 1695.

It is as absurd to say that the standard of Queen Elizabeth has not been debased by enacting that the English unit shall be acquired with 113 grains of fine gold, as it would be to affirm that it would not be debased from what it is at present by enacting that a pound of butter should every where be received in payment for a pound Sterling; although the pound Sterling should continue to consist of 3 ounces, 17 pennyweights, and 10 grains of standard silver, according to the statute of the 43 of Elizabeth. In that case, most debtors would pay in butter; and silver, as at present, acquire a conventional value as a metal, but would be looked upon no longer as a standard, or as money.

If therefore by the law of England, a pound Sterling must consist of 1718.7 grains troy of fine silver, by the law of England also, 113 grains of gold must be of the same value; but no law can establish that proportion; consequently, in which ever way a reformation be brought about, some law must be revised; consequently, expediency, and not compliance with law, must be the motive in reforming the abuse.

From what has been said, it is not at all surprising that the pound Sterling should in fact be reduced nearly to the value of the gold. Whether it ought to be kept at that value is another question. All that we here decide is, that coining the pound troy into 65 shillings would restore the proportion of the metals, and render both species common in circulation. But restoring the weight and proportion of the coin is not the difficulty which prevents a reformation of the English coinage.

8. Circumstances to be attended to in a new Regulation of the British Coin.

To people who do not understand the nature of such operations it may have an air of justice to support the unit at what is commonly believed to be the standard of Queen Elizabeth, viz. at 1718.7 grains of fine silver.

The regulating the standard of both silver and gold to 4 fine, and the pound Sterling to four ounces standard silver, as it stood during the reign of Queen Mary I. has also its advantages, as Mr Harris has observed. It makes the crown-piece to weigh just one ounce, the thilling four penny-weight, and the penny eight grains; consequently, were the new statute to bear, the secretory of the coin should regulate its currency upon certain occasions, the having the pieces adjusted to certain aliquot parts of weight would make weighing easy, and would accustom the common people to judge of the value of money by its weight, and not by the stamp.

In that case there might be a convenience in striking the gold coins of the same weight with the silver, because the proportion of their values would then constantly be the same with the proportion of the metals. The gold crowns would be worth at present £1. 13s. 6d. the half crowns 11. 16s. 3d. the gold shillings 14s. and 6d. and the half 7s. and 3d. This was anciently the practice in the Spanish mints.

The interest within the state can be nowise perfectly protected but by permitting conversions of value from the old to the new standard, whatever it be, and
Money. by regulating the footing of such conventions by act of parliament, according to circumstances.

For this purpose, we shall examine those interests which will chiefly merit the attention of government, when they form a regulation for the future of acquitting permanent contracts already entered into. Such as may be contracted afterwards will naturally follow the new standard.

The landed interest is no doubt the most considerate in the nation. Let us therefore examine, in the first place, what regulations it may be proper to make, in order to do justice to this great class, with respect to the land-tax on one hand, and with respect to their lees upon the other.

The valuation of the lands of England was made many years ago, and reasonably ought to be supported at the real value of the pound Sterling at that time, according to the principles already laid down. The general valuation, therefore, of the whole kingdom will rise according to this scheme. This will be considered as an injustice; and no doubt it would be so, if, for the future, the land-tax be imposed as herefore, without attending to this circumstance; but as that imposition is annual, as it is laid on by the landed interest itself, who compose the parliament, it is to be supposed that this great class will at least take care of their own interest.

Were the valuation of the lands to be settled according to the valuation of the pound Sterling of 1718.7 grains of silver, which is commonly supposed to be the standard of Elizabeth, there would be no great injury done; this would raise the valuation only 5 per cent, and the land-tax in proportion.

There is no class of inhabitants in all England so much at their ease, and so free from taxes, as the class of farmers. By living in the country, and by consuming the fruits of the earth without their suffering any alienation, they avoid the effect of many excises, which, by those who live in corporations, are felt upon many articles of their consumption, as well as on those which are immediately loaded with those impositions. For this reason it will not, perhaps, appear unreasonable, if the additional 5 per cent, on the land-tax were thrown upon this class, and not upon the landlords.

With respect to leases, it may be observed, that we have gone upon the supposition that the pound Sterling in the year 1728 was worth 1718.7 grains of fine silver, and 113 grains of fine gold.

There would be no injustice done the lees upon all the lands in the kingdom, were their rents to be fixed at the mean proportion of these values. We have observed how the pound Sterling has been gradually diminishing in its worth from that time by the gradual rise of the silver. This mean proportion, therefore, will nearly answer to what the value of the pound Sterling was in 1743; supposing the rise of the silver to have been uniform.

It may be farther alleged in favour of the landlords, that the gradual debasement of the standard has been more prejudicial to their interest in letting their lands, than to the farmers in disposing of the fruits of them. Proprietors cannot so easily raise their rents upon new leases, as farmers can raise the prices of their grain according to the debasement of the value of the currency.

The pound Sterling, thus regulated at the mean proportion of its worth, as it stands at present, and as it stood in 1728, may be realised in 1678.6 grains of fine silver, and 115.76 grains of fine gold; which is 2.4 per cent, above the value of the present currency. No injury, therefore, would be done to lessees, and no unreasonable gain would accrue to the landed interest, in appointing conventions of all land-rents at 2.4 per cent, above the value of the present currency.

Without a thorough knowledge of every circumstance relating to Great Britain, it is impossible to lay down any plan. It is sufficient here briefly to point out the principles upon which it must be regulated.

The next interest to be considered is that of the nation's creditors. The right regulation of their concerns will have a considerable influence in establishing public credit upon a solid basis, by making it appear to all the world, that no political operation upon the money of Great Britain can in any respect either benefit or prejudice the interest of that who lend their money upon the faith of the nation. Therefore, alfo the interest of so great a body, will serve as a rule for all creditors who are in the same circumstances, and will upon other accounts be productive of greater advantages to the nation in time coming.

In 1749, a new regulation was made with the public creditors, when the interest of the whole redeemable national debt was reduced to 3 per cent. This circumstance infinitely facilitates the matter with respect to this class, since, by this innovation of all former contracts, the whole national debt may be considered as contracted at, or posterior to, the 25th of December 1749.

Were the slate, by any arbitrary operation upon money (which every reformation much be), to diminish the value of the pound Sterling in which the parliament at that time bound the nation to acquit those capitals and the interest upon them, would not all Europe say, That the British parliament had defrauded their creditors? If therefore the operation proposed to be performed should have a contrary tendency, viz. to augment the value of the pound Sterling with which the parliament at that time bound the nation to acquit those capitals and interests, must not all Europe also agree, That the British parliament had defrauded the nation?

This convention with the ancient creditors of the state, who, in consequence of the debasement of the standard, might have justly claimed an indemnification for the loss upon their capitals, lent at a time when the pound Sterling was at the value of the heavy silver, removes all causes of complaint from that quarter. There was in the year 1749 an innovation in all their contracts; and they are now to be considered as creditors only from the 25th of December of that year.

Let the value of the pound Sterling be inquired into during one year preceding and one posterior to the transactions of the month of December 1749. The sums borrowed and paid back by the nation during that period, will furnish data sufficient for that calculation. Let this value of the pound be specified.
Money.

In troy grains of fine silver and fine gold bullion, without mentioning any denomination of money according to the exact proportion of the metals at that time. And let this pound be called the pound of national credit.

This first operation being determined, let it be enacted that the pound Sterling, by which the state is to borrow for the future, and that in which the creditors are to be paid, shall be the exact mean proportion between the quantities of gold and silver above specified, according to the actual proportion of the metals at the time such payments shall be made; or that the sums shall be borrowed or acquitted, one half in gold and one half in silver, at the respective requisitions of the creditors or of the state, when borrowing. All debts contracted posterior to 1749 may be made liable to conversions.

The consequence of this regulation will be the insensible establishment of a bank-money. Nothing would be more difficult to establish, by a positive resolution, than such an invariable measure; and nothing will be found so easy as to let it establish itself by its own advantages. This bank-money will be liable to much fewer inconveniences than that of Amsterdam. There the persons transacting must be upon the spot; here, the Sterling currency may, every quarter of a year, be adjusted by the exchequer to this invariable standard, for the benefit of all debtors and creditors who incline to profit of the stability of this measure of value.

This scheme is liable to no inconvenience from the variation of the metals, let them be ever so frequent or hard to be determined; because upon every occasion where there is the smallest doubt as to the actual proportion, the option competent to creditors to be paid half in silver and half in gold will remove.

Such a regulation will also have this good effect, that it will give the nation more just ideas of the nature of money, and consequently of the influence it ought to have upon prices.

If the value of the pound Sterling shall be found to have been by accident less in December 1749 than it is a present; or if at present the currency be found below what it has commonly been since 1749; in justice to the creditors, and to prevent all complaints, the nation may grant them the mean proportion of the value of the pound Sterling from 1749 to 1760, or any other which may to parliament appear reasonable.

This regulation must appear equitable in the eyes of all Europe; and the strongest proof of it will be, that it will not produce the smallest effect prejudicial to the interest of the foreign creditors. The course of exchange with regard to them will stand precisely as before.

A Dutch, French, or German creditor, will receive the same value for his interest in the English stocks as heretofore. This must silence all clamours at home, being the most convincing proof, that the new regulation of the coin will have made no alteration upon the real value of any man's property, let him be debtor or creditor.

The interest of every other denomination of creditors, whose contracts are of a fresh date, may be regulated upon the same principles. But where debts are of an old standing, justice demands, that attention be had to the value of money at the time of contracting. Nothing but the stability of the English coin, when compared with that of other nations, can make such a proposal appear extraordinary. Nothing is better known in France than this stipulation added to obligations, *argent au cours de ce jour*; that is to say, That the sum shall be repaid in coin of the same intrinsic value with what has been lent. Why should such a clause be thought reasonable for guarding people against arbitrary operations upon the numerary value of the coin, and not be found just upon every occasion where the numerary value of it is found to be changed, let the cause be what it will?

The next interest we shall examine is that of trade. When men have attained the age of 21, they have no more occasion for guardians. This may be applied to traders; they can parry with their pen every inconvenience which may result to other people from the changes upon money, provided only the laws permit them to do themselves justice with respect to their engagements. This class demands no more than a right to convert all reciprocal obligations into denominations of coin of the same intrinsic value with those they have contracted in.

The next interest is that of buyers and sellers; that is, of manufacturers with regard to consumers, and of servants with respect to those who hire their personal service.

The interest of this class requires a most particular attention. They must, literally speaking, be put to school, and taught the first principles of their trade, which is buying and selling. They must learn to judge of price by the grains of silver and gold they receive; they are children of a mercantile mother, however warlike the father's disposition. If it be the interest of the state that their bodies be rendered robust and active, it is no less the interest of the state that their minds be instructed in the first principles of the trade they exercise.

For this purpose, tables of conversion from the old standard to the new must be made, and ordered to be put up in every market, in every shop. All duties, all excises, must be converted in the same manner. Uniformity must be made to appear every where. The smallest deviation from this will be a stumbling-block to the multitude.

Not only the interest of the individuals of the class we are at present considering, demands the nation's care and attention in this particular, but the prosperity of trade, and the well-being of the nation, are also deeply interested in the execution.

The whole delicacy of the intricate combinations of commerce depends upon a just and equitable vibration of prices, according as circumstances demand it. The more, therefore, the industrious classes are instructed in the principles which influence prices, the more easily will the machine move. A workman then learns to fix his price without regret, and can raise it without aversion. When principles are not understood, prices cannot gently fall, they must be pulled down; and merchants dare not suffer them to rise, for fear of abuse, even
The last interest is that of the bank of England, which naturally must regulate that of every other. Had this great company followed the example of other banks, and established a bank-money of an invariable standard as the measure of all their debts and credits, they would not have been liable to any inconvenience upon a variation of the standard.

The bank of England was projected about the year 1694, at a time when the current money of the nation was in the greatest disorder, and government in the greatest distress both for money and for credit. Commerce was then at a very low ebb; and the only, or at least the most profitable, trade of any, was jobbing in coin, and carrying backwards and forwards the precious metals from Holland to England. Merchants profited also greatly from the effects which the utter disorder of the coin produced upon the price of merchandise.

At such a juncture the resolution was taken to make a new coinage; and upon the prospect of this, a company was found, who, for an exclusive charter to hold a bank for 13 years, willingly lent the government upwards of a million Sterling at 8 per cent. (in light money we suppose), with a prospect of being repaid both interest and capital in heavy. This was not all: part of the money lent was to be applied for the establishment of the bank; and no less than 4000l. a-year was allowed to the company, above the full interest, for defraying the charge of the management.

Under such circumstances the introduction of bank-money was very superfluous, and would have been very impolitic. That invention is calculated against the raising of the standard; but here the bank profited of that rise in its quality of creditor for money lent; and took care not to commence debtor by circulating their paper until the effect of the new regulation took place. That is, after the general re-coinage of all the clipped silver.

From that time till now, the bank of England has been the basis of the nation’s credit, and with great reason has been constantly under the most intimate protection of every minister.

The value of the pound Sterling, as we have seen, has been declining ever since the year 1601, the standard being fixed to silver during all that century, while the gold was constantly rising. No sooner had the proportion taken another turn, and silver begun to rise, than the government of England threw the standard virtually upon the gold, by regulating the value of the guineas at the exact proportion of the market. By these operations, however, the bank has constantly been a gainer (in its quality of debtor) upon all the paper in circulation; and therefore has lost nothing by not having established a bank-money.

The interest of this great company being established upon the principles we have endeavoured to explain, it is very evident, that the government of England never will take any step in the reformation of the coin which in its consequences can prove hurtful to the bank. Such a step would be contrary both to justice and to common sense. To make a regulation which, by raising the standard, will prove beneficial to the public creditors, to the prejudice of the bank (which we may call the public debtor), would be an operation upon public credit like that of a person who is at great pains to support his house by props upon all sides, and who at the same time blows up the foundation of it with gunpowder.

We may therefore conclude, that with regard to the bank of England, as well as every other private banker, the notes which are constantly payable upon demand must be made liable to a conversion at the actual value of the pound Sterling at the time of the new regulation.

That the bank will gain by this, is very certain; but the circulation of their notes is so extensive, that it would be absurd to allow to the then possessors of them that intensification which naturally should be shared by all those through whose hands they have passed, in proportion to the debasement of the standard during the time of their respective possession.

Besides these considerations, which are in common to all states, the government of Great Britain has one peculiar to itself. The interest of the bank, and that of the creditors, are diametrically opposite: every thing which raises the standard hurts the bank; every thing which can sink it hurts the creditors: and upon the right management of the one and the other, depends the solidity of public credit. For these reasons, without the most certain prospect of conducting a restitution of the standard to the general advantage as well as approbation of the nation, no minister will probably ever undertake so dangerous an operation.

We shall now propose an expedient which may remove at least some of the inconveniences which would result from so extensive an undertaking as that of regulating the respective interests in Great Britain by a positive law, upon a change in the value of their money of account.

Suppose then, that, before any change is made in the coin, government should enter into a transaction with the public creditors, and ascertain a permanent value for the pound Sterling for the future, specified in a determined proportion of the fine metals in common bullion, without any regard to money of account, to any coin whatever.

This preliminary step being taken, let the intended alteration of the standard be proclaimed a certain time before it is to commence. Let the nature of the change be clearly explained, and let all such as are engaged in contracts which are dissoluble at will upon the pretensions stipulated, be acquitted between the parties, or innovated as they shall think proper; with certification, that, posterior to a certain day, the stipulations formerly entered into shall be binding according to the denominations of the money of account in the new standard.

As to permanent contracts, which cannot at once be fulfilled and dissolved, such as leases, the parliament may either prescribe the methods and terms of conversion; or a liberty may be given to the parties to annul the contract, upon the debtor’s refusing to perform his agreement according to the new standard. Contracts, on the other hand, might remain in force, with respect to creditors who would be satisfied with payments made on the footing of the old standard. If the rise intended should not be very considerable, no great injustice can follow such a regulation.
Money.

Annuities are now thoroughly understood, and the value of them is brought to so nice a calculation, that nothing will be easier than to regulate these upon the footing of the value paid for them, or of the subject effected by them. If by the regulation, land-rents are made to rise in denomination, the annuities charged upon them ought to rise in proportion; if in intrinsic value, the annuity should remain as it was.

9. Regulations which the Principles of this Inquiry point out as expedient to be made by a new Statute for regulating the British Coin.

Let us now examine what regulations it may be proper to make by a new statute concerning the coin of Great Britain, in order to preserve always the same exact value of the pound Sterling realized in gold and in silver, in spite of all the incapacities inherent in the metals to perform the functions of an invariable scale or measure of value.

1. The first point is to determine the exact number of grains of fine gold and fine silver which are to compose it, according to the then proportion of the metals in the London market.

2. To determine the proportion of these metals with the pound troy: and in regard that the metals of value, according to the then proportion of the metals. Then of or measure of value.

3. To fix the mint-price within certain limits; that is to say, to leave to the king and council, by proclamation, to carry the mint price of bullion up to the value of the coin, as is the present regulation, or to sink it to per cent. below that price, according as government shall incline to impose a duty upon coinage.

4. To order, that silver and gold coin shall be struck of such denominations as the king shall think fit to appoint; in which the proportion of the metals above determined shall be constantly observed through every denomination of the coin, until necessity shall make a new general coinage unavoidable.

5. To have the number of grains of the fine metal in every piece marked upon the exergue, or upon the legend of the coin, in place of some initial letters of titles, which not one person in a thousand can decipher; and to make the coin of as compact a form as possible, diminishing the surface of it as much as is consistent with beauty.

6. That it shall be lawful for all contracting parties to stipulate their payments either in gold or silver coin, or to leave the option of the species to one of the parties.

7. That where no particular stipulation is made, creditors shall have power to demand payment, half in one species, half in the other: and when the sum cannot fall equally into gold and silver coins, the fractions to be paid in silver.

8. That in buying and selling, when no particular species has been stipulated, and when no act in writing has intervened, the option of the species shall be competent to the buyer.

9. That all sums paid or received by the king’s receivers, or by bankers, shall be delivered by weight, if demanded.

10. That all money which shall be found under the legal weight, from whatever cause it may proceed, may be rejected in every payment whatsoever; or if offered in payment of a debt above a certain sum, may be taken according to its weight, at the then mint price, in the option of the creditor.

11. That no penalty shall be incurred by those who melt down or export the nation’s coin; but that wallowing, clipping, or diminishing the weight of any part of it shall be deemed felony, as much as any other theft, if the person doing it afterwards make it circulate for lawful money.

To prevent the inconveniences resulting from the variation in the proportion between the metals, it may be provided,

12. That upon every variation of proportion in the market-price of the metals, the price of both shall be changed, according to the following rule:

Let the price of the pound troy fine gold in the coin be called G.

Let the price of ditto in the silver be called S.

Let the new proportion between the market-price of the metals be called P.

Then state this formula:

$$\frac{G}{S} = \frac{P}{2}$$

This will be a rule for the mint to keep the price of the metals constantly at par with the price of the market; and coinage may be imposed, as has been described, by fixing the mint price of them at a certain rate below the value of the fine metals in the coin.

13. As long as the variation of the market-price of the metals shall not carry the price of the rising metal so high as the advanced price of the coin above the bullion, no alteration need be made on the denomination of either species.

14. So soon as the variation of the market price of the metals shall give a value to the rising species, above the difference between the coin and the bullion; then the king shall alter the denominations of all the coin, silver and gold, adding to the coins of the rising metal exactly what is taken from those of the other. An example will make this plain:

Let us suppose that the coinage has been made according to the proportion of 14.5 to 1; that 20 shillings, or 4 crown-pieces, shall contain, in fine silver, 14.5 times as many grains as the guinea, or the gold pound, shall contain grains of fine gold. Let the new proportion of the metals be supposed to be 14 to 1. In that case, the 20 shillings, or the 4 crowns, will contain \( \frac{4}{5} \) more value than the guinea. Now since there is no question of making a new general coinage upon every variation, in order to adjust the proportion of the metals in the weight of the coins, that proportion might be adjudged by changing their respective denominations according to this formula:

Let the 20 shillings, or 4 crowns, in coin, be called S. Let the guinea be called G. Let the difference between the old proportion and the new, which is \( \frac{1}{14} \), be called P. Then say,

$$S = \frac{P}{2}$$

By this it appears that all the silver coin must be raised...
M O N  [ 2 2 9 ]  M O N

Money, raised in its denomination \( \frac{7}{10} \), and all the gold coin must be lowered in its denomination \( \frac{7}{10} \); yet still \( S + G \) will be equal to two pounds Sterling, as before, whether they be considered according to the old or according to the new denominations.

But it may be observed, that the imposition of coinage rendering the value of the coin greater than the value of the bullion, that circumstance gives a certain latitude in fixing the new denominations of the coin, to as to avoid minute fractions. For, providing the deviation from the exact proportion shall fall within the advanced price of the coin, no advantage can be taken by melting down one species preferably to another; since, in either case, the loss incurred by melting the coin must be greater than the profit made upon selling the bullion. The mint price of the metals, however, may be fixed exactly, that is, within the value of a farthing upon a pound of fine silver or gold.

This is easily reckoned at the mint; although upon every piece in common circulation the fractions of farthings would be inconvenient.

15. That notwithstanding of the temporary variations made upon the denomination of the gold and silver coins, all contracts formerly entered into, and all fluctuations in pounds shillings and pence, may continue to be acquitt'd according to the old denominations of the coins, payable one-half in gold and one-half in silver; unless in the case where a particular species has been fluctuated; in which case, the sums must be paid according to the new regulation made upon the denomination of that species, to the end that neither profit nor loss may result to any of the parties.

16. That notwithstanding the alterations on the mint price of the metals, and in the denomination of the coins, no change shall be made upon the weight of the particular pieces of the latter, except in the case of a general re-coining of one denomination at least; that is to say, the mint must not coin new guineas, crowns, &c. of a different weight from those already in currency, although by so doing the fractions might be avoided. This would occasion confusion, and the remedy would cease to be of any use upon a new change in the proportion of the metals. But it may be found convenient, for removing the small fractions in shillings and fixpence, to recoin such denominations altogether, and to put them to their integer numbers, of twelve and of six pence, without changing in any respect their proportion of value to all other denominations of the coin; this will be no great expense, when the bulk of the silver coin is put into 5 shilling pieces.

By this method of changing the denominations of the coin, there never can result any alteration in the value of the pound Sterling; and although fractions of value may now and then be introduced, in order to prevent the abuses to which the coin would otherwise be exposed by the artificers who melt it down, yet still the inconvenience of such fractions may be avoided in paying, according to the old denominations, in both species, by equal parts. This will also prove demonstratively, that no change is thereby made in the true value of the national unit of money.

17. That it be ordered, that shillings and fixpence shall only be current for 20 years; and all other coins, both gold and silver, for 40 years, or more. For ascertaining which term, there may be marked, upon the exergue of the coin, the last year of their currency, in place of the date of their fabrication. This term elapsed, or the date effaced, that coin shall have no more currency whatsoever; and, when offered in payment, may be received as bullion at the actual price of the mint, or refused, at the option of the creditor.

18. That no foreign coin shall have any legal currency, except as bullion at the mint price.

By these and the like regulations may be prevented, 1mo. The melting or exporting of the coin in general. 2mo. The melting or exporting one species, in order to sell it as bullion at the advanced price. 3mo. The profit in acquiring obligations preferably in one species to another. 4mo. The degradation of the standard, by the wearing of the coin, or by a change in the proportion between the metals. 5mo. The circulation of the coin below the legal weight. 6mo. The profit that other nations reap by paying their debts more cheaply to Great Britain than Great Britain can pay her's to them.

And the great advantage of it is, that it is an uniform plan, and may serve as a perpetual regulation, compatible with all kinds of denominations of coins, variations in the proportion of the metals, and with the imposition of a duty upon coining, or with the preference it free; and further, that it may in time be adopted by other nations, who will find the advantage of having their money of account preferred perpetually at the same value, with respect to the denominations of all foreign money of account established on the same principles.

A TABLE
A Table of Coins.

Showing the Quantity of Fine Metal contained in them.

The number of grains of fine metal in every coin is sought for in the regulations of the mint of the country where it is coined, and is expressed in the grains in use in that mint. From that weight it is converted into those of other countries according to the following proportions:

3840 Troy grains, 4676.35 Paris grains, 5192.8 Holland aces or grains, and 4649.06 Colonia grains, are supposed to be equal weights; and the coins in the Table are converted according to those proportions.

<table>
<thead>
<tr>
<th>TABLE OF COINS, reduced to Grains of fine Metal, according to the Troy, Paris, Colonia, and Holland weights.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Guinea by statute</td>
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<tr>
<td>A Crown by statute</td>
</tr>
<tr>
<td>A Shilling by statute</td>
</tr>
<tr>
<td>A Silver Pound Sterling by statute 1601</td>
</tr>
<tr>
<td>A Gold Pound Sterling by statute 1728</td>
</tr>
<tr>
<td>A Silver Pound Sterling in currency = 1/2 lb. Troy</td>
</tr>
<tr>
<td>A Silver Pound Steal, at the proportion of gold to silver as 1 to 14</td>
</tr>
<tr>
<td>A Gold Pound Sterling at the same proportion of 1 to 14</td>
</tr>
<tr>
<td>A Shilling current = 1/4 of a pound Troy</td>
</tr>
<tr>
<td>A Guinea in Silver, or 21 Shillings standard weight</td>
</tr>
<tr>
<td>A Guinea at the proportion of 1 to 14, worth in Silver</td>
</tr>
<tr>
<td>A Pound Troy, or 12 ounces English weight</td>
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<thead>
<tr>
<th>GOLD COINS.</th>
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<tbody>
<tr>
<td>------</td>
</tr>
<tr>
<td>118.651</td>
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<tr>
<td>429.60</td>
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<tr>
<td>151.93</td>
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<td>1718.7</td>
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<tr>
<th>SILVER COINS.</th>
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</tr>
<tr>
<td>5760.</td>
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<tr>
<td>113.27</td>
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<tr>
<td>409.04</td>
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<tr>
<td>204.97</td>
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<tr>
<td>68.34</td>
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<tr>
<td>1639.7</td>
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<tr>
<td>3783.87</td>
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<tr>
<td>3398.3</td>
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<tr>
<td>1674.6</td>
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<tr>
<th>METAL, according to the Troy, Paris, Colonia, and Holland weights.</th>
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<tbody>
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<td>1 A Carolin legal weight</td>
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<tr>
<td>2 A Ducat of the Empire ditto</td>
</tr>
<tr>
<td>3 A Florin of Convention</td>
</tr>
<tr>
<td>4 A Dollar of Convention</td>
</tr>
<tr>
<td>5 A Dollar of Exchange, the Carolin = 9 flor. 42 kreutzers</td>
</tr>
<tr>
<td>6 A Florin current = 1/2 of a Carolin</td>
</tr>
<tr>
<td>7 A Carolin in silver, at the proportion of 1 to 14</td>
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<th>DUCAT, German Coins.</th>
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<tbody>
<tr>
<td>1 A Dutch Ducat</td>
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<td>2 A Florin in Silver</td>
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</table>
**UNIVERSAL TABLE**

Of the present State of the **Real and Imaginary Monies** of the World.

† This mark is prefixed to the Imaginary Money, or Money of Account.

All Fractions in the Value English are Parts of a Penny.

= This mark signifies is, make, or equal to.

<table>
<thead>
<tr>
<th>ENGLAND AND SCOTLAND.</th>
<th>HOLLAND, &amp;c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>London, Bristol, Liverpool, &amp;c.</td>
<td>L. s. d.</td>
</tr>
<tr>
<td>Edinburgh, Glasgow, Aberdeen, &amp;c.</td>
<td>60 Stivers a Dry Guilder - 0 5 3</td>
</tr>
<tr>
<td></td>
<td>105 Stivers a Ducat - 0 9 3</td>
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<tr>
<td></td>
<td>6 Guilders †a Pound Flem. - 0 10 6</td>
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</tbody>
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<table>
<thead>
<tr>
<th>NETHERLANDS AND HOLLAND.</th>
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<tbody>
<tr>
<td>A Farthing - - 0 0 0 ¼</td>
</tr>
<tr>
<td>2 Farthings = a Halfpenny - 0 0 0 ½</td>
</tr>
<tr>
<td>2 Halfpence a Penny - 0 0 1</td>
</tr>
<tr>
<td>4 Pence a Groat - 0 0 2</td>
</tr>
<tr>
<td>6 Pence a Half Shilling - 0 0 6</td>
</tr>
<tr>
<td>12 Pence a Shilling - 0 1 0</td>
</tr>
<tr>
<td>5 Shillings a Crown - 0 5 0</td>
</tr>
<tr>
<td>20 Shillings †a Pound Sterling 1 0 0</td>
</tr>
<tr>
<td>21 Shillings a Guinea - 1 1 0</td>
</tr>
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<thead>
<tr>
<th>IRELAND.</th>
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<tbody>
<tr>
<td>Dublin, Cork, Londonderry, &amp;c.</td>
</tr>
<tr>
<td>A farthing - - 0 0 0 ¼</td>
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<td>2 Farthings = a Halfpenny - 0 0 0 ½</td>
</tr>
<tr>
<td>2 Halfpence †a Penny - 0 0 1</td>
</tr>
<tr>
<td>6 Pence †a Shilling Irish - 0 0 6</td>
</tr>
<tr>
<td>12 Pence †a Shilling Irish - 0 0 11 ¼</td>
</tr>
<tr>
<td>13 Pence a shilling - 0 1 0</td>
</tr>
<tr>
<td>65 Pence a Crown - 0 5 0</td>
</tr>
<tr>
<td>20 Shillings †a Pound Irish 0 18 5 ¼</td>
</tr>
<tr>
<td>22½ Shillings a Guinea - 1 1 0</td>
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<tr>
<th>FLANDERS AND BRABANT.</th>
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<tr>
<td>Ghent, Oostend, &amp;c. Antwerp, Brussels, &amp;c.</td>
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<tr>
<td>†A Pening - - 0 0 0 ¼</td>
</tr>
<tr>
<td>4 Peningens = an Urch - 0 0 0 ½</td>
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<tr>
<td>8 Peningens †a Grote - 0 0 1 ¼</td>
</tr>
<tr>
<td>2 Grote a Petard - 0 0 6</td>
</tr>
<tr>
<td>6 Petards a Scalin - 0 0 6 ½</td>
</tr>
<tr>
<td>7 Petards a Scalin - 0 0 6 ½</td>
</tr>
<tr>
<td>40 Grotes †a Florin - 0 1 6</td>
</tr>
<tr>
<td>17½ Scalins a Ducat - 0 9 3</td>
</tr>
<tr>
<td>240 Grotes †a Pound Flem. - 0 9 0</td>
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<tr>
<th>HOLLAND AND ZEALAND.</th>
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<td>Amsterdam, Rotterdam, Middleburg, Flushing, &amp;c.</td>
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<td>† Pening - - 0 0 0 ¼</td>
</tr>
<tr>
<td>8 Peningens †a Grote - 0 0 0 ½</td>
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<tr>
<td>2 Grote a Stiver - 0 0 1 ¼</td>
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<tr>
<td>6 Stivers a Scalin - 0 0 6</td>
</tr>
<tr>
<td>20 Stivers a Guilder - 0 1 9</td>
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<tr>
<td>50 Stivers a Rix-dollar - 0 4 4 ¼</td>
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<tr>
<th>HAMBURG. Altona, Lubeck, Bremen, &amp;c.</th>
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<tr>
<td>†A Tryling = - - 0 0 0 ¼</td>
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<td>2 Trylings †a Sexling - 0 0 0 ½</td>
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<tr>
<td>2 Sexlings a Fening - 0 0 1 ¼</td>
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<tr>
<td>12 Fenings a Shilling Lbr. - 0 0 1 ½</td>
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<tr>
<td>16 Shillings †a Mare - 0 1 6</td>
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<tr>
<td>2 Marcs a Slat dollar - 0 3 0</td>
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<tr>
<td>3 Marcs a Rix-dollar - 0 4 6</td>
</tr>
<tr>
<td>6 Marcs a Ducat - 0 9 4 ¼</td>
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<tr>
<td>120 Shillings †a Pound Flem. 0 11 3</td>
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<tr>
<th>HANOVER. Lunenburg, Zell, &amp;c.</th>
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<td>†A Fening = - - 0 0 0 ¼</td>
</tr>
<tr>
<td>3 Fenings a Dreyer - 0 0 0 ½</td>
</tr>
<tr>
<td>8 Fenings a Marien - 0 0 1 ½</td>
</tr>
<tr>
<td>12 Fenings a Grolf - 0 0 1 ½</td>
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<tr>
<td>8 Grofhen a Half Guldun - 0 1 2</td>
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<tr>
<td>16 Grofhen a Guldun - 0 2 4</td>
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<tr>
<td>24 Grofhen †a Rix-dollar - 0 3 6</td>
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<tr>
<td>32 Grofhen a Double Guldun 0 4 8</td>
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<tr>
<td>4 Grofhen a Ducat - 0 9 2</td>
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<tr>
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<td>Dresden, Leipzig, &amp;c. Wismar, Kel, &amp;c.</td>
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<td>†An Heller = - - 0 0 0 ¼</td>
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<td>2 Hellers a Fening - 0 0 0 ½</td>
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<tr>
<td>6 Hellers a Dreyer - 0 0 1 ½</td>
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<tr>
<td>16 Hellers a Marien - 0 0 1 ½</td>
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<tr>
<td>12 Fenings a Grof - 0 0 1 ½</td>
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<tr>
<td>16 Grofhen a Gould - 0 2 4</td>
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<td>24 Grofhen †a Rix-dollar - 0 3 6</td>
</tr>
<tr>
<td>32 Grofhen a Specie-dollar 0 4 8</td>
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<tr>
<td>4 Goulds a Ducat - 0 9 4</td>
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<th>BRANDENBURG AND POMERANIA.</th>
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<td>Berlin, Potsdam, &amp;c. Steins, &amp;c.</td>
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<td>†A Denier = - - 0 0 0 ¼</td>
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<td>9 Deniers a Polchen - 0 0 0 ½</td>
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<tr>
<td>18 Deniers a Groth - 0 0 1 ½</td>
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<tr>
<td>3 Polchen an Abrafs - 0 0 0 ½</td>
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<tr>
<td>30 Grohen †a Mare - 0 0 9 ¼</td>
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**EUROPE, Northern Parts.**
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<th>Value in S.</th>
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<td>MON BRANDENBURG, &amp;c.</td>
<td>30 Grothen = a Florin</td>
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<td>90 Grothen = a Rix-dollar</td>
<td>0 3 6</td>
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<td>108 Grothen = an Albertus</td>
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<td></td>
<td>8 Florins = a Ducat</td>
<td>0 9 4</td>
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<td>MON POLAND, &amp;c.</td>
<td>18 Grothen = an Florin</td>
<td>0 0 8</td>
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<tr>
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<td>30 Grothen = a Florin</td>
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<td>90 Grothen = a Rix-dollar</td>
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<td>8 Florins = a Ducat</td>
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<td>5 Rix dollars = a Frederic d'Or</td>
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<td>LIVONIA.</td>
<td>A Blacken = a Grosh</td>
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<td>6 Blackens = a Grosh</td>
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<td>9 Blackens = a Vording</td>
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<td>2 Grothen = a Whiten</td>
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<td></td>
<td>30 Grothen = a Florin</td>
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<td>108 Grothen = an Albertus</td>
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<td>64 Whitens = a Copper-plate Dollar</td>
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<td>BOHEMIA, SILEZIA, AND HUNGARY.</td>
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<td>Prague, Breslau, Presburg, &amp;c.</td>
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<td>3 Fening = a Grosh</td>
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<td>6 Fening = a Crüitzer</td>
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<td>3 Crüitzer = a White Grosh</td>
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<td>4 Fening = a Crüitzer</td>
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<td>99 Fening = a Rix-dollar</td>
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<td>Vienna, Tišť, &amp;c.</td>
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<td>4 Fening = a Crüitzer</td>
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<td>14 Fening = a Crüitzer</td>
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<td>6 Fening = a Crüitzer</td>
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<td>3 Crüitzer = a Batzen</td>
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<td>15 Fening = a Batzen</td>
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<td>3 Batzen = a Specie-dollar</td>
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<td>3 Fening = a Keyser Grosh</td>
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<td>15 Fening = a Batzen</td>
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<td>60 Fening = a Batzen</td>
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<td>POLAND AND PRUSSIA.</td>
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<td>Cracow, Warsaw, &amp;c.</td>
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<td>5 Couries = a Timpe</td>
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<td>DENMARK, ZEALAND, AND NORWAY.</td>
<td>A Skilling = a Dugden</td>
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<td>16 Skilling = a Rixmark</td>
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<td>20 Skilling = a Rixmark</td>
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<td>3 Copper Mars = a Silver Mars</td>
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<td>4 Copper Mars = a Copper Dollar</td>
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<td>2 Denufas = a Copper Mark</td>
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<td>10 Copeces = a Grievers</td>
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<td>25 Copeces = a Polttop</td>
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<td>50 Copeces = a Poltlin</td>
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<td>100 Copeces = a Ruble</td>
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<td>2 Rubles = a Xervonitz</td>
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<td>BASIL. Zurich, Zug, &amp;c.</td>
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<td>3 Rapen = a Fening</td>
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<td>4 Fening = a Crüitzer</td>
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<td>12 Fening = a Sol</td>
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<tr>
<td>Country</td>
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<td>£</td>
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<td><strong>MON</strong></td>
<td><strong>BASIL, &amp;c.</strong></td>
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</table>
| 15 Fenings | = a Coarse Batzen | 0 | 0 | 1
| 18 Fenings | = a Good Batzen | 0 | 0 | 2
| 20 Sols | = a Livre | 0 | 2 | 6
| 60 Crucizers | = a Gulden | 0 | 2 | 6
| 108 Crucizers | = a Rix dollar | 0 | 4 | 6

<table>
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<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
<th>d</th>
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<td><strong>MON</strong></td>
<td><strong>BERN. Lucern, Neufchatel, &amp;c.</strong></td>
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| A Denier | = a RixOLL | 0 | 0 | 1
| 4 Deniers | = a Crucizer | 0 | 0 | 1
| 4 Crucizers | = a Gros | 0 | 0 | 2
| 6 Crucizers | = a Batzen | 0 | 2 | 6
| 20 Sols | = a Livre | 0 | 2 | 6
| 75 Crucizers | = a Gulden | 0 | 2 | 6
| 135 Crucizers | = a Crown | 0 | 4 | 6

<table>
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<th>s</th>
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<td><strong>MON</strong></td>
<td><strong>GENEVA. Pekay, Bonne, &amp;c.</strong></td>
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| A Denier | = a Denier current | 0 | 0 | 1
| 2 Deniers | = a Small Sol | 0 | 1 | 2
| 12 Deniers current | = a Sol current | 0 | 0 | 1
| 12 Small Sols | = a Florin | 0 | 0 | 1
| 20 Sols current | = a Livre current | 0 | 1 | 3
| 10¼ Florins | = a Pataron | 0 | 3 | 11
| 15¼ Florins | = a Croifade | 0 | 5 | 10
| 24 Florins | = a Ducat | 0 | 9 | 0

<table>
<thead>
<tr>
<th>Country</th>
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<th>s</th>
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</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>Lisle, Cambay, Valenciennes, &amp;c.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Denier | = a Sol | 0 | 0 | 1
| 15 Deniers | = a Patard | 0 | 0 | 1
| 15 Sols | = a Pette | 0 | 0 | 1
| 20 Sols | = a Livre Tournois | 0 | 10
| 60 Sols | = an Ecu of Ex. | 0 | 2 | 6
| 10½ Livres | = a Ducat | 0 | 9 | 3
| 24 Livres | = a Louis d'Or | 1 | 0 | 0

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
<th>d</th>
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</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>Dunkirk, St Omer, St Quentin, &amp;c.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Denier | = a Sol | 0 | 0 | 1
| 12 Deniers | = a Sol | 0 | 0 | 1
| 15 Sols | = a Patard | 0 | 0 | 1
| 20 Sols | = a Livre Tournois | 0 | 10
| 24 Livres | = a Louis d'Or | 1 | 0 | 0

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
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<th>d</th>
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</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>PARIS, Lyons, Marfilles, St. Bourdeaux, Bayonne, &amp;c.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Denier | = a Livre Tournois | 0 | 0 | 10
| 3 Deniers | = a Liard | 0 | 0 | 10
| 12 Liards | = a Sol | 0 | 0 | 10
| 12 Deniers | = a Sol | 0 | 0 | 10
| 20 Sols | = a Livre Tournois | 0 | 0 | 10
| 60 Sols | = an Ecu of Ex. | 0 | 2 | 6
| 6 Livres | = an Ecu | 0 | 5 | 0
| 10 Livres | = a Pillole | 0 | 8 | 4
| 24 Livres | = a Louis d'Or | 1 | 0 | 0

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>PORTUGAL. Lisbon, Oporto, &amp;c.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Re | = a Half Vin tier | 0 | 0 | 0
| 10 Re | = a Pillole | 0 | 0 | 1
| 5 Vintins | = a Pillole | 0 | 0 | 6
| 4 Tetoons | = a Crude of Ex. | 0 | 2 | 3
| 4 Vintins | = a New Crude | 0 | 2 | 3
| 10 Tetoons | = a Milre | 0 | 5 | 7
| 48 Tetoons | = a Moeda | 1 | 7 | 0
| 64 Tetoons | = a Joane | 1 | 16 | 0

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>Madrid, Cadiz, Seville, &amp;c. New Pts.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Maravedie | = a Quartil | 0 | 0 | 1
| 2 Maravedies | = a Rial | 0 | 0 | 2
| 34 Maravedies | = a Rial | 0 | 0 | 3
| 2 Rials | = a Pitarine | 0 | 0 | 6
| 8 Rials | = a Piatrefe of Ex. | 0 | 3 | 7
| 10 Rials | = a Dollar | 0 | 4 | 6
| 37½ Maravedies | = a Ducat of Ex. | 0 | 4 | 11
| 32 Rials | = a Pillole of Ex. | 0 | 14 | 4
| 36 Rials | = a Pillole | 0 | 16 | 9

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>Gibraltar, Malaga, Denia, &amp;c Velon.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 3½ Maravedies | = a Ochavo | 0 | 0 | 1
| 2 Maravedies | = a Quartil | 0 | 0 | 1
| 34 Maravedies | = a Rial Velon | 0 | 0 | 2
| 15 Rials | = a Piatrefe of Ex. | 0 | 3 | 7
| 5½ Maravedies | = a Piatrefe | 0 | 3 | 7
| 60 Rials | = a Pillole of Ex. | 0 | 14 | 4
| 2048 Rials | = a Pillole of Ex. | 0 | 16 | 9
| 78 Rials | = a Pillole | 0 | 16 | 9

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>Barcelona, Saragossa, Valencia, &amp;c. Old Pts.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Maravedie | = a Soldo | 0 | 0 | 3
| 16 Maravedies | = a Soldo | 0 | 0 | 3
| 2 Soldos | = a Rial Old Plate | 0 | 0 | 6
| 20 Soldos | = a Libra | 0 | 5 | 7
| 24 Soldos | = a Ducat | 0 | 6 | 9
| 16 Soldos | = a Dollar | 0 | 4 | 6
| 22 Soldos | = a Ducat | 0 | 6 | 2
| 21 Soldos | = a Ducat | 0 | 5 | 10
| 60 Soldos | = a Pillole | 0 | 16 | 9

<table>
<thead>
<tr>
<th>Country</th>
<th>Notes</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MON</strong></td>
<td><strong>GENOA. Novi, &amp;c. CORSICA. Bafias, &amp;c.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A Denari | = a Soldi | 0 | 0 | 3
| 12 Denari | = a Soldi | 0 | 0 | 3
| 4 Soldi | = a Chevalet | 0 | 0 | 1
| 26 Soldi | = a Lire | 0 | 0 | 8
| 30 Soldi | = a Pillole | 0 | 1 | 0
| 5 Lire | = a Pillole | 0 | 1 | 0
| 5 Lire | = a Pillole | 0 | 1 | 0
<table>
<thead>
<tr>
<th>MON</th>
<th>GENOA, &amp;c.</th>
<th>SICILY and MALTA. Palermo, Messina, &amp;c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Lires = a Croisade</td>
<td>A Pichila = a Grain</td>
<td></td>
</tr>
<tr>
<td>112 Soldi = a Pezzo of Ex.</td>
<td>6 Pichili = a Grain</td>
<td></td>
</tr>
<tr>
<td>6 Trefoons = a Genouine</td>
<td>8 Pichili = a Ponti</td>
<td></td>
</tr>
<tr>
<td>20 Lires = a Pitole</td>
<td>10 Grains = a Carlin</td>
<td></td>
</tr>
<tr>
<td>=</td>
<td>20 Grains = a Tarin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 Tarins = a Florin of Ex.</td>
<td></td>
</tr>
<tr>
<td>PIEDMONT, SAVOY, AND SARDINIA. Turin, Chambery, Cagliari, &amp;c.</td>
<td>13 Tarins = a Ducat of Ex.</td>
<td></td>
</tr>
<tr>
<td>A Denari =</td>
<td>15 Carlsins = a Ducat</td>
<td></td>
</tr>
<tr>
<td>3 Denari = a Quattrini</td>
<td>2 Ounces = a Pitole</td>
<td></td>
</tr>
<tr>
<td>12 Denari = a Soldi</td>
<td>15</td>
<td>8 Tarins = a Ducat</td>
</tr>
<tr>
<td>12 Soldi = a Florin</td>
<td>13 Julios = a Croitade</td>
<td></td>
</tr>
<tr>
<td>20 Soldi = a Lire</td>
<td>3 Julios = a Telfoon</td>
<td></td>
</tr>
<tr>
<td>6 Florins = a Scudi</td>
<td>80 Bayocs = a Schudi of Ex.</td>
<td></td>
</tr>
<tr>
<td>7 Florins = a Ducatoon</td>
<td>105 Bayocs = a Ducatoon</td>
<td></td>
</tr>
<tr>
<td>13 Lires = a Pitole</td>
<td>100 Bayocs = a Crown</td>
<td></td>
</tr>
<tr>
<td>16 Lires = a Louis d'Or</td>
<td>31 Julios = a Pitole</td>
<td></td>
</tr>
<tr>
<td>A Denari =</td>
<td>15</td>
<td>6 Tarins = a Ducat Current</td>
</tr>
<tr>
<td>5 Denari = a Quattrini</td>
<td>124 Soldi = a Ducat Current</td>
<td></td>
</tr>
<tr>
<td>12 Denari = a Soldi</td>
<td>24</td>
<td>6 Tarins = a Ducat Current</td>
</tr>
<tr>
<td>20 Soldi = a Lire</td>
<td>17 Lires = a Chequin</td>
<td></td>
</tr>
<tr>
<td>112 Soldi = a Scudi current</td>
<td>17 Lires = a Chequin</td>
<td></td>
</tr>
<tr>
<td>117 Soldi = a Sendi of Ex.</td>
<td>17 Lires = a Chequin</td>
<td></td>
</tr>
<tr>
<td>6 Lires = a Philip</td>
<td>22 Lires = a Spanish Pitole</td>
<td></td>
</tr>
<tr>
<td>22 Lires = a Pitole</td>
<td>23 Lires = a Spanish Pitole</td>
<td></td>
</tr>
<tr>
<td>23 Lires = a Spanish Pitole</td>
<td>16 9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MON</th>
<th>LEON, Florence, &amp;c.</th>
<th>VENICE. Bergam, &amp;c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Denari =</td>
<td>A Picoli = a Soldi</td>
<td></td>
</tr>
<tr>
<td>4 Denari = a Quattrini</td>
<td>12 Picoli = a Soldi</td>
<td></td>
</tr>
<tr>
<td>12 Denari = a Soldi</td>
<td>64 Soldi = a Gros</td>
<td></td>
</tr>
<tr>
<td>20 Soldi = a Lire</td>
<td>18 Soldi = a Jule</td>
<td></td>
</tr>
<tr>
<td>112 Soldi = a Scudi current</td>
<td>20 Soldi = a Lire</td>
<td></td>
</tr>
<tr>
<td>117 Soldi = a Sendi of Ex.</td>
<td>3 Julios = a Telfoon</td>
<td></td>
</tr>
<tr>
<td>6 Lires = a Philip</td>
<td>124 Soldi = a Ducat Current</td>
<td></td>
</tr>
<tr>
<td>7 Lires = a Ducat</td>
<td>24</td>
<td>6 Tarins = a Ducat Current</td>
</tr>
<tr>
<td>22 Lires = a Pitole</td>
<td>17 Lires = a Chequin</td>
<td></td>
</tr>
</tbody>
</table>

| ROME, Civita Vecchia, Ancona. | TURK. Mores, Candia, Cyprus, &c. |
| A Quattrini = | A Mangar = a Aftper |
| 5 Quattrini = a Bayoc | 4 Mangars = a Aftper |
| 8 Bayocs = a Julo | 3 Aftpers = a Parac |
| 10 Bayocs = a Stampt Julia | 8 Aftpers = a Beftic |
| 24 bayocs = a Telfoon | 10 Aftpers = a Ofic |
| 10 Julios = a Crown current | 20 Aftpers = a Solota |
| 12 Julios = a Crown current | 80 Aftpers = a Piadre |
| 18 Julios = a Chequin | 100 Aftpers = a Caragrouch |
| 31 Julios = a Pitole | 10 Solotas = a Xeriff |

| NAPLES. Gaeta, Capua, &c. | ARABIA. Medina, Musca, Mocha, &c. |
| A Quattrini = | A Carret = a Cearve |
| 3 Quattrini = a Grain | 54 Carrets = a Cearve |
| 10 Grains = a Carin | 7 Carrets = a Comalhee |
| 40 Quattrini = a Paulo | 80 Carrets = a Larin |
| 20 Grains = a Tarin | 18 Comalhees = a Abyfis |
| 40 Grains = a Telfoon | 60 Comalhees = a Piadre |
| 100 Grains = a Ducat of Ex. | 80 Caverses = a Dollar |
| 23 Tarins = a Pitole | 100 Comalhees = a Sequin |
| 25 Tarins = a Spanish Pitole | 80 Larins = a Tobmond |

<p>| PERUS. Isphaban, Ormus, Gombroach, &amp;c. | PERSIA. Isphaban, Ormus, Gombroach, &amp;c. |
| A Coz = a Bilbi | A Coz = a Bilbi |
| 4 Coz = a Bilbi | 10 Coz = a Shahee |
| 10 Coz = a Shahee | 20 Coz = a Mamoua |
| 25 Coz = a Larin | 25 Coz = a Larin |
| 4 Shahees = a Abashee | 4 Shahees = a Abashee |
| 5 Abashees | 5 Abashees |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Abafhees</td>
<td>5</td>
<td>Guzzurat</td>
<td>Surat, Cambay, &amp;c.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Abafhees</td>
<td>a Bovello</td>
<td>A Pecka</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 Abafhees</td>
<td>a Tomond</td>
<td>2 Peckas</td>
<td>a Pice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Pices</td>
<td>a Fanam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Pices</td>
<td>a Viz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 Pices</td>
<td>an Ana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Anas</td>
<td>a Rupee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Rupees</td>
<td>an English Crown</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 Anas</td>
<td>a Pagoda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Pagodas</td>
<td>a Gold Rupee</td>
<td>1 1 5 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bombay, Dabol, &c.**

- A Budgroom = A Budgroom = A Re | 0 0 0 7 4
- 16 Pices = a Larse | 0 0 5
- 20 Pices = a Quarter | 0 0 6
- 240 Rez = a Xeraphim | 0 1 4
- 4 Quarters = a Rupee | 0 2 3
- 14 Quarters = a Pagoda | 0 8 0
- 60 Quarters = a Gold Rupee | 1 1 5 0

**Goa, Vizapour, &c.**

- A Re = A Re = 2 Rez | 0 0 2 7 4
- 2 Bazanacos = a Peeka | 0 0 3
- 20 Rez = a Vintin | 0 0 4
- 20 Vintins = a Larse | 0 0 5
- 3 Larests = a Xeraphim | 0 1 4
- 42 Vintins = a Tangu | 0 4 6
- 8 Tangus = a Paru | 0 1 8 0
- 8 Tangus = a Gold Rupee | 1 1 5 0

**Coromandel. Madagascar, Pondicherry, &c.**

- A Caff | 5 Caff | 2 Viz | 6 Pices | 8 Pices | 10 Fanams | 2 Rupees | 36 Fanams | 4 Pagodas
- a Viz | a Pice | a Pical | a Fanam | a Rupee | an English Crown | a Pagoda | a Gold Rupee | 1 1 5 0

**Bengal. Calcutta, Calcutto, &c.**

- A Pice = 4 Pices | 6 Pices | 12 Pices | 10 Anas | 16 Anas | 2 Rupees | 2 Rupees | 56 Anas
- a Fanam | a Viz | a Ana | a Yuzo | a Rupee | a French Ecu | a English Crown | a Pagoda | 0 8 9

**Mon.**

- Abafhees = an Or | 0 8 6
- 12 Abafhees = a Bovello | 0 1 6 0
- 50 Abafhees = a Tomond | 3 6 8

**Mon.**

- A Cori = 800 Cori | 125 Cori | 250 Cori | 500 Cori | 900 Cori | 4 6 0
- a Fettee | a Satalee | a Sooco | a Tatal | a Dollar | 4 6 0
- 2 Icles | 4 Soocos | 8 Sateelees | 0 0 5 0

**China.**

- A Casa = 10 Casa | 10 Canedereens | 35 Canedereens | 2 Rupers | 70 Canedereens | 7 Maces | 2 Rupees | 10 Maces
- a Candereen | a Mace | a Rupee | a Dollar | a Rix-dollar | an Ecu | a Crown | 0 0 6 8

**Japan.**

- A Piti = 20 Pitis | 15 Maces | 20 Maces | 30 Maces | 13 Ounces Silver | 2 Ounces Gold | 2 Japanefe | 21 Ounces Gold
- a Mace | a Ounce Silver | a Tale | a Ingot | a Ounce Gold | a Japanese | a Double | 2 1 2 0
- 0 4 10 0 | 6 6 0 | 12 12 0 | 66 3 0

**Egyp.**

- An Apher | 3 Apher | 24 Medins | 80 Apher | 96 Apher | 32 Medins | 200 Apher | 70 Medins
- a Medin | a Italian Ducat | a Piastre | a Dollar | a Ecu | a Crown | a Sultan | a Pargo Dollar
- 0 0 1 2 4 | 0 4 0 | 0 4 6 | 0 5 0 | 0 1 0 | 0 1 0 0

**Barbary.**

- An Apher | 3 Apher | 10 Apher | 2 Rials | 4 Doubles | 24 Medins | 30 Medins | 150 Apher | 15 Doubles
- a Medin | a Rial old Plate | a Double | a Dollar | a Silver Chequin | a Dollar | a Zequin | a Pifole
- 0 0 1 2 4 | 0 6 0 | 0 1 1 4 | 0 4 6 | 0 3 4 | 0 4 6 | 0 8 1 0 | 0 1 0 9

**Morocco.**

- An Apher | 24 Flues = a Blanquil
- a Medin | a Rial old Plate | a Double | a Dollar | a Silver Chequin | a Dollar | a Zequin | a Pifole
- 0 0 1 2 4 | 0 6 0 | 0 1 1 4 | 0 4 6 | 0 3 4 | 0 4 6 | 0 8 1 0 | 0 1 0 9
MONGAULT (Nicholas Hubert), an ingenious and learned Frenchman, and one of the best writers of his time, was born at Paris in 1674. At 16 he entered into the congregation of the fathers of the oratory, and was afterwards sent to Mans to learn philosophy. That of Aristotle then obtained in the schools, and was the only one which was permitted to be taught: nevertheless Mongault, with some of his engagements would in cultivating polite literature; and, in 1714, published at Paris, in 6 vols. 12mo. an edition of Tulley's Letters to Atticus, with an excellent French translation, and judicious comment upon them. This work has been often reprinted and is still reckoned admirable; for, as Middleton has observed, in the preface to his Life of Cicero, the Abbé Mongault "did not content himself with retaining the remarks of other commentators, or out of the rubbish of their volumes with selecting the best, but entered upon his task with the spirit of a true critic, and by the force of his own genius has happily illustrated many passages which all the interpreters before him had given up as inexplicable."

He published also a very good translation of Herodian from the Greek; the best edition of which is that of 1745, in 12mo. He died at Paris in 1746. He was a member of the French academy, and of the academy of inscriptions and belles lettres; and was fitted to do honour to any society.

MONGOZ, in zoology. See LEMUR.

MONK, anciently denoted, "a person who retired from
from the world to give himself up wholly to God, and to live in solitude and abstinence. The word is derived from the Latin *monachus*, and that from the Greek μοναχός, "solitary person" or *monachos*, "alone."

The original of monks seems to have been this: The perfections which attended the first ages of the Gospel forced some Christians to retire from the world, and live in deserts and places most private and unfrequented in hopes of finding that peace and comfort among beasts which were denied them among men. And this being the case of some very extraordinary persons, their example gave so much reputation to retirement, that the practice was continued when the reason of its commencement ceased. After the empire became Christian, inferences of this kind were numerous; and those whose security had obliged them to live separately and apart, became afterwards united into societies. We may also add, that the mystic theology, which gained ground towards the close of the third century, contributed to produce the same effect, and to drive men into solitude for the purposes of enthusiastic devotion.

Those, at least the ancient ones, were distinguished into *soritaires, canoniets, and faralbites.*

The *soritaires* are those who live alone, in places remote from all towns and habitats of men, as do still some of the hermits.—The *canoniets* are those who live in community with several others in the same house, and under the same superiors.—The *faralbites* were strolling monks, having no fixed rule or residence.

The houses of monks again were of two kinds, viz. *monasteries* and *laure.* See *Monastery and Laura.*

Those we call monks now-a-days are *canoniets,* who live together in a convent or monastery, who make vows of living according to a certain rule established by the founder, and wear a habit which distinguishes their order. Those that are endowed, or have a fixed revenue, are most properly called monks, *monachi,* or the Charteux, Benedictines, Bernardines, &c. The Mendiants, or those that beg, as the Capuchins and Franciscans, are more properly called *religieux and friars,* though the names are frequently confounded.

The first monks were those of St. Anthony; who, towards the close of the fourth century, formed them into a regular body, engaged them to live in society with each other, and prescribed to them fixed rules for the direction of their conduct. These regulations, which Anthony had made in Egypt, were soon introduced into Palestine and Syria by his disciple Hilarion. Almost about the same time, Aegidius or Eugenius, with their companions Gaddanas and Azyzias, instituted the monastic order in Mesopotamia and the adjacent countries; and their example was followed with such rapid success, that in a short time the whole east was filled with a lazy set of mortals, who, abandoning all human connections, advantages, pleasures, and concerns, were out a languishing and miserable life amidst the hardships of want, and various kinds of suffering, in order to arrive at a more close and rapturous communication with God and angels.

From the east this gloomy institution passed into the west, and first into Italy and its neighbouring islands; though it is uncertain who transplanted it thither. St. Martin, the celebrated bishop of Tours, created the first monasteries in Gaul, and recommended this religious solitude with such power and efficacy, both by his instructions and his example, that his funeral was said to have been attended by no less than 2000 monks. From hence the monastic discipline extended gradually its progres through the other provinces and countries of Europe. There were besides the monks of St. Basil (called in the east *Calagi,* from καλαγός "good old man") and those of St. Jerome, the hermits of St. Augustin, and afterwards those of St. Benedict and St. Bernard; at length came those of St. Francis and St. Dominic, with a legion of others; all which fee under their proper heads, *Benedictines,* &c.

Towards the close of the 5th century, the monks, who had formerly lived only for themselves in solitary retreats, and had never thought of affuming any rank among the ecclesiastical order, were now gradually distinguished from the populace, and endowed with such opulence and honourable privileges, that they found themselves in a condition to claim an eminent station among the supports and pillars of the Christian community. The fame of their pious foundation was increased, by the pious advice, or more great, that bishops and prelates were often chosen out of their order; and the passion of erecting edifices and convents, in which the monks and holy virgins might serve God in the most commodious manner, was at this time carried beyond all bounds. However, their licentiousness, even in this century, was become a proverb; and they are said to have excited the most dreadful tumults and seditions in various places. The monastic orders were at first under the immediate jurisdiction of the bishops, from which they were exempted by the Roman pontiff about the end of the 7th century; and the monks, in return, devoted themselves wholly to advance the interests and to maintain the dignity of the bishop of Rome. This immunity which they obtained was a fruitful source of licentiousness and disorder, and occasioned the greatest part of the vices with which they were afterwards unjustly charged. In the 8th century the monastic discipline was extremely relaxed both in the eastern and western provinces, and all efforts to restore it were ineffectual. Nevertheless, this kind of institution was in the highest esteem, and nothing could equal the veneration that was paid about the close of the 9th century to such as devoted themselves to the sacred gremium and indulgence of a convent. This veneration induced several kings and emperors to call them to their courts, and to employ them in civil affairs of the greatest moment. Their reformation was attempted by Louis the Meck, but the effect was of short duration. In the 11th century they were exempted by the pope from the authority of their sovereigns, and new orders of monks were continually established; insomuch that in the council of Lateran that was held in the year 1215, de crees were passed, by the advice of Innocent III., to prevent any new monastic institutions; and several were entirely suppressed. In the 15th and 16th centuries, it appears, from the testimonies of the best writers, that the monks were generally lazy, illiterate, profligate, and licentious Epicureans, whose views in life were confined to opulence, idleness, and pleasure. However, the Reformation had a manifest influence.
influence in restraining their excesses, and rendering them more circumspect and cautious in their external conduct.

Monks are distinguished by the colour of their habits into black, white, grey, &c. Among the monks, some are called monks of the choir, others professed monks, and others lay monks; which last are defined for the service of the convent, and have neither clericate nor literature.

Cloistered monks are those who actually reside in the house; in opposition to extra-monks, who have benefits depending on the monastery.

Monks are also distinguished into reformed, whom the civil and ecclesiastical authority have made masters of ancient convents, and put in power to retrieve the ancient discipline, which had been relaxed; and ancients, who remain in the convent, to live in it according to its establishment at the time when they made their vows, without obliging themselves to any new reform.

Anciently the monks were all laymen, and were only distinguished from the rest of the people by a particular habit and an extraordinary devotion. Not only the monks were prohibited the priesthood, but even priests were expressly prohibited from becoming monks, as appears from the letters of St. Gregory. Pope Syricius was the first who called them to the clericate, on occasion of some great scarcity of priests, that the church was then suppos'd to labour under; and since that time, the priesthood has been usually united to the monastical profession.

Monk (George), a personage memorable for having been the principal agent in restoring Charles II. to his crown, was descended from a very ancient family, and born in Devonshire in 1608. Being an unprovided younger son, he dedicated himself to arms from his youth, and obtained a pair of colours in the expedition to the Isle of Rhé; he served afterwards in the Low Countries with reputation in both King Charles’s northern expeditions; and did such service in quelling the Irish rebellion, that he was appointed governor of Dublin, but was superseded by parliamentary authority. Being made major-general of the Irish brigade employed in the siege of Nantwich in Cheshire, he was taken prisoner by Sir Thomas Fairfax, and remained confined in the Tower of London until the year 1646; when, as the means of liberty, he took the covenant, and accepted a command in the Irish service under the parliament. He obtained the command in chief of all the parliamentary forces in the north of Ireland, where he did signal services, until he was called to account for a treaty made with the Irish rebels; a circumstance which was only obviated by his future good fortune. He served in Scotland under Oliver Cromwell with such successe, that he was left there as commander in chief; and he was one of the commissioners for uniting that kingdom with the new-created commonwealth. He served at sea also against the Dutch; and was treated so kindly on his return, that Oliver is said to have grown jealous of him. He was, however, again sent to Scotland as commander in chief, and continued there five years; when he dissembled so well, and improved circumstances so dexterously, that he aided the defires of a wearied people, and restored the king without any disturbance; for which he was immediately rewarded both with honours and profit: (See BRITAIN, n° 154, &c.)—He was created duke of Albermarle, with a grant of 7000 l. per annum estate, beside other emoluments; and enjoyed the confidence of his matter without forfeiting that of the people. After his death in 1670, there was published a treatise composed by him while he remained prisoner in the Tower, intitled 'Observations on Military and Political Affairs,' a small folio.

MONKISH. See SQUALUS.
MONK'S-HEAD, or Wolf's bane. See ACONITUM.
MONKEY, in zoology. See APE and SIMIA.
MONMOUTH (James, duke of), son to Charles II. by Mrs Lucy Walters, was born at Rotterdam in 1649. Upon the Restoration, he was called over to England, where the king received him with all imaginable joy, created him earl of Orkney (which was changed into that of Monmouth), and he took his seat in the house of peers in the ensuing session of parliament. He married Anne, the heiress of Francis earl of Buccleugh; and hence it came to pass that he had also the title of Buccleugh, and took the surname of Scot, according to the custom of Scotland. In 1668 his father made him captain of his life-guard of horse; and in 1672 he attended the French king in the Netherlands, and gave proofs of bravery and conduct. In 1673 the king of France made him lieutenant general of his army, with which he came before Maastricht, and behaved himself with incredible gallantry, being the first who entered it himself. He returned to England, was received with all possible respect, and was received chancellor of the university of Cambridge. After this he went to assist the prince of Orange to raise the siege of Mons, and did not a little contribute towards it. He returned to England; and was sent, in quality of his father's general, to quell an insurrection in Scotland, which he effected; but soon after he fell into disgrace; for, being a Protestant, he was deluded into ambitious schemes, upon the hopes of the exclusion of the duke of York; he conspired against his father and the duke; and when the latter came to the throne by the title of James II. he openly appeared in arms, encouraged by the Protestant army; but coming to a decisive battle before he had sufficient forces to oppose the royal army, he was defeated, taken soon after concealed in a ditch, tried for high treason, condemned, and beheaded in 1685, aged 36. See BRITAIN, n° 242. 249—255.

MONMOUTH, the capital of the county of Monmouthshire in England, 129 miles from London. It has its name from its situation at the confluent of the Monow or Mynyw, and the Wye, over each of which it has a bridge, and a third over the Frathy. Here was a castle in William the Conqueror’s time, which Henry III. took from John Baron of Monmouth. It afterwards came to the house of Lancaster, who bestowed many privileges upon the town. Here Henry V. summoned the Monmouth, was born. The famous historian Geoffrey was also born at this place. Formerly it gave the title of earl to the family of Carey, and of duke to king Charles the Second’s eldest natural son; but now of earl to the Mordaunts, who are also earls of Peterborough. It is a populous and well built place, and carries on a
Monmouth

considerable trade with Bristol by means of the Wye. It has a weekly market, and three fairs.

Monmouthshire, a county of England; anciently reckoned a part of Wales, but in Charles the Second's time taken out of the Oxford circuit, and made an English county. It is bounded on the north by Herefordshire, on the east by Gloucestershire, on the south by the river Severn, and on the west by the Welsh counties of Brecknock and Glamorgan. Its extent from north to south is about 30 miles, from east to west 26, and in circumference 110. It is subdivided into four hundreds; and contains seven market-towns, 127 parishes, about 8,694 houses, 38,900 inhabitants; but sends only three members to parliament, that is, one for Monmouth, and two for the county. The air is temperate and healthy; and the soil fruitful, though mountainous and woody. The hills feed sheep, goats, and horned cattle; and the valleys produce plenty of grass and corn. This county is extremely well watered by several fine rivers; for, besides the Wye, which runs from Gloucestershire, the Mynow, which runs between it and Herefordshire, and the Rumney, which divides it from Glamorganshire, it has, peculiar to itself, the Usk, which enters this county a little above Abergavenny, runs mostly southward, and falls into the Severn by the mouth of the Ebwth; which last river runs from north to south, in the western side of the county. All these rivers, especially the Wye and Usk, abound with fish, particularly salmon and trout.

Monnoyer (Bernard de la), born at Dijon in 1641, was a man of fine parts and great learning. He was admirably formed for poetry; and used to win the first prizes instituted by the members of the French academy, till he discontinued to write for them (it is said) at the solicitation of the academy; a circumstance which, if true, would reflect higher honour on him than a thousand prizes. All his pieces are in a most exquisite taste; and he was no less skilful in Latin poetry than in the French. Menage and Bayle have both belauded the highest encomiums on his Latin poetry. His Greek poems are likewise looked upon as very good; and fo are his Italian, which are written with great spirit. But poetry was not La Monnoyer's only province: to a perfect skill in poetry, he joined a very accurate and extensive knowledge of the languages. He had great skill in criticism; and no man applied himself with greater affinity to the study of history, ancient and modern. He was perfectly acquainted with all the scarce books that had any thing curious in them; very well versed in the history of the learned; and what completes all, is the wonderful clearness with which he polished these various kinds of knowledge. He wrote Remarks on the Menagiana; in the last edition of which, in 4 vols 12mo, printed in 1715, are included several pieces of his poetry, and a curious dissertation on the famous book De tribus Impagioribus. His Dissertation on Pomponius Latus, at least an extract of it, is inserted in the new edition of Baillot's Jugemens des Lettres, published in 1722, with a great number of remarks and corrections by La Monnoyer. He also embellished the Anti-Baillot of Menage with a multitude of corrections and notes. It would employ several pages to enumerate the various services this ingenious and learned man did to the republic of letters; as well by enriching it with productions of his own, as by the assiduity with which he communicated very freely upon all occasions to the learned of his time. Thus, among others, he favoured Bayle with a great number of curious particulars for his Dictionary, and was highly applauded by him on that account. He died at Paris, October 15th, 1728, in his 85th year.

—Mr de Sallinger published at the Hague A Collection of Poems by La Monnoyer, with his eulogium, from whence many of the above particulars are taken. He also left behind him a Collection of Letters, mostly critical; several curious Differtations; 300 Select Epigrams from Martial, and other poets ancient and modern, in French verse; several other works in prose and verse, in French, Latin, and Greek, all ready for the press.

Monnoyer (John Baptista), one of the greatest masters (according to Mr Walpole) that has appeared for painting flowers. They are not so exquisitely finished as Van Huynum's, but his painting and composition are in bolder lines. He was born at Liége in 1635; and educated at Antwerp as a painter of history, which he soon changed for flowers. Going to Paris in 1663, he was received into the academy with applause; and employed at Versailles, Trianon, Marly, and Meudon; and painted in the hotel de Brézéville, and other houses. The duke of Montague brought him to England, where much of his hand is to be seen, at Montague-house, Hampton-court, the duke of St Alban's at Windsor, Kennington, Lord Carlisle's, Burlington-house, &c. But his most curious work is said to be a looking glass at Kennington palace, which he adorned with flowers for Queen Mary, who held him in such high esteem, that she honoured him with her presence nearly the whole time he was busied in the performance. Baptista passed and repassed several times between France and England; but having married his daughter to a French painter who was suffered to alter and touch upon his pictures, Baptista was offended and returned to France no more. He died in Pall-mall in 1699. His son Antony, called young Baptista, painted in his father's manner, and had merit.

Monoceros, unicorn, in astronomy, a southern constellation formed by Hevelius, containing in his catalogue 19 stars, and in the Britannic Catalogue 31.

Monoceros, in zoology. See Monodon.

Monochord; an instrument by which we are enabled to try the several proportions of musical sounds and intervals, as well as the natural as in tempered scales. Originally it had, as its name implies, only one string; but it is better contrived with two, as we have by means of this additional string an opportunity of judging of the harmony of two tempered notes in every possible variety of temperament (see Temperament and Tuning). It consists of a bras rule placed upon a sound-board, and accurately divided into different scales according to the purposes for which it is chiefly intended. Above this rule the strings are to be stretched over two fixed bridges, between which there is a moveable fret, so contrived as to divide at pleasure one of the strings into the same proportional parts as are engraved upon the scales beneath. The figure of the instrument, the manner of striking

Mons.
The following table contains the chief scales that have hitherto been computed. In column 1st is given the natural scale, or scale of perfect intervals. The second column contains a new tempered scale, which seems better adapted than any other to keyed instruments, when chiefly designed for lefson-playing, or playing without accompaniments. The third is a scale proposed by Mr. Emerson in his "Mechanics," and since recommended by Mr. Jones in his "Phylogographical Disquisitions," and by Mr. Cavallo in the "Philosophical Transactions," for 1788. The fourth and fifth exhibit the systems of mean tones, and of equal harmony, calculated by Dr. Smith for instruments of a more perfect construction than those now in ufe.

<table>
<thead>
<tr>
<th>Note</th>
<th>Natural Scale</th>
<th>Tempered Scale</th>
<th>Emerson, Jones, &amp;c.</th>
<th>Mean Tones</th>
<th>Equal harmony</th>
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<tbody>
<tr>
<td>C</td>
<td>1000</td>
<td>1000</td>
<td>957</td>
<td>959.3</td>
<td></td>
</tr>
<tr>
<td>C♯</td>
<td>937.5</td>
<td>932.9</td>
<td>943.8</td>
<td>957</td>
<td>959.3</td>
</tr>
<tr>
<td>D</td>
<td>888.9</td>
<td>883.8</td>
<td>890.9</td>
<td>894.4</td>
<td>895</td>
</tr>
<tr>
<td>D♯</td>
<td>833.3</td>
<td>837.5</td>
<td>840.8</td>
<td>845</td>
<td>858.6</td>
</tr>
<tr>
<td>E</td>
<td>800</td>
<td>798</td>
<td>793.7</td>
<td>800</td>
<td>801</td>
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<tr>
<td>E♯</td>
<td>750</td>
<td>749.1</td>
<td>749.1</td>
<td>747.6</td>
<td>747.4</td>
</tr>
<tr>
<td>F</td>
<td>711.1</td>
<td>712.9</td>
<td>707.1</td>
<td>715.5</td>
<td>717</td>
</tr>
<tr>
<td>G</td>
<td>666.7</td>
<td>668.3</td>
<td>667.4</td>
<td>668.7</td>
<td>669</td>
</tr>
<tr>
<td>G♯</td>
<td>625</td>
<td>632</td>
<td>629.9</td>
<td>640</td>
<td>641.7</td>
</tr>
<tr>
<td>A</td>
<td>600</td>
<td>597</td>
<td>594.6</td>
<td>598</td>
<td>598.7</td>
</tr>
<tr>
<td>A♯</td>
<td>562.5</td>
<td>559.7</td>
<td>556.2</td>
<td>572.4</td>
<td>574.4</td>
</tr>
<tr>
<td>B</td>
<td>533.3</td>
<td>532.3</td>
<td>529.7</td>
<td>535</td>
<td>536</td>
</tr>
<tr>
<td>B♯</td>
<td>500</td>
<td>500</td>
<td>500</td>
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</tbody>
</table>

N. B. Mr. Jones propofes to have the two numbers which are denoted by fars refeitively altered to the numbers 756 and 531.

The method of tuning any instrument by means of the monochord is as follows: Firt, you must tune the C of the monochord to the concert pitch by means of a tuning-fork; next, you are to put the middle C of your instrument in perfect unison with the C of the monochord: Then move the sliding fret to the next division on the scale, and proceed in the same manner with all the feveral notes and half notes within the compass of an octave. When this is done with accuracy, the other keys are all to be tened, by comparing them with the octave which is already tempered. [The monochord is here supposed to be made to the pitch of C; but this may be varied at the will of the contrufor.]

The curious reader who may wish for further information respecting the construction and ufe of monochords, will be highly gratified in perufing the appendix of Mr. Atwood's "Treatif on Rectilinear Motion," and Mr. Jones's ingenious and entertaining observations on the scale of music, monochord, &c. in his "Phylogographical Disquisitions."

Monochord is also used for any musical instrument that conflits of only one thing or chord; in this fens the trumpet marine may properly be called a monochord.

Monoculus, in zoology; the name of a genus of insects of the order of apertus, in the Linnean fystem. Its body is short, of a roundish figure, and covered with a firm crustaceous skin: The fore-legs are ramose, and serve for leaping and swimming; it has but one eye, which is large, and compos'd of three smaller ones.

Of this genus, many of which have been reckoned among the microcopic animals, authors enumerate a great number of species. The figure in Plate CCCXV. represents the quadricornis, or four-horned monoculus, a very small species about half a line in length, and of an affen grey colour. From the head arife four antennae, two forwards and two backwards; all four furnished with a few hairs, which give them the figure of a branch. Between the antennae, on the fore part of the head, is situated a fingle eye. From the head to the tail the body goes down, decreasing in shape like a pear; and is compos'd of seven or eight rings, which grow continually more ftraitened. The tail is long, divided into two; each division giving rise outwardly to three or four briefly hairs. The animal carries its eggs on the two sides of its tail in the form of two yellowish parcels filled with small grains, and which taken together, nearly equal the insect in big­nes. This minute insect is found in standing pools. A number of them being kept in a bottle of water, some will be feen loaded with their eggs, and after a while depositing the two parcels, either jointly or separately.

The name monoculus has been given to this genus, as confifting of individuals which apparently have but one eye: and from the manner in which they proceed forward in the water by leaping, they have also been called water-fleas. The branching antennae serve them instead of oars, the legs being feldom used for swimming. "The tail, forked in fome species, in Barbon's associates, others fimple, ferves them for a rudder. The group of four varies from white to green, and to red, more or lefs deep, doublef in a ratio to the fragments of the P. 360. vegetables on which they feed. The red tincture they fometimes give to the water, has made some ignorant men think that the water had turned to blood. Too weak to be carnivorous, they on the contrary fall a prey to other aquatic insects, euen to polypis. Their body, compact and hard, is fo transparent that in fome the eggs with which the abdomen is filled are discernable. The water-parrot and the shell monoculus, are remarkable. This latter is provided with a bivalvular shell, within which he thuts himself
Mangol

M. Monodon.

himself up, if drawn out of the water. The shell opens underneath, the infect puts forth its antennae, by means of which it swims very expeditiously in various directions, seeking a solid body to adhere to, and then it is that it uses its feet in walking, by stretching them out through the aperture of its shell.

"I preferred a pair of these infests (says our author), last year, in a small glafs tumblers, the one male the other female, having a bag filled with eggs affixed on each side the abdomen. In the space of 14 days the increase was astonishing; it would have been impossible to have taken a single drop of water out of the glafs without taking with it either the larva or a young monocus. I again repeated the experiment by selecting another pair; and at the expiration of the last 14 days my surprise was increased beyond measure. The contents of the glafs appeared a mass of quick-moving, animated matter; and being diversified by colours of red, green, ash-colour, white, &c. afforded with the allusion of the magnifier, considerable entertainment."

Monodon, in ichthology, a genus of fishes belonging to the order of cete; the characters of which are: There are two very long, straight, and spirally twirled teeth, which flick out from the upper jaw; and the spiracle or breathing hole, is situated on the anterior part of the skull. There is but one species, the monocrates, or horrid narwhal, which sometimes grows to 25 feet in length, exclusive of the horn; but the usual size is from 16 to 20. It is particularly noted for its horn or horns, as they are called; but which are real teeth. Of these there are always two in young animals; though the old ones have generally but one, sometimes none. From the circumstance of only one tooth being usually found, the animal has acquired the name of Unicorn Fish, or Sea Unicorn. They inhabit the northern seas, from Norway to within the arctic circle; they are plentiful in Davis's straits and the north of Greenland; where the natives, for want of wood, make rafters of the teeth. From the tooth or horn may be diffilled a very strong falt volatile; the scrapings are esteemed alethropharmic, and were used of old in malignant fevers and against the bites of serpents. The use of it to the animal seems to be chiefly as a weapon of offence, and a very powerful one it appears to be: there are many instances of its having been found in the bottoms of ships which returned from the northern seas, probably owing to the animal's having mistaken the ship for a whale, and attacked it with such fury as not to be able to get out the weapon from the wood. It may also serve as an instrument to loosen and disengage from the rocks or bottom of the sea the sea plants on which it feeds. These fishes swim swiftly, and can only be struck when numbers happen to be found together, and obstruct their own course with their teeth. Their skin is white, with black spots on the back, and has a great quantity of blubber underneath.

The tooth of this animal was in old times imprecated upon the world as the horn of an unicorn, and sold at a very high price. The heirs of the chancellor to Christianus of Denmark, valued one at 8000 imperial. There is a magnificent throne made of this species of ivory for the Danish monarchs, which is still preserved in the castle at Rosenberg. The price of this material was superior to gold.

Monody, in ancient poetry, a mournful kind of song, sung by a person all alone, to give vent to his grief. The word is derived from µονος, "alone," and µου "I sing."

Monoeïa, from µονος, alone, and εϊς a soul; the name of the 21st class in Linnaeus's sexual method. See Botany.

Monogamy, compounded of µονος solus, and γαμας "marriage," the state or condition of those who have only married once, or are restrained to a single wife. See Polygamy.

Monoglossum (anc. geog.), a mart-town of the Hither India, situated on the Ganges, into which the Indus empties itself. Said to be Mangarol on the coast of Malabar. E. Long. 74°, N. Lat. 13°.

Monogram, a character or cypher, composed of one, two, or more letters interwoven; being a kind of abbreviation of a name, anciently used as a seal, badge, arms, &c.

Mononyia, from µονος, alone, and νος a woman; the name of the first order or subdivision in the first 13 classes of Linnaeus's sexual method; consisting of plants which, besides their agreement in their class character, generally derived from the number of their flowers, have only one style, or female organ.

Monomotapa, a country of Africa, has the maritime kingdom of Sofala on the coast, the river Dindimutu Santo on the south, the mountains of Caxaria on the west, and the river Cuma on the north, which parts it from Monteummi. The air of this country is very temperate; the land fertile in pastures and all the necessaries of life, being watered by several rivers. The inhabitants are rich in black cattle, which they value more than gold. They have a vast number of elephants, as appears from the great quantity of ivory that is exported from hence. There are many gold-mines, and the rivers that run through their veins carry a great deal of gold-dust along with them. The inhabitants are lovers of war, which is the employment followed by all those who do not apply themselves to commerce. This country is divided into seven provinces or petty kingdoms, vassals to the king; viz. Monomotapa Proper, Quiveve, Manica, Inhambana, Inhemor, Sabia, and Sofala.

Monopetalous, in botany, a term applied to flowers that have only one petal or flower-leaf.

Monophysites, (from µονος solus, and φυσις nature), a general name given to all those sectaries in the Levant who only own one nature in Jesus Christ; and who maintain, that the divine and human nature of Christ were so united as to form only one nature, yet without any change, confusion or mixture of the two natures.

The monophysites, however, properly so called, are the followers of Severus, a learned monk of Palestine, who was created patriarch of Antioch in 513, and Petrus Pullenius.

The monophysites were encouraged by the emperors Anastatus, but repressed by Justin and succeeding emperors. However, this sect was restored by Jacob Baradatus, an obscure monk, informed that
of provisions, or any commodities, or the rate of of labour, are in many cases severely punished by particular statute; and, in general, by statute 2 & 3 Edward VI. c. 15, with the forfeiture of L.10. or 20 days imprisonment, with an allowance of only bread and water for the first offence: L.20 or the pillory for the second; and L.10 for the third, or else the pillory, los of one ear, and perpetual infamy. In the same manner, by a constitution of the emperor Zego, all monopolies and combinations to keep up the price of merchandise, provisions, or workmanship, were prohibited, upon pain of forfeiture of goods and perpetual banishment.

MONOSYLLABLE, in grammar, a word that consists only of one syllable, and is composed either of one or more letters pronounced at the same time. The too frequent use of monosyllables has a very bad effect in English poetry, as Dr Pope both intimates and exemplifies in the same verses.

"And ten flow words oft creep in one dull line."

MONOTHELITES, (compounded of mono single, and thesa: will, of thea: will), an ancient sect, which sprang out of the Eutychians; thus called, as only allowing of one will in Jesus Christ.

The opinion of the Monothelites had its rise in 630, and had the emperor Heraclius for an adherent: it was the same with that of the Acephalous Severians. They allowed of two wills in Christ, considered with regard to the two natures; but reduced them to one, by reason of the union of the two natures; thinking it absurd there should be two free wills in one and the same person. They were condemned by the sixth general council in 680, as being supposed to destroy the perfections of the humanity of Jesus Christ, depriving it of will and operation. Their sentiments were afterwards embraced by the Maronites.

MONOTONY, an uniformity of sound, or a fault in pronunciation, when a long series of words are delivered in one unvaried tune. See Reading.

MONOTRÖPA, Bird's-nest, A genus of the monogynia order, belonging to the monandria class of plants; and in the natural method ranking with those of which the order is doubtful. There are two species; of which the only remarkable one is the hippopithys, a native of Britain and some of the northern kingdoms of Europe. It is about five inches high, having no other leaves than oval scales, and terminated with a nodding spike of flowers, which in the seeding state becomes erect: the whole plant is of a pale yellow colour, smelling like the primrose, or like beans in bloom. The country people in Sweden give the dried plant to cattle that have a cough.

MONRÉAL. See Montreal.

MONRO (Dr Alexander, senior), a most eminent physician and anatomist, was descended by his father from the family of Monro of Milton, which had large possessions in the county of Ross; and by his mother, from that of Forbes of Culloch.

His father John, youngest son of Sir Alexander Monro of Bearcroft, was bred to physic and surgery, and
and served for some years as a surgeon in the army under King William in Flanders; but, for several successive years, obtaining leave of absence from the army in the winter, he during that season resided with his wife in London, where his son Alexander was born in the year 1697. About three years thereafter, he quitting the army, and went to settle as a surgeon at Edinburgh; where his knowledge in his profession, and engaging manners, soon introduced him into an extensive practice.

The son showed an inclination to the study of physic; and the father, after giving him the best education that Edinburgh then afforded, sent him successively to London, Paris, and Leyden, to improve himself further in his profession. At London, he attended the lectures of Messrs Haukbee and Whilton on experimental philosophy, and the anatomical demonstrations of Mr Cheffelden. At Paris, he attended the hospitals, and the lectures which were read on the different branches of physic and surgery at that time. Towards the end of autumn 1718, he went to Leyden, and studied under the great Boerhave; by whom he was particularly esteemed.

On his return to Edinburgh in autumn 1719, Messrs Drummond and Macgill, who were then conjunct nominal professors and demonstrators of anatomy to the surgeons company, having resigned in his favour, his father prevailed on him to read some public lectures on anatomy; and to illustrate them by shewing the curious anatomical preparations which he had made and sent home when abroad. He at the same time persuaded Dr Atton, then a young man, to give some public lectures on botany. Accordingly, in the beginning of the winter 1720, these two young professors began to give regular courses of lectures, the one on the materia medica and botany, the other on anatomy and surgery; which were the first regular courses of lectures on any of the branches of medicine that had ever been read at Edinburgh, and may be looked upon as the opening of that science which had ever been read at Edinburgh, and were made professors of medicine; the professorship of materia medica and botany, which Dr Atton then held, having been added to the university many years before. Immediately after these gentlemen were elected professors, they began to deliver regular courses of lectures on the different branches of medicine, and they and their successors have uniformly continued to do every winter.

The plan for a medical education at Edinburgh was still incomplete without an hospital, where students could see the practice of physic and surgery, as well as hear the lectures of the professors. A scheme was therefore proposed by Dr Monro's father, and others, particularly the members of the royal college of physicians and board of surgeons, for raising by subscription a fund for building and supporting an hospital for the reception of diseased poor; and our author published a pamphlet setting forth the advantages that would attend such an institution. In a short time a considerable sum of money was raised, a small house was fitted up, and patients were admitted into it, and regularly attended by many of the physicians and surgeons in town. The fund for this charity increasing very considerably, in a great measure from the activity and influence of that very worthy citizen and magistrate George Drummond, Esq; the foundation stone was laid of the present large, commodious, and useful hospital, the Royal Infirmary: in the planning of which Dr Monro suggested many useful hints, and in particular the elegant room for chirurgical operations was designed and executed under his direction. Provost Drummond and he were nominated the building committee; and the fabric was entirely completed in a short space of time. It has since been so largely endowed, as to be capable of receiving a great number of diseased poor, whose cases the students of physic and surgery have an opportunity of seeing daily treated with the greatest attention and care, by physicians and surgeons eminent in their profession; and a register of the particulars of all the cases which have been received into the house since its first opening has been kept, in books appropriated for that purpose, for the use of the students.

In order to make the hospital of still further use to the students, Dr Monro frequently, while he continued professor of anatomy, gave lectures on the chirurgical cases; and the late judicious physician, Dr Rutherford professor of the practice of physic, began, in the year 1748, to deliver clinical lectures to be continued every winter, on the most remarkable cases in the hospital.

Doctor Monro, though he was elected professor of anatomy in the year 1721, was not received into the university till the year 1725, when he was inducted along with that great mathematician the late Mr Colin Maclaurin, with whom he ever lived in the closest friendship. From this time he regularly every winter gave a course of lectures on anatomy and surgery, from October to May, upon a most judicious and comprehensive plan: A talk in which he perused with the greatest affiduity, and without the least interruption, for near 40 years; and so great was the reputation he had acquired, that students flocked to him from the most distant corners of his majesty's dominions.

In 1759, our professor entirely relinquished the business of the anatomical theatre to his son Dr Alexander, who had returned from abroad, and had assisted him in the course of lectures the preceding year. But after this resignation, he still endeavoured to render his labours
laborous useful to mankind, by reading clinical lectures at the hospital for the improvement of the students; of which Dr. Duncan, who was one of his pupils, has given the following account: “There I had my first happiness of being a pupil, who profited by the judicious conduct of his practice, and was improved by the wisdom and acuteness of his remarks. I have indeed to regret that I attended only the last course of lectures in which he had ever a share, and at a time when he was subjected to a disease which proved at length fatal. Still, however, from what I knew and from what I heard, I can venture to assert, that it is hardly possible to conceive a physician more attentive to practice, or a preceptor more anxious to communicate instruction. His humanity, in the former of these characters, led him to bestow the most anxious care on his patients while they were alive, and his zeal in the latter induced him to make them the subject of useful lessons when they happened to die.—In the different stations of physician, of lecturer, and of manager in the hospital, he took every measure for inquiring into the causes of diseases by dissection.—He personally attended the opening of every body; and he not only dissected, but he also instructed the students in an accurate report of the dissection, but with nice discrimination contrasted the diseased and found state of every organ. Thus, in his own person, he afforded to the students a conspicuous example of the advantages of early anatomical pursuits as the happiest foundation for a medical superstructure. His being at once engaged in two departments, the anatomical theatre and clinical chair, furnished him with opportunities both on the dead and living body, and placed him in the most favourable situation for the improvement of medicine; and from these opportunities he derived every possible advantage which they could afford.”

His father, old Mr. Monro, lived to an advanced age; and enjoyed the unpeeable pleasure of beholding a son, esteemed and regarded by mankind, the principal actor in the execution of his favourite plan, the great object of his life, the founding a seminary of medical education in his native country: The son, who survived him nearly 30 years, had the satisfaction to behold this seminary of medical education frequented by 100 of the students, many of whom came from the most distant corners of his majesty’s dominions, and to see it arrive to a degree of reputation far beyond his most sanguine hopes, being equalled by few, and inferior to none in Europe.

Few men were members of more societies than Dr. Monro: still fewer equally affiduous in their attendance of those in which he could tend to promote public utility. He was a manager of many public charities; and not only a member of different medical societies, but likewise of several others instituted for promoting literature, arts, sciences, and manufactures, in Scotland, and was one of their most useful members—While he was held in high estimation at home, he was equally esteemed and respected abroad, and was elected member of the Royal Society of London, and an honorary member of the Royal Academy of Surgery at Paris.

He was not only very active in the line of his own profession, but as a citizen and general member of the community; for, after he had resigned the anatomical chair to his son, he executed with the strictest punctuality the duties of several engagements both of a civil and political nature: He was a director of the Bank of Scotland, a Justice of the Peace, a Commissioner of High-Roads, &c. At length, after a life spent in the most active industry, he became afflicted with a tedious and painful disease, which he bore with equal courage and resignation till his death, which happened on July 10th, 1767, in the 70th year of his age.

Of his works, the first in order is his Osteology, which was written for the use of students, but is capable also of affording instruction to the old and most experienced physician; as, besides a minute description of the parts copied from nature, it extends everywhere with new and important observations immediately applicable to practice. It has been translated into many languages, and has passed through numerous editions; and has been reprinted in foreign countries in the most superb manner, accompanied with elegant and masterly engravings. His description of the Lactic Acid and Thoracic Duct contains the most accurate account of that important part of the body which has been yet published: and his Anatomy of the Nerves will transmit to posterity an excellent example of accurate dissection, faithful description, and ingenious reasoning.

The six volumes of Medical Essays and Observations, published by a society in Edinburgh, are universally known and esteemed. To that society he was appointed secretary; but, after the publication of the first volume, in which he had largely contributed, the members growing remiss in their attendance, he became the sole collector and publisher of the work: To him we are therefore in a great measure indebted for these numerous and important discoveries with which this publication has enriched every department of medical knowledge. In the two first volumes of the Physical and Literary Essays, published by the physical society in Edinburgh, in which he had the rank of one of the professors, we find several papers written by him, which are not the least ornaments of that collection. His account of the Success of Inoculation in Scotland may be considered as his last publication: It demonstrates his extensive correspondance and indefatigable industry, and has had great influence in promoting that salutary practice.

Besides these, he was also the author of several other elegant and masterly productions, which were either never published, or were published without his knowledge and from incorrect copies. A collection of all his works, properly arranged, corrected, and illustrated with copperplates, has been published by Dr. Alexander Monro, his son and successor in the anatomical chair, in a splendid quarto volume, printed for Elliot, Edinburgh, 1781; to which is prefixed a life of the author, by another of his sons, Dr. Donald, physician in London. The observation of an excellent judge, the illustrious Haller concerning our author’s Medical Essays and Observations, which now form a part of this collection, may with no less justice be applied to the whole: It is a “book which ought to be in the possession of every medical practitioner.”

MON, an ancient, large, handsome, rich, and very strong city of the Austrian Netherlands in Hainault.
Monsieur, in the plural Messieurs, a title of honour and respect used by the French in writing to persons of superior rank or quality, before the late abolition of all ranks.

Dukes, peers, archbishops, bishops, and presidents à la mortier, were complimented with the title of Monsieur. In the petitions presented to the sovereign courts, they used the term Messieurs.

Monsieur, absolutely used, was a title restrained to the dauphin of France. This custom was unknown till the time of Louis XIV. before which the dauphin was styled Monseigneur le Dauphin.

Monsieur, in the plural Messieurs, a term or title of civility, used by the French in speaking to their equals, or those a little below them, answering to Mr or Sir among the English.

Monsieur, absolutely used, was a title or quality appropriated to the second son of France, or the king's brother. The king was also called Monseigneur, but that only by the children of France.

Monsieur (Sir William), a brave English admiral, third son of Sir John Mounson of South Carlton in Lincolnshire, was born in 1569. He was employed in many expeditions against the Spaniards in Queen Elizabeth's time, and was highly honoured; the queen knighted him for his services in the earl of Essex's expedition to Cadiz, where he assisted much by his wife and moderate counsel to the earl. Military men were no favourites with James I. Therefore, on the death of the queen, he received no recompense or pay beyond the ordinary service in which he was engaged: nevertheless, as admiral of the narrow seas, he supported the honour of the British flag against the infidels of the Dutch states, of which he frequently complains in his Navy Tract; and protected the trade against the encroachments of France. He had the misfortune to fall into disgrace by his vigilance, and was imprisoned in the Tower through the resentment of some powerful courtiers; yet he was discharged, and wrote a vindication of his own conduct, intitled, "Concerning the infidels of the Dutch, and a justification of Sir William Monson." He spent his latter days in peace and privacy, which he employed in digesting his Navy Tracts, and died in 1643. Part of these tracts were printed in 1682; and they were afterwards all included in Churchill's Collection of Voyages.

Monsonia, in botany: A genus of the dodecandria order, belonging to the polyadphila class of plants. The calyx is pentaphyllous; the corolla pentapetalous and irregular; the stamens are fifteen in number, and coiled into five filaments; the style bifid; the capsule pentacoccous.

Monsun, a regular or periodical wind, in the East Indies, blowing constantly the same way, during six months of the year, and the contrary way the remaining six.

In the Indian ocean, the winds are partly general, and blow all the year round the same way, as in the Ethiopic ocean; and partly periodical, i.e., half the year blow one way, and the other half year on the opposite points; and those points and times of shifting differ in different parts of this ocean. These latter are what we call monsoons.

The shifting of these monsoons is not all at once; and in some places the time of the change is attended with calms, in others with variable winds, and particularly those of China, at ceaseing to be westerly, are very subject to be tempestuous; and such is their violence, that they seem to be of the nature of the West India hurricanes, and render the navigation of those seas very unsafe at that time of the year. These tempers the seamen call the breaking up of the monsoons.

Monsoons, then, are a species of what we otherwise call trade winds. They take the denomination monsoon from an ancient pilot, who first crossed the Indian sea by means hereof. Though others derive the name from a Portuguese word, signifying motion or change of wind, and sea.

Lucretius and Appolonius make mention of annual winds which arise every year, ostra fabria, which seem to be the same with what in the East Indies we now call monsoons. For the physical cause of these winds, see Wind.

Monster; a birth or production of a living being, degenerating from the proper and usual disposition of parts in the species to which it belongs: As, when there are too many members, or too few; or some of them are extravagantly out of proportion, either on the side of defect or excess. The word comes from the Latin monstrum, of monstrare, "showing." Whence also the box wherein relics were anciently kept to be shown, was called monstrum. Dugdale mentions an inventory of the church of York with this article, item unum monstrenum can officius sancti Petri in Beryl, & crucifix in fummittate.

Aristotle defines a monster to be a defect of nature, when, acting towards some end, it cannot attend to it, from some of its principles being corrupted.

Monsters do not propagate their kind; for which reason some rank males among the number of monsters, as also hermaphrodites.

Females which bring forth twins, are found most liable to produce monsters. The reason, probably, is owing to this; that though the twins are covered with one common chorion, yet they have each their separate amnions, which by their contiguity may chance to grow together, and so occasion a confusion or blending of the parts. Hence so many double creatures.
The Creator has established such a communication between the several parts of his creation, that we are not only naturally led to imitate one another, i.e., have a disposition to do the same things and assume the same manners with those with whom we converse; but also have certain natural dispositions which incline us to compassion as well as imitation. These things most men feel, and are sensible of; and therefore need not be proved. The animal spirits, then, are not only naturally carried into the respective parts of the body to perform the same actions and the same motions which we see others do, but also to receive in some manner their wounds, and take part in their sufferings.

"Experience tells us, that when we look attentively on any person feverely beaten, or that hath a large wound, ulcer, or the like, the spirits immediately flow into those parts of our body which answer to those we see suffer in the other; unless their course be stopped from some other principle. This flux of spirits is very sensible in persons of a delicate constitution, who frequently shudder, and find a kind of trembling in the body on these occasions; and this sympathy in bodies produces compassion in the mind.

"Now it must be observed, that the view of a wound, &c. wounds the person who views it the more strongly and sensibly, as the person is more weak and delicate; the spirits making a stronger impression on the fibres of a delicate body than in those of a robust one. Thus strong, vigorous men, &c. see an execution without much emotion, whereas weak, &c. are struck with pity and horror. As to children in full in their mother's womb, the fibres of their flesh being incomparably finer than those in women, the course of the animal spirits must necessarily produce much greater alterations.

"These things being laid down, monsters are easily accounted for. Suppose, e.g., a child born a fool, and with all its legs and arms broke in the same manner as those of criminals in some countries are; which cafe we choose to instance in, because we are told from Paris that such a monster was actually born there, and lived in one of their hospitals 20 years; the cause of this accident, according to the principles laid down, was, that the mother seeing a criminal executed, every stroke given to the poor man, struck forcibly the imagination of the woman; and, by a kind of counter-stroke, the tender and delicate brain of the child.—Now, though the fibres of the woman's brain were strangely shaken by the violent flux of animal-spirits on this occasion, yet they had strength and presence of mind enough to prevent an entire disorder; whereas the fibres of the child's brain being unable to bear the shock of these spirits, were quite ruined, and the rage was great enough to deprive him of reason all his lifetime.

"Again, the view of the execution frightening the woman, the violent course of the animal spirits was directed forcibly from the brain to all those parts of the body corresponding to the suffering parts of the criminal; and the same thing must happen in the child. But in regard the bones of the mother were strong enough to resist the impulsion of those spirits, they were not damaged; and yet the rapid course of these spirits could easily overpower and break the tender and delicate fibres of the bones of the child; the bones being the last parts of the body that are formed, and having a very flender consistence while the child is yet in the womb.

"To which it may be here added, that had the mother determined the course of these spirits towards some other part of her body, by tickling or scratching herself vehemently, the child would not in all probability have had its bones broken; but the part answering that to which the motion of the spirits was determined, would have been the sufferer. Hence appears the reason why women in the time of gestation, seeing persons, &c. marked in such a manner in the face, imprints the fame mark on the same parts of the child: and why, upon rubbing some hidden part of the body when startled at the sight of anything agitated with any extraordinary passion, the mark or impression is fixed on that hidden part rather than on the face of the child. From the principles here laid down, may most, if not all, the phenomena of monsters be easily accounted for."

Various other theories have been formed by different philosophers and physiologists. But after all, it must be confessed, that we seem as yet to be very little acquainted with Nature in her sports and errors. For each organized being there appears to exist a primitive germ or model of the different species drawn by the Creator, determined by forms and sexes, and realized in the individuals of both sexes, which must unite in order to their reproduction. From this model nature never departs, unless when compelled by circumstances which derange the primitive order so common to the species, and produce what we call monsters.

With respect to structure, we have already remarked, that monsters are of various kinds. Some have an excess or defect in certain parts; such as those which are called acephalous, or who want the head; those which have two heads, two arms, two legs, and one body, or which have two bodies and one head, or which have three legs; and those which want the arms or the legs. Others err through an extraordinary and deformed conformation, through an unnatural union of certain parts or viscera, through a great derangement in one or more of their members, and through the extraordinary place which these often occupy in consequence of this derangement or transplantation. The monster described by Dr. Eller of the academy of Berlin was of this kind. It was a fetus of nine months, 28 inches long, with an enormous head and frightful countenance; and in the middle of a broad and vaulted forehead it had a red devilish eye, without either eyebrows or eyelids, and sunk deep into a square hole.Immediately below this eye was an excrecence which strongly resembled a penis with a glans, a prepuce, and an urethra: the part covered with hair was likewise below the nape of the neck. In other monsters we meet with the unnatural union of some parts, which, from their destination and functions, ought always to be separate; and the separation of other parts, which, for the same reasons, ought constantly to be united. The reader may see the different ways in which the formation of monsters takes place in four memoirs by M. Lemery, published in L'Histoire de l'Academie des Sciences, 1738 and 1739. M. du Verney has likewise published a Memoir on the same subject.
In the volume published by the Academy of Sciences in 1724, mention is made by M. Geoffroy of a monter born in Barrois 1722. This monstrous production consisted of two children without the inferior extremities, joined together by a common navel: each of them had a nose, mouth, and four legs and feet: the other felt. The reader may like-wise consult the second part of Winslow's Memoirs on Monsters, inferred in the volume published by the Academy of Sciences in 1734, where will he find the history of two very extraordinary twin monsters, who evidenced during their life a great difference in their moral and physical qualities. We are obliged simply to refer to those Memoirs, as they are too long for abridgment.

It is observed by Haller, that in some monsters the natural structure is changed by some shock or passion: in others the structure, independent of any accident, is originally monstrous; such as when all the members are reversed from left to right, when the pelvis has fix fingers, and in many other instances, M. de Maupertius mentions, that is at Berlin a family who have had fix fingers on each hand for several generations. M. de Riville saw an instance of this at Malta, of which he has given a description. M. Renou, surgeon at Pommeraye in Anjou, has published an account of some families with fix fingers, which are to be found in several parishes of the Lower Anjou, and which have existed there for time immemorial. This deformity is perpetuated in these families even when they intermarry with persons who are free from it. Whether the propagation of these supernumerary organs, which are not only useless but inconvenient and even disagreeable, be owing to the father or mother, their children of both sexes are subject to it indiscriminately. A father or mother with fix fingers frequently have a part, and sometimes the whole, of their children, free from this deformity; but it again makes its appearance, and in a very great degree, in the third generation. From this it appears, that this fault in the conformation is hereditary. M. Reaumur has likewise published the history of a family in the island of Malta, the children of which are born with fix fingers and fix toes. But it deserves to be inquired, Whether these supernumerary fingers are real fingers? The reader may see the Journal de Physique for November 1774, p. 372. This variety of feedigatory hands and feet is not comprehended in the Recherches sur quelques conformationes monstrueuses des doigts dans l'homme, which is inserted in the Memoirs of the Academy of Sciences for 1771. In the Journal de Physique for August 1776, we find a description of a double uterus and vagina observed in a woman who died in childbirth, by Dr Purcell of Dublin: and in that for June 1788, we have an account of a man with seven fingers on each hand, by Baron Dietrich.

Several monstrous productions are to be seen in the cabinet at Chantilly. 1. Two calves joined together in the body, with each a separate head and neck, and four legs in whole. 2. Two calves united only by the pelvis, with only one anus and one tail: the whole is supported by fix legs, four before and two behind. 3. A lamb with fix legs, four of which are behind. 4. The skeleton of a ram, which has like wise fix legs. 5. A hermaphrodite deer. 6. The head of a foal which has only one eye in the middle of the forehead. 7. Som leverets with fix and eight legs. 8. A pigeon, the lips of which are divided fourfold. 9. Some festures of a hog which have a kind of tube upon their forehead one or two inches long; and another, the hinder part of which is double in every thing. 10. Two double human festures joined by the belly, with four arms and three legs. 11. A young chicken with two bodies and one head. 12. A pigeon and a duck, each with two bills. 13. A duck with two heads. 14. A pigeon with four feet. 15. A capon with three feet; the third being fixed to the anus. 16. Two heads of a calf joined together, each of them with two ears; these two heads were both fixed to one neck. 17. In the Menagerie at Chantilly there was formerly to be seen a cow with five feet, the fifth of which was connected with the dug. 18. A rabbit without ears. 19. Two ears, each having two heads. 20. Two leverets newly brought forth, well shaped in the body and legs, but connected together by means of only one head. 21. Several eggs, in the figure of which there occur some monstrous appearances and extraordinary deformities, sufficient to shew that they are contrary to the established form of nature.

Everhard Hume, Esq; F. R. S. some time ago presented to John Hunter, Esq; F. R. S. the double child, born at Calcutta in May 1783, of poor parents aged 30 and 35, and which lived to be nearly two years old. The body of this child was naturally formed; but the head had the phenomenon of appearing double; another head of the same size, and almost equally perfect, being attached to its upper part. In this extraneous and preternatural head no pulsation could be felt in the arteries of the temples, but the superficial veins were very evident; one of the eyes had been hurt by the fire, upon which the midwife, in her first alarm, threw the child; the other moved readily; but the iris was not affected by the approach of any thing to it. The external ears of this head were very imperfect; the tongue adhered to the lower jaw, except for about half an inch at the lip, which was loose: the jaw was capable of motion, but there were no teeth. The child was shown about the streets of Calcutta for a curiosity; but was rendered unhealthy by confinement, and died at last of a bite of the cobra de capello. It was dug up by the East India Company's agent for salt at Tumlock, and the skull is now in the museum of Mr Hunter.

Among the monstrous productions of the animal kingdom, we may rank those individuals which ought only to possess one sex, but in which we observe the union or the appearance of two. See the articles Androgyne and Hermaphrodite.

M. Fabri arranges mutilations of the members, distortions, gibbosities, tumors, divisions of the lips or of the palate, compressions of the intestines, and many other deformities of this kind, in the class of morbid monstrosities. In that which he calls connotatum (connaturelle) monstrosities, are placed the plurality, transposition, and infection of the parts. To explain these facts, a great many writers have had recourse to the effect of the imagination of pregnant women.—The causes of the first class of monstrosities are discussed by M. Fabri, who observes that some of them are internal with regard to the mother, and others exter-
By an internal cause, he here means all those deprivations or morbid principles which can affect the fluids, and which vitiate the form and structure of the solids; in particular the uterus, in which such deprivations have often been found to occur. To these he adds violent affections of the mind, spasmodic contractions, hybernic convulsions, and the many inconveniences of this kind to which women are extremely subject. External causes comprehend every thing which can act externally upon the fetus contained in the uterus, such as the pressure of the clothes; and in short every thing which prevents the free dilatation of the belly in women who are pregnant, violent motions, falls, blows, and all accidents of this kind. These external causes, and especially the fire, comprefs the fetus in the womb, and oblige it to remain in a very confined situation. This, according to the observation of Hippocrates, produces those embryos which are born with some entire part wounded. M. Fabri maintains, that all deformities of the fetus proceed from mechanical and accidental causes.

The name of monstrous is likewise given to animals enormous for bulk; such as the elephant among terrestrial quadrupeds, and the shark and the whale among sea animals; to other animals remarkable for fierceness and cruelty; and to animals of an extraordinary species, which, we are told, arise from the copulation of one animal with another of a different genus. According to the report of travellers, Africa abounds with monsters of this kind; and accounts of the East are full of descriptions of sea monsters, which, however, are seldom to be seen, such as saunders, mermaids &c.

Monsters are more common and more extraordinary in the vegetable than in the animal kingdom, because the different juices are more easily deranged and confounded together. Leaves are often seen, from the internal part of which other leaves spring forth: and it is not uncommon to see flowers of the ranunculus, from the middle of which issued a stalk bearing another flower. M. Bonnet informs us, that in certain warm and rainy years he has frequently met with monsters of this kind in rose-trees. This observer saw a rose, from the centre of which issued a figure stalk, of a whitish colour, tender, and without prickles, which at its top bore two flower-buds opposite to each other, and totally destitute of a calyx; a little above the buds issued a petal of a very irregular shape. Upon the prickly stalk, which supported the rose, a leaf was observed, which had the shape of trefoil, together with a broad flat pedicle. In the memoirs of the Academy of sciences for 1707, p. 448, mention is made of a rose, from the centre of the leaves of which issued a rose-branch two or three inches long, and furnished with leaves. See the same Memoirs for 1749, p. 44, and for 1724, p. 20. In the Memoirs for 1775, a very singular instance is mentioned of a monstruous observed by M. Duhamel, in an apple-tree ingrafted with clay. At the place of the inreion, there appeared a bud which produced a stalk and some leaves; the stalk and the pedicle of the leaves were of a pulpy substance, and had the most perfect resemblance both in taste and smell to the pulp of a green apple. An extraordinary chorisorium is mentioned in the Alta

Histoire. M. Bonnet, in his Recherches pour l'usage des feuilles, mentions likewise some monstrons productions which have been found in fruits with kernel, analogous in their nature to those which occur in the flowers of the ranunculus and of the rose-tree. He has seen a pear, from the eye of which issued a tuft of 13 or 14 leaves, very well shaped and many of them of the natural size. He has seen another pear which gave rise to a ligneous and knotty stalk, on which grew another pear somewhat larger than the first.—The stalk had probably flourished, and the fruit had formed. The lilium album polyanthos, observed some years ago at Brelau, which bore on its top a bundle of flowers, conhiting of 102 lilies, all of the common shape, is well known. M. Reynier has mentioned some individuals monstrons with respect to the flower, in the Journal de Physique et d'Histoire Naturelle, for November 1785. He has likewise mentioned a monstrons tulip which is seen in the gardens of some amateurs; juniper berries with horns; a balsamic with three spurs, &c.

These vegetable productions, which are so extraordinary, and so contrary to the common course of things, do nevertheless present deviations subject to particular laws, and reducible to certain principles, by distinguishing such as are perpetuated either by seed or by transplanting, from those which are only accidental and passing. Monstrosities which are perpetuated exist in the original organization of the seed of the plant, such as marked or curled leaves, &c. The word monstrous is more properly applied to those irregularities in plants which arise from frequent transplantation, and from a particular culture, such as double flowers, &c. but these monstrosities which are not perpetuated, and which arise from accidental and transient causes deranging the primitive organization of the plant, when it comes to be unfolded, as is the effect of diseases, of heat or cold, of a superfluity or scarcity of juices, or a deprivation of the vessels contributing to nutrition, of the wing of insects, of concretions and natural grafts, retain also the name of monstrous. Of this kind are knots or swellings, flancting, gall-nuts, certain stinks, and other similar defects. All the parts of plants are subject to some of these monstrosities, whichever with respect to their formation, figure, proportion, and number. Some trees are naturally of so great a size, that they may be considered as a kind of whale species in the vegetable kingdom; of this kind are the baobab and the ceiba. Others, as the oak, the yew, the willow, and many others, sometimes though rarely, attain so extraordinary a bulk that they are likewise monsters among the vegetables. It is conjectured, in short that monsters are more common in the vegetable than in the animal kingdom, because in the latter the methods of propagation are not so numerous. Plants are seldom monstrons in all their parts; some are monstrons only through excess in the calyx and corolla; others are so through defect only in the leaves, flamina, and fruit. Now, a monstrosity, says M. Adanson, has never changed the name or affected the immutability of a species. Every skilful succeeding botanist has arranged these monstrosities in plants among accidental circumstances, which in whatever manner they
are propagated, have always a tendency to revert to the order and regularity of their original species when they are multiplied by means of food; which method of reproduction is the most natural and the most certain for determining the species. One species may be compared with another; but a monster can only be put in comparison with an individual of the species from which it comes. The reader may consult the Observations Botaniques of M. Schletterbec, of the Society of Bafli, concerning monsters in plants, wherein he pretends to demonstrate, that in their production nature follows the same course in the vegetable as in the animal kingdom.

MONTEALE, a strong town of Spain, in the kingdom of Aragon, with a strong citadel; seated on the river Rio-martin, 44 miles south of Saragossa, and 92 north by west of Valencia. W. Long. 1°. 30'. N. Lat. 41. 9'.

Mont-d'Alber, an ancient town of France in Picardy, where the kings of France formerly had a palace and kept their court. It is seated on a mountain, 17 miles from Amiens and Compeigne, and 58 north of Paris. W. Long. 2°. 34'. N. Lat. 49. 39'.

Mont-Lher, a town of the Isle of France, 15 miles from Paris. Here are the remains of a tower, which may be seen at great distance. E. Long. 2°. 0'. N. Lat. 48. 38'.

Mont-Louis, a small but strong town of France, in the Pyrenees, with a strong citadel; seated on an eminence, 430 miles south of Paris. E. Long. 2°. 5'. N. Lat. 42. 58'.

Mont-Luiz, a town of France in Breff, and capital of the territory of Valbonne; seated in a fertile pleasant country on the river Sarine, eight miles from Lyons, and 205 south-east of Paris. E. Long. 5°. 8'. N. Lat. 45. 49'.

Mont-Luzon, a town of France in Bourbonnois; seated on the Cher, 35 miles south-west of Moulins, and 150 south of Paris. E. Long. 2°. 45'. N. Lat. 46. 22'.

Mont-Blanc. See Mont-Blanc.

MONTAUBOUR, a small fortified town of Germany, in the electorate of Treves, between Coblenz and Limburg. E. Lon. 7°. 50'. N. Lat. 50. 50'.

MONTAGNAC, a considerable town of Ais, in Natolia, and in the province of Bec-Sangol, on the sea of Marmora. It carries on a great trade, especially in fruits, and is seated on a bay of the same name, 12 miles from Burfa, and 60 south-east of Constantinople. E. Long. 29°. 40'. N. Lat. 40. 20'.

MONTAGUE (Edward), earl of Sandwich, an illustrious Englishman, who shone from the age of 19, and united the qualifications of general, admiral, and statesman; yet there were strange inconsistencies in his character. He acted early against Charles I; he perfuaded Cromwell, whom it is said he admired, to take the crown; and he was zealous for the restoraion of Charles II. All this is imputed to a fond and unaccountable passion which he had for royalty. Upon general Monk's coming into England, he sided with the fleet to Holland, and soon after he had the honour to convey his majesty to England. For this he was created knight of the garter; and on the 11th of July 1665, he was created baron. Montague of St. Necta, in the county of Huntingdon, Viscount Hinchenbrooke in the same county, and earl of Sand-wich in Kent, from one of his majesty's most honourable privy-council, made master of the king's wardrobe, admiral of the Narrow Seas, and lieutenant-admiral to the duke of York, as lord high admiral of England.

When the Dutch war broke out in 1694, and the duke of York took upon himself the command of a fleet as high-admiral, his lordship commanded the blue squadron, and by his industry and care abundance of the enemies ships were taken; and in the great battle fought on the third of June 1665, in which the Dutch lost admiral Opdam, and had 18 men of war taken and 14 destroyed, a large share of the honour of the victory was justly given to the command of the earl of Sandwich. On the return of the English navy, the command of the whole fleet was given to the earl of Sandwich, which he was ordered to put as speedily as possible in a condition to return to the coast of Holland. Accordingly the earl failed on the 5th of July with 60 men of war to the Dutch coast, when finding that their East India and Smyrna fleets were to return home north about, he steered for the coast of Norway, and found they had taken shelter in the port of Bergen, where the fleet were attacked: but leaving them there, and falling back towards the coast of Holland, he met with four Dutch East Indiamen, with several other merchant ships, under a good convoy, and took eight men of war, two of their East India ships, and 20 fall of merchant-men; and a few days after, a part of the fleet falling in with 18 of the Hollanders, the greatest part of them were also taken, with four Dutch men of war, and above 1000 prisoners. On his return he was received by the king with distinguished marks of favour; and soon after, he was sent ambassado extraordinary to the court of Madrid, to mediate a peace between the crowns of Spain and Portugal; when he had the happiness to conclude a peace between the two nations to their mutual satisfaction.

On the breaking out of the late Dutch war, his lordship went to sea with the duke of York, and commanded the blue squadron; the French admiral, count d'Etrees, commanding the white. The fleet was at sea in the beginning of the month of May; and coming to an anchor in Southwold-bay in order to take in water, we are told, that on the 27th many officers and seamen were permitted to go on shore, and were at Southwold, Dunwich, and Aldborough; when, the weather being hazy, the wind being north about, he had the honour to convey his majesty to England. For this he was created knight of the garter; and on the 11th of July 1665, he was created baron. Montague of St. Necta, in the county of Huntingdon, Viscount Hinchenbrooke in the same county, and earl of Sand-
had not that gentlemen been more solicitous about adorning the duke. When therefore he saw him fail by, heedless of the condition in which he lay, he said to those who were about him, "There is nothing left for us now, but to defend the ship to the last man." Being at length grappled by a fourth fire­ship, he begged his captain Sir Richard Haddock, and all his servants, to get into the boat and save themselves, which they did: yet some of the sailors refused to quit the admiral, and flaying endeavoured to extinguish the fire, but in vain; the ship blew up about noon. His lordship's body was found about a fortnight after, and was interred with great state in Henry VII. s chapel.—We have of his lordship's writings, 1. The Art of Metals, in which is declared the manner of their generation, translated from the Spanish of Albaro Alonso Barba, 8vo. 2. Several letters during his em­bassy to Spain, published with Arlington's letters. 3. A letter to secretary Thurloe. 4. Original letters and negotiations of Sir Richard Fanshaw, the earl of Sandwich, the earl of Sunderland, and Sir William Godolphin, wherein divers matters between the three crowns of England, Spain, and Portugal, from the year 1663 to 1678, are set in a clear light, 2 vols. 8vo.

Montagu (Charles), earl of Halifax, fourth son of George Montague of Harton in Northamptonshire, Esq.; son of Henry the first earl of Manche­ster, was born in 1661. He was educated at Westminster-school and Cambridge, shewed very early a most geniuus talent, and quickly made great progress in learning. In 1684, he wrote a poem on the death of King Charles II in which he displayed his genius to such advantage, that he was invited to London by the earl of Dorset; and upon his coming thither soon increased his fame, particularly by a piece which he wrote in conjunction with Prior, published at London in 1687, under the title of, "The Hind and the Panther transferred to the Story of the Country mouse and the City mouſe." Upon the abdication of King James II. he was chosen one of the members of the convention, and recommended by the earl of Dorset to King William, who immediately allowed him a pension of 500 l. per annum. Having given proofs of his great abilities in the house of commons, he was made one of the commissioners of the treasury, and soon after chancellor of the exchequer: in which capacity he was raised to the peerage, and made a great work of re-coining all the current money of the nation. In 1698, he was appointed first commissioner of the treasury; and in 1699 was created a peer of England, by the title of Baron Halifax in the county of York. In 1701, the house of commons impeached him of six articles, which were dis­missed by the house of Lords. He was attacked again by the house of commons in 1702, but without success. In 1705, he wrote, An Answer to Mr Bromley's Speech in relation to the occa­sional Conformity-bill. In 1706, he was one of the commissioners for the Union with Scotland; and upon passing the bill for the naturalization of the illustrious house of Hanover, and for the better security of the succession of the crown in the Protestant line, he was made choice of to carry that act to Hanover. Upon the death of Queen Anne, when the king had taken pos­session of his throne, his lordship was appointed first commissioner of the treasury, and created earl of Halifax and knight of the garter. He died in 1715. His lordship wrote several other pieces besides those above mentioned; all which, with some of his speeches, were published together in 1716 in an octavo volume.

Montagu (Lady Mary Wortley) accompanied her husband who was sent on an embassy to Constantinople in the beginning of this century. On her return she introduced the practice of inoculation into England, and thence acquired great celebrity. She cultivated the belles lettres; and at one period of her life she was the friend of Pope, and at another his enemy. While they were at enmity with each other, Lady Mary Montague embraced every opportunity of defaming the poet, who well knew how to take revenge. Both of them carried their animosity to so great a height, that they became the subject of public conversation. After a long life, full of singular and romantic adventures, she died about the year 1760. From her we have Letters, written during her travels from the year 1716 to the year 1718. They have been translated into French, and published at Rotterdam 1764, and at Paris 1783, one vol. 12 mo. They are composed in a lively, interesting, and agreeable style, and contain many curious facts relating to the manners and government of the Turks, which are not where else to be found. The Baron de Tott, who lived many years at Constantinople, attacked them with great severity; but they have been defended with equal zeal by M. Guis of Marseille, who has published a valuable work on Turkey. It need not appear extraordinary, that persons who have visited the same country should not see things in the same light. How few travellers agree in their accounts of the fame objects, which they nevertheless pretend to have seen and have examined with attention.

Montagu (Edward Wortley), son of the former, passed through such variegated scenes, that a bare recital of them would favour of the marvellous. From Westminster-school, where he was placed for education, he ran away three several times. He exchanged clothes with a chimney-sweeper, and followed, for some time that footy occupation. He next joined himself to a fisherman, and called himself in Rotherhithe. He then sailed as a cabin-boy to Spain; where he had no sooner arrived, than he ran away from the vessel, and hired himself to a driver of mules. After this vagabondifying it some time, he was discovered by the confidant, who returned him to his friends in England. They received him with a joy equal to that of the father of the prodigal son in the gospel. A private tutor was employed to recover those rudiments of learning which a life of dissipation, of blackguardism, and of vulgarity, might have obliterated. Wortley was sent to the West Indies, where he remained some time; then returned to England, acted according to the dignity of his birth, was chosen a member, and served in two successive parliaments. His expenses exceeding his income, he became involved in debt, quitted his native country, and commenced that wandering traveller he continued to the time of his death. Having visited most of the eastern countries, he contrived a partiality for their manners. He drank little wine; a great deal of coffee; wore a long beard; smok'd much; and,
and, even whilst at Venice, he was habited in the eastern style. He cut cross-legged in the Turkish fashion through choice. With the Hebrew, the Arabic, the Chaldaic, and the Persian languages, he was as well acquainted as with his native tongue. He published several pieces. One on the "Rise and Fall of the Roman Empire." Another an Exploration of "The Causes of Earthquakes." As this gentleman was remarkable for the uncommon incidents which attended his life, the close of that life was no less marked with singularity. He had been early married to a woman who aspired to no higher a character than that of an indolent wenchwoman. As the marriage was solemnized in a frollick, Wortley never deemed her sufficiently the wife of his bosom to cohabit with her. She was allowed a maintenance. She lived contented, and was too submissive to be troublesome on account of the conjugal rites. Mr. Montague, on the other hand, was a perfect patriarch in his manner. He had wives of almost every nation. When he was with Ali Bey in Egypt, he had his household of Egyptian females, each striving who should be the happiest of who could gain the greatest attendance over this Anglo-Indian-baw-baw. At Constantinople, the Greek women had charms to captivate this unsettled wanderer. In Spain, a Spanish brunette, in Italy the olive complexioned female were solicited to partake the honours of the bridal-bed. It may be asked what became of this group of wives? Mr. Montague was continually shifting the place, and consequently varying the scene. Did he travel with his wives as the patriarchs did with their flocks and herds? No such thing; Wortley, confidering his leader, the heresiarch Montanus, a Phrygian by birth; whence they are sometimes styled Phrygians and Cata­phrygians.

Montanus, it is said, embraced Christianity in hopes of rising to the dignities of the church. He pretended to inspiration; and gave out, that the Holy Ghost had instructed him in several points, which had not been revealed to the apostles. Priscilla and Maximilla, two enthusiastic women of Phrygia, presently became his disciples; and in a short time he had a great number of followers. The bishops of Asia, being assembled together, condemned his prophecies, and excommunicated those who adhered to them. Afterwards they wrote an account of what had passed to the western churches, where the pretended prophecies of Montanus and his followers were likewise condemned.

The Montanists, finding themselves exposed to the censure of the whole church, formed a schism, and set up a distinct society under the direction of those who called themselves prophets. Montanus, in conjunction with Priscilla and Maximilla, was at the head of the sect.

These sectaries made no alteration in the creed. They only held, that the Holy Spirit made Montanus his organ for delivering a more perfect form of discipline than what was delivered by the apostles. They refused communion for ever to those who were guilty of notorious crimes, and believed that the bishops had no authority to reconcile them. They held it unlawful to fly in time of persecution. They condemned second marriages, allowed the dissolution of marriage, and observed three lents.

The Montanists became separated into two branches; one of which were the disciples of Proclus, and the other
MONTANUS (Benign Arians), a most learned Spanish theologian, born in the diocese of Badajoz, about the year 1528. He alluded at the council of Trent with great reputation; and his merit and writings recommended him to Philip II. of Spain, who employed him in publishing a new polyglot bible after the Complutensian edition, which was printed by the care of Cardinal Ximenes. This bible was printed at Antwerp, whither Montanus went in 1571; and on his return to Spain he refused the bishopric which Philip offered him for his reward, but spent the rest of his days at Sevilla, where he died about the year 1598. Montanus had not only a low heterodoxy. 

MONTANAUN, a small but populous town of Italy, in the territory of the Church, with a bishop's see; seated on a mountain, near the lake Bolsena, in a country abounding with excellent wine, 12 miles south-west of Orvieto, and 45 north-west of Rome. E. Long. 12. 4. N. Lat. 42. 26.

MONTARIGIS, a considerable town of Portugal, on the road from Lisbon to Badajoz. Long. W. 9. 35. N. Lat. 38. 42. 

MONTAUBAN, a considerable town of France, in Guienne, and territory of Quercy, with a bishop's see, and an academy. The fortifications were demolished in 1629, because it took the part of the Huguenots. It is seated on the river Tarns, 20 miles north of Toulouse, and 30 miles south of Cahors. E. Long. 1. 27. N. Lat. 43. 56.

MONTBAZON, a town of France, in Touraine, with the title of a duchy; agreeably seated at the foot of a hill, on which there is an ancient castle, 153 miles south-west of Paris. E. Long. 0. 45. N. Lat. 47. 17.

MONTPELLIARD, a handsome and strong town of France, capital of a province of the same name, between Aisace and the Franche Compte. It is seated at the foot of a rock, on which there is a large, strong castle, in the form of a citadel. The prince of Montpellier has a voice and seat in the college of the princes of the empire. It was taken by the French in 1674, who demolished the fortifications, but it was restored to the prince. It is seated near the rivers Alain and Doux, 33 miles west of Bale, and 45 north-east of Bezanzon. E. Long. 6. 30. N. Lat. 47. 31.

MONTBLANC, a town of Spain, in the province of Catalonia, 15 miles north of Tarragon. E. Long. 1. 5. N. Lat. 41. 20.

MONTBRISIAC, a considerable town of France, and capital of Forez, seated on the river Veziza, 40 miles west of Vienne, and 250 south by east of Paris. E. Long. 4. 27. N. Lat. 45. 52.

MONTECCHIO, a considerable town of Italy, in the duchy of Reggio, 10 miles south-east of Parma, and eight north-west of Reggio. E. Long. 15. 54. N. Lat. 48. 8.

MONTENEGRO, a town of Italy, in the territory of the church and duchy of Spalato; seated on a mountain near the river Clitunno, 12 miles west of Spalato. E. Long. 12. 40. N. Lat. 42. 58.

MONTEFALCO, a town of Italy, in Friuli, with a castle. It belongs to the Venetians, and is near the river Ponzano, 10 miles north-west of Aquileia, and 12 north-west of Trieste. E. Long. 13. 0. N. Lat. 46. 4.
ceeded with feint marches in order to deceive Turenne, in which he obtained great honour. However, the command of that army was taken from him the next year; but it was restored to him in 1675, in order that he might make head against the great Turenne. All Europe had their eyes fixed on these two able warriors, who then made use of all the stratagems which genius and military knowledge were capable of suggesting. The marshal de Turenne was obtaining his superiority when he was taken off by a cannon ball. Monteculvi was at the death of so formidable an enemy, and bellowed upon him the greatest praise. The great prince de Conde was the only French general that could deprive Monteculvi of the superiority he had obtained by Turenne's death. That prince was therefore sent to the Rhine, and stopped the Imperial general; who considered this last campaign as the most glorious of his life, not from his being conqueror, but for his not being conquered, when he was opposed by a Turenne and a Conde. He spent the rest of his life at the Imperial court; and died at Lintz in 1680.

He wrote Memoirs; the best edition of which is that of Strasbourg, 1735.

MONTGOMERAY, a town of Jamaica, and next to Kingston the most flourishing in the island, contains above 350 houses; and carriers on a very considerable commerce with Great Britain and her remaining colonies in North America. The harbour is capacious; but rather exposed to the north winds, which at certain times in the year blow with great violence. It is the capital of the parish of St. James; in which are 70 sugar-plantations, 70 other settlements, and 27,000 slaves.

MONTESA, a very strong town of Spain, in the kingdom of Valencia. It is the seat of an order of knighthood of the same name; and is five miles from Xativa. W. Long. 0. 10. N. Lat. 39. 0.

MONTESQUIEU (Charles de Secondat) baron, a most illustrious Frenchman descended from an ancient and noble family of Guienne, was born at the castle of La Brede, near Bourdeaux, in 1689. The greatest care was taken of his education; and at the age of 20, he had actually prepared materials for his Spirit of Laws, by well digested extracts from those immense volumes of civil law which he had studied, not merely as a civilian, but as a philosopher. He became a counsellor of the parliament of Bourdeaux in 1714, and received president a morrow two years after. In 1721 he published his Persian Letters; in which, under the screen of Oriental manners, he satirized those of France, and treated of several important subjects by delicate transient glances: he did not avow this publication; but was so soon pointed out as the author, that he was without knowledge, and ever under the mark of it, united at once against the Persian Letters. He was received into the French academy in 1728; and having previously quitted his civil employments, he entirely devoted himself to his genius, and was no longer a magistrate, but a man of letters. Having thus let himself at liberty, he travelled through Germany, Italy, Switzerland, Holland, and England, in which last country he resided three years, and contracted intimacies with the greatest men then alive; for Locke and Newton were dead. The result of his observations was, "that Germany was fit to travel in, Italy to sojourn in, England to think in, and France to live in." On his return he retired for two years to his estate at La Brede, where he finished his work On the causes of the Grandeur and Decline of the Romans; which appeared in 1754. The reputation acquired by this last work only cleared the way for his greater undertaking, the Spirit of Laws, which was printed at Geneva in 2 vols 4to. 1750. This was immediately attacked by the adversaries of his Persian Letters, in a multitude of anonymous pamphlets; containing all the reproaches to which a liberal mind is exposed from craft and ignorance. M. Montesquieu drew up a defence of this work; which, for truth, moderation, and delicacy of ridicule, may be regarded as a model in its way. This great man was peaceably enjoying that fulfilment of which his great merits had procured him, when he fell sick at Paris, and died on the 10th of February 1755.—The following character of this great man is drawn by Lord Chesterfield. His virtues did honour to human nature, his writings justice. A friend to mankind, he affected their undoubted and unalienable rights with freedom, even in his own country; whose prejudices in matters of religion and government he had long lamented, and endeavoured, not without some success, to remove. He well knew, and justly admired, the happy constitution of this country, where fixed and known laws equally restrain monarchy from tyranny, and liberty from licentiousness. His works will illustrate his name, and survive him, as long as right reason, moral obligation, and the true spirit of laws, shall be understood, respected, and maintained." As to his personal qualities, we are told by his elogist, M. d'Alembert, that, "he was of a sweet, gay, and even temper. His conversation was spirited, agreeable, and instructive. Nobody told a story in a more lively manner, or with more grace and ease of affectation. He had frequent absence of mind; but always awaked from it by some unexpected stroke that re-animated the languishing conversation. Though he lived with the great, he retired whenever he could to his estate in the country, and there met his books, his philosophy, and his repose. Surrounded at his leisure-hours with peasants, after having studied men in the commerce of the world, he studied him in those simple people solely instructed by nature. With them he cheerfully conversed; he endeavoured, like Socrates, to find out their genius, and appeared as happy with them as in the most brilliant assemblies; especially when he reconciled their differences, and by his benevolence relieved them from their difficulties."

Besides the works already mentioned, M. Montesquieu wrote several small pieces, as the Temple of Gnids, Lyfimachus, and Esfay upon Tafes, which is left unfinished. His works have been collected since his death, and printed at Paris in a splendid edition, in quarto. They have likewise all of them been translated into English.

MONTÈZUMA, or Montezuma, was emperor or king of Mexico when Cortez invaded that country in 1519, invited thither, as he pretended, by the inhabitants, who are children Montezuma, in the blindness of his superition, had sacrificed to his idols. The warlike animals on which the Spanish officers were mounted, the artificial thunder with which they were armed, the wooden cales on which they had crossed the
the ocean, the armour with which they were covered, the victories which they gained wherever they went; all these circumstances, added to that foolish dispositions to wonder which always characterises a simple people, so operated upon the minds of the Mexicans, that when Cortez arrived at the city of Mexico, he was received by Montezuma as his master, and by the inhabitants as a god. At first they fell down in the streets when a Spanish valet passed by; but by degrees the court of Montezuma grew familiar with the strangers, and ventured to treat them as men. Montezuma, unable to expel them by force, endeavoured to inspire them with confidence at Mexico by expressions of friendship, while he employed secret means to weaken their power in other quarters. With this view, one of his generals, who had private orders to that purpose, attacked a party of the Spaniards who were stationed at Vera-Cruz; and, although his troops were unsuccessful, yet three or four of the Spaniards were killed. The head of one of them was carried to Montezuma. In consequence of this, Cortez did what has been reckoned one of the boldest political strokes that ever was performed. He ran to the palace, followed by fifty of his troops; and, by perusia and threats, carried the emperor prisoner into the Spanish quarter. He afterwards obliged him to deliver up those who had attacked his troops at Vera-Cruz; and, like a general who punishes a common robber, he loaded Montezuma with chains. He next obliged him to acknowledge himself in public the vassal of Charles V.; and, in name of tribute for this homage, Cortez received 600,000 marks of pure gold. Montezuma soon afterwards fell a sacrifice to his submission to the Spaniards. He and Alvaro, the lieutenant of Cortez, were besieged in the palace by 200,000 Mexicans. The emperor proposed to show himself to his subjects, that he might persuade them to desist from the attack; but the Mexicans no longer considered him in any other light but as the slave of foreign conquerors. In the midst of his speech, he received a blow with a stone which wounded him mortally; and he expired soon after. A. D. 1520.—See Cortez. This unfortunate prince left two sons and three daughters, who embraced the Christian faith. The eldest received baptism, and obtained from Charles V. lands, revenues, and the title of Count de Montezuma. He died in 1668; and his family is one of the most powerful in Spain.

MONTFAUCON (Bernard de), a very learned Benedictine of the congregation of St Maur, singularly famous for his knowledge in Pagan and ecclesiastical antiquities, was born of an ancient and noble family in Languedoc, in 1655. He served for some time in the army; but the death of his parents mortified him so with regard to the world, that he commenced Benedictine monk in 1675, and applied himself intensively to study. Though Montfaucon's life was long, healthy, retired, and laborious, his voluminous publications seem sufficiently to have employed the whole, exclusive of his greatest undertakings, for which he will be always memorable. This was his Antiquités expliquées, written in Latin and French, illustrated with elegant plates, in 10 vol. folio, to which he added a supplement of 4 vols more. He died at the abbey of St Germain in 1741.

MONTFERRAT, a province of Italy, with the title of a duchy; bounded on the east by the duchy of Monfort, Milan, and part of the territory of Genoa; on the north, by the Vercellese and Canavese; on the west, by Piedmont properly so called; and on the south by the territory of Genoa, from whence it is separated by the Apennine mountains. It contains 200 towns and castles; and is very fertile and well cultivated, abounding in corn, wine, oil, and flax. It belongs to the kingdom of Sardinia, and Calas is the capital town.

MONTFORT, a town of France, in Upper Burgundy, founded on the river Men, 12 miles from Rennes. W. Long. 1° 58'. N. Lat. 48° 8'.

MONTFORT, an handome and strong town of the Netherlands, in the United Provinces, with an ancient castle; situated on the river Vyl, seven miles from Utrecht. E. Long. 5° 0'. N. Lat. 52° 4'.

MONTFORT, a town of Germany, in the circle of Suabia, on the confines of Tirol, 16 miles south of Landau, and the lake Constance. It is capital of a province of the same name, which has been almost all purchased by the house of Austria. E. Long. 9° 51'. N. Lat. 47° 22'.

MONTFORT-DE-LEMOS, an ancient town of Spain, in the kingdom of Glicia, with a magnificent castle, where the Comarca of Lemos resides. It is seated in a fertile country, 25 miles north-east of Orense, and 55 south of Compostella. W. Long. 7° 9'. N. Lat. 42° 28'.

MONTFORT-L'AMULY, a town in the Isle of France, with the title of a duchy, 25 miles from Paris. E. Long. 2° 50'. N. Lat. 48° 45'.

MONTFORT (Simon Count de), descended from an illustrious and flourishing family, was lord of a small town of the same name ten leagues from Paris. He was one of the greatest generals of the age in which he lived; and he displayed his bravery in a voyage beyond seas, and in the wars with the English and Germans. The strength of his constitution enabled him to support without inconvenience the severest labours of the field: his majestic stature distinguished him in the midst of the battle; and the motion of his sword was sufficient to strike terror into his boldest enemies. In the greatest dangers he poised the utmost coolness and presence of mind; he observed every emergency; and was ready to bring ad infinitum, while he himself was employed in attacking the bravest who made head against him. He was appointed to conduct the crusade against the Albigenses in 1229; and the name of Simon de Montfort is highly celebrated in this war. He took Beziers and Carcassonne, raised the siege of Castelnau, and gained a great victory in 1213 over Peter king of Arragon, Raimond VI, count of Toulouse, and the counts of Foix and Comminges. Simon de Montfort was killed at the siege of Toulouse on the 27th of June 1218, by a blow with a stone discharged by the hands of a woman.

Such was the fate of one who had fulfilled the glory of his victories by the cruelty of his executions.

Some historians have given him the name of Maccabaeus and of Defender of the Faith; but men, animated with the true spirit of Christianity, have revolted against such titles. "We cannot (says the Abbé Noutte) read the accounts of his severity, or rather cruelty, towards the Albigenses without horror. He was not guided by the spirit of the religion of de-
MONTGATZ, a town of Lower Hungary, in the country of Pecszaus, with a fortress composed of three castles, seated on a craggy rock. It is, too, honored with a great moral, and art and nature have rendered it almost impregnable. It was defended by the Princess Ragotky, wife of Count Tekeli, when besieged by an army of the imperialists, who were obliged to raise the siege in 1688.

MONTGERON (Louis-Balile-Carre de), was born at Paris, A. D. 1686; his father was master of requests. He was scarcely 25 years of age when he purchased the place of counsellor in parliament, where, by his wit and external qualifications he gained considerable reputation. Deeply engaged in all the vices which flow from irreligion, he was converted by an unexpected circumstance. He went on the 7th of September 1731 to the tomb of Deacon Paris, with an intention to examine, with the rigour of the severe critic, the miracles which were reported to be performed there. But, according to his own account, he felt himself suddenly beat to the earth by innumerable flashes of light with which he was surrounded. His incredulity was converted into flaming zeal; and he became the apostle of the saint whom he formerly ridiculed. From that moment he devoted himself to the fanaticism of corvinum, with the same impetuosity of character with which he had run into the most shameful excesses. He had not long been the disciple of Janzenen, when he suffered persecution. When the chamber of inquests was abolished in 1733, he was sent into the mountains of Auvergne; which, instead of cooling, tended rather to inflame his zeal. During his exile, he formed the plan of collecting the proofs of the miracles wrought at the tomb of the Abbe Paris, and of composing what he called a Demonstration of them. On his return to Paris, he prepared to execute this plan; and on the 29th of July 1737, he actually presented to the king at Versailles a volume in quarto superfully bound. This work he accompanied with a speech, which is a mixture of zeal and argument in a tolerable style. In consequence of this work, which some consider as a master-piece of eloquence, and others as a mass of absurdities, he was committed to the Bicêtre. After a few months confinement, he was sent to an abbey of Benedictine monks in the diocese of Avignon; whence he was, in a short time carried to Viviers. He was afterwards confined in the citadel of Valence, where he died, A. D. 1754, aged 68. The work which he presented to the king was entitled La verité des Miracles opérés par l'intervention de M. Paris, &c. &c.—The critics, even to this day, form to be guided in their opinion concerning this book either by hatred or by charity. It would be easy enough (says the Abbe de St Pierre, in the second volume of his Annales, p. 593.) to maintain with the Molenbeis, that no miraculous cure was ever performed at the tomb of the Abbe Paris; and to say with the Janzenen, that these cures were performed by a supernatural power, would be the height of fanaticism. The truth is (adds the same author,) that no miracle appears ever to have been performed at this tomb except in the cure of the human body; in all other cases, there would have been the want of that imagination on which the whole miracle depended." Thus, although Montgeron ventured to compare these prodigies with the miracles of Jesus Christ and his apostles, yet we find no person raised from the dead, no multiplication of loaves, no command obeyed by the elements; and, no blind or deaf restored to their sight or hearing. It belongs to the Author of nature alone, or to those who have derived power from him, to work such miracles as are recorded by the evangelists, or in the history of the apostles. Montgeron added a second and third volume on the same subject; he left also in manuscript a work which he composed in prison contre les Incredibles. Religion, it must be confessed, had much more powerful advocates. Fortunately Pufcal and Bosuet are among the number; and it could well have wanted both Paris and Montgeron, whatever virtues they might possess in other respects.

MONTGOMERY, the capital of a county of the same name in north Wales, 158 miles from London, took its name from Roger de Montgomery, Earl of Shrewsbury, who built the castle; but it is called by the Welsh Ty Valeudd, that is, Baldwin's town; having been built by Baldwin, lieutenant of the marches of Wales, in the reign of William I. The Welch, after having put the garrison to the sword, demolished it in 1095; but Henry III. rebuilt it, and granted it the privileges of a free borough, with other liberties. It is a large and tolerably well built town, in a healthful situation and fertile soil. It sends a member to parliament, and has the title of an earldom. It had formerly a tower and castle; but they were demolished in the civil wars. It has a weekly market, and four fairs. MONTGOMERY (Gabriel de), count of Montgomery in Normandy, was remarkable for his valour and noble achievements, but still more so for being so unfortunate as to put out the eye of Henry II. on the 21st of June 1559. That prince having engaged several knights in a tournament in the concertation of the marriage of his daughter the Princess Elizabeth with Philip king of Spain, at last wilfully to break a lance with the young Montgomery, at that time lieutenant of the Scotch guard. Montgomery, as if he had foreseen the fatal consequences, again and again declined the combat, and it was with great reluctance he at length yielded, when he saw the king about to take offence at his refusal. In the course, his lance broke in the king's visor, and wounded him in the eye. Henry died on the 11th day after receiving the wound, and gave orders on his death-bed that Montgomery should not be prosecuted, or harrowed in any respect, on account of what had happened. After this unhappy accident, Montgomery retired for some time to his estate in Normandy. He next visited Italy and other foreign countries; and did not return to France till the commencement of the civil wars, when he joined the party of the Protestants, and became one of their principal leaders. In 1562, he defended Rouen against the royal army with great valour and obstinacy. The city being at length taken by storm, he
he threw himself into a galley; and, having, with equal temerity and good fortune, surmounted by dint of rowing a chain which had been thrown across the Seine at Candinbec for the purpose of preventing fugitives from England, he escaped to Havre. In 1569 Montgomery was sent to the aflilliance of Beam, which the Catholics, under the command of Terrides, had almost entirely wrenched from the hands of Janed' Alibret, queen of Navarre. He executed this commission with so great dispatch, that Terrides was obliged to raise the siege of Navarre, and to retire with great precipitation to Orthez. Montgomery pursued him to this city, which he took by assault; and before Terrides had time to recover himself, he and his principal officers were taken prisoners in the castle. After this defeat, the col of Beam submitted to the conqueror wherever he made his appearance. This expedition acquired him the greatest glory, and has been celebrated by the Catholic no less than by the Protestant historians. He was at Paris at the time of the massacre on St Bartholomew's day 1572, and lodged in the Faubourg St Germain. Some accident having retarded the execution of that quarter, he was informed of it at the very moment when it was about to begin; and he had just sufficient time to mount his horse and, in company with some Protestant gentlemen who lodged near him, to make his escape at full gallop. They were pursued as far as Montfort-l'Amaury; and Montgomery, whose escape alone is particularly attended to, owed his safety on this occasion to the swifhness of his horse, which, according to a manuscript of the time, carried him 50 leagues without halting. Having escaped this danger, he took refuge with his family, first in the island of Jersey and afterwards in England. The following year, Montgomery carried a considerable fleet, which he had armed and fitted out in England, partly on his own credit and partly on that of the inhabitants of Rochelle, to the relief of that city, which was at that time besieged by the Catholics: But, whether distrusting his forces, or for other reasons about which historians do not agree, he left the road without fighting the Catholic fleet, and went to pillage Belleisle on the coast of Brittany. Having disembarked his fleet, he returned to England to Henry de Champernon his son in law, coaft-admiral of Cornwall. On the renewal of the war in France in 1573 Montgomery, who was then in Jersey, passed over into Normandy, and joined the Protestant nobility of that province. Matignon, lieutenant-general in Lower Normandy, to whom Catharine de Medicis had given a particular charge to use his utmost endeavours to seize the person of the count, came unexpectedly upon him in Saint-Lo, and laid siege to that city. On the evening of the fifth day of the siege, Montgomery left Saint-Lo with between 60 and 80 horse, forced the guard in the suburbs, and escaped amidst a shower of musket bullets, without loosing a single man, leaving the command of the place to Coulombieres, Francois de Briqueville. Montgomery arrived at Domfront May 7, 1574, with only twenty followers, intending to make no longer a stay in that place than was necessary to recruit them after the fatigues of so rapid a march. The same day he was joined by several gentlemen, who brought to his assistance a company of forty horse. Meanwhile Matignon, informed of his escape, and enraged at having left his prey, flew at the head of a party of horse, with some companies of foot mounted on horseback, and arrived on the morning of the 9th before Domfront. He blocked up the place on all sides till the infantry and cannon which followed him should arrive. On their arrival, he attacked the city with great violence; and, as it was impossible to defend it, Montgomery was soon obliged to retire into the castle with the garrison amounting to no more than 135 men, including 80 foot soldiers who guarded the city when he entered it. He sustained a furious assault, fought with the greatest boldness and obstinacy, and exposed himself in the breach like one who wished for death. Perceiving, however, that his followers partly by the fire of the enemy, and partly by constant defection, were reduced almost to nothing, he capitulated on the 27th of May. Many Protestant historians affirm, that the articles of capitulation were violated with regard to Montgomery; but, not to mention the testimony of others, it appears evident, from the authority of D'Aubigny himself, who of all the Protestant writers is most worthy of credit, that the Count had no promife from Matignon, except personal safety and good treatment while he continued his prisoner. This general gave him no assurance of pardon from the king or the queen-mother. After the capture of Domfront, Matignon conducted his prisoner to Saint-Lo, the siege of which was still going on, in hopes that he might have some influence with his former friend and fellow-solier to persuade him to surrender. For this purpose, Montgomery was brought to the side of the ditch; and he exerted Coulombieres, who appeared on the wall, to follow his example. But Coulombieres, full of indignation, reproached him in the severest and most upbraiding terms for his cowardice in entering into a shameful capitulation, instead of dying in the breach like a soldier, with his sword in his hand. This intrepid governor spoke the true sentiments of his heart; for when the assault was made some days after, he was killed defending the breach. In the mean time, Matignon received orders from Catharine de Medicis, now regent of the kingdom by the death of Charles IX, to send Montgomery to Paris under a strong guard. When he arrived there, he was conducted to the gaol belonging to the parliament, and confined in the tower which still bears his name. Commissioners were appointed by the queen to conduct his trial. He was interrogated concerning the conspiracy imputed to the admiral Coligny; but the principal charge on which his condemnation was founded, was his hoisting the English flag on board of the fleet which he intended for the relief of Rochelle. The sentence by which he was condemned also deprived his children of the title of nobles. When Montgomery heard this part of the sentence read, 'If they have not the virtue of nobles to retrieve this loss (said he), I consent to their degradation.— After undergoing a very severe torture, he was carried to the place de Greve, drenched in mourning, and there beheaded on the 26th of June 1574. D'Aubigny, who was present at his execution, and who stood immediately behind Pervaques, says that he appeared on the scaffold with a firm and undaunted countenance; and gives us a pretty long speech which he delivered on that occasion, addressing himself first to the spectators.
MONTH, the twelfth part of a year. See Chronology, No. 17.

MONTH, in its proper acceptance, is that space of time which the moon takes up in passing from any certain point to the same again, which is called a periodic month; or it is the space of time between two conjunctions of the moon with the sun, which is called a synodical month. That space of time which the moon takes up in passing through one sign or 12th part of the zodiac, is also called (but improperly) a month.

So that there are two sorts of months: lunar, which are measured by the moon; and solar, which are measured by the sun. The lunar periodical month consists of 27 days, 7 hours, 43 minutes, 5 seconds. The lunar synodical month is 29 days; 12 hours, 4 minutes, 3 seconds, and 11 thirds. A solar month contains upon a mean calculation, 30 days, 10 hours, 29 minutes, 5 seconds.

The Jews, Greeks, and Romans, made use of lunar synodical months, but to avoid fractions, they confined alternately of 29 and 30 days. The former the Romans called cosis, and the Greeks κοσίον; the latter were termed pleni and ἄνθεων.

1. The Hebrew months were ranged differently in their facred and in their civil year.

Order of the sacred Year. | Order of the civil Year.
---|---
Nisan | Mar. 1 | Tisri |
Iyar | Apr. 2 | Mischnevan |
Sivan | June 3 | Caslu |
Thammuz | May 4 | Thobet |
Ab | July 5 | Sebat |
Elul | Aug. 6 | Adar |
Tisri | Sep. 7 | Nisan |
Marosevan | Oct. 8 | Yar |
Caflu | Nov. 9 | Sewan |
Tothet | Dec. 10 | Thamnus |
Sebat | Jan. 11 | Ab |
Adar | Feb. 12 | Elul |

These months being lunar cannot exactly answer to our solar months; but every Jewish month must be conceived to answer to two of ours, and partake of both. As these 12 lunar months consisted only of 354 days, the Jews, in order to bring it nearer to the true year, took care every three years to intercalate a 13th month into the number, which they called Zaddar, or the second adar. The new moon was always the beginning of the month; and it is said the Jews had people posted on elevated places, to give notice to the Scribes as soon as she made her appearance: After this proclamation was made by sound of trumpet, and the feast of the new moon, the feast of the new moon, "refounded amongst the people.

2. The months of the Athenian year, as we have before observed, consisted alternately of 29 and 30 days. The first month, according to Meton's reform of the calendar, began with the first new moon after the summer solstice, and was called Hemidoxen, answering to the latter half of June, and the former...
Each month was divided into three decades of days called ἅρμονια. The first was called μήση ἅρμωνια or ἁρμώνια, or the decade of the beginning of the month; the second was μήση μεσονία or the decree of the middle; and the third was μήση τετράδες, τετράδες or τετράδες, the decade of the expiring month.

The first day of the first decade was termed ἀρετή, because the first month began with the new moon; the second day was Ἀρετή ἀρετή, the third Ἀρετή ἀρετή, &c. The first day of the second decade was πρῶτον μεσονιά, the second πρῶτον μεσονία, &c.; the days of this decade were also called ἁρμώνια τοῦ πρῶτον, i.e. the first day, &c. after 20, because the last decade began on the 20th day. This decade was also counted by inversion thus: 

| 21st, 22nd, 23rd, and so of the last day of the month, which was called ἄρετη | 
|---|---|---|---|
| 23rd, and so of the last day of the month, which was called ἄρετη | 

The Grecian months, thus confounding of 29 and 30 days alternately, fell short of the solar year 11 days 6 hours. To remedy this defect the cycle of four years, called τέτραγωνος, was invented. In this cycle, after the first two years, they added an intercalated month called ἄρετη, confounding of 22 days; and again, after the expiration of two years more, they inserted another month of 29 days, the fourth part of a day having in the space of four years amounted to a whole day. See Year.

3. The Roman year under Romulus consisted of 10 months only, and began with March, which contained 31 days, then followed April which had 30, May 31, June 30, Quintilis 31, Sextilis 30, September 30, October 31, November 30, December 30. These 10 months containing no more than 304 days, this account was in a short time found to be deficient. Numa Pompilius, therefore, took away one day from each of his six months, April, June, Sextilis, September, October, November, December; and to the six days thus obtained he added 51, which was the number that Romulus's year, in his opinion, wanted to make it perfect. Numa had now 57 days to dispose of; he therefore divided them, and constituted two other months, January and February; the former confounding of 29 and the latter of 28 days. The month of January, which he placed at the winter solstice, he made instead of March to begin the year. Thus Numa's year confounded of 355 days: but this being found 11 days 6 hours short of the solar year, he made use of the intercalation of 90 days at the expiration of eight years perpetually: which number, being made up of the 11 days and a quarter, kept the year pretty well to its place. The beginning of the year in Julius Cæsar's time had anticipated its true place 67 whole days: these he intercalated between November and December; so that the year confided, for this one time of 15 months or 445 days. This reformation was called the Julian correction, and this year the year of confusion. At the end of 12 years, by the ignorance of priests, who did not understand intercalation, 12 days had been intercalated for nine. This was observed by Augustus Cæsar, and rectified, by ordering 12 years to pass without any intercalary days.

The order and succession of months was the same as in the calendar of the Romans, all of which were reckoned backwards. The kalends were the first day of the month. The nones fell on the seventh, and the ides on the 15th, of March, May, July, October—but in all other months the nones were on the fifth, and the ides on the 13th. For the more easy comprehension of the Roman manner of dating, according to this division of the months, here follows a table.

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N. B. Every leap-year, February confounding of 29 days, the 24th and 25th of that month are written festo Kal. Mart.; hence leap-year is called Bisextilis.
MONTIA, in botany: A genus of the trygonia order, belonging to the triandria class of plants; and in the natural method ranking with those with which the order is doubtful. The calyx is diphyllous; in corolla monopetalous and irregular; the capsule unicellular and trivalved.

MONTINIA, in botany; A genus of the tetrandria order, belonging to the dioecia class of plants. The perianthium of the male is quadridented superior; and there are four petals. The female calyx and corolla are as in the male; the filaments barren; the style bident; the capsule oblong and bicellular.

MONTME DEI, a small but strong town of France, in Luxemburg, seated on the river Chire, which deviates it into the upper and lower towns. It is 22 miles south-east of Sedan, 27 south-west of Luxemburg, and 135 north-east of Paris. E. Long. 5. 23. N. Lat. 49. 32.

MONTMORENCI (Francois Henry de.) See LUXEMBURG.

MONTMORENCY, a town of France, with the title of a duchy, remarkable for the tombs of the dukes of this name. It is seated on a hill, near a large valley, fertile in fruits, especially excellent cherries. E. Long. 2. 24. N. Lat. 48. 59.

MONTMORENCY (Anne de), a peer, marshal, and count of France, and one of the greatest generals of the 16th century, defended in 1512, the city of Menzies against the emperor Charles V., and obliged the count of Nassau to raise the siege. The following year he was made marshal of France; and in 1525, following king Francis I. into Italy, he was taken with that prince at the battle of Pavia, which was fought contrary to his advice. The important services he afterwards rendered the state were rewarded by the sword of count of France, with which he was precipitated by the king on the 10th of February 1538. He afterwards underwent various revolutions of fortune both at court and in the field. At last, being wounded at the battle of St Denis, which he gained on the 10th of November 1567, he died of his wounds two days after, at 74 years of age. It is said, that a cordelier attempting to prepare him for death, when he was covered with blood and wounds, after the battle of St Denis, he replied in a firm and steady voice: “Do you think that a man who has lived near 80 years with honour, has not learnt to die for a quarter of an hour?”

MONTPELIER, one of the handsomest towns of France, and the most considerable in Languedoc excepting Toulouse, is situated in E. Long. 4. 20. N. Lat. 45. 58. It hath a citadel, a bishop’s see, an university, a royal academy of sciences, and a mint. This town has been long famous for a fabulous, air and skilful physicians. In reality the air may be necessary in cataractous consumptions from its dryness and density; but it is too sharp in cafes of pulmonary imputations. The climate, according to some late travellers, is so much altered for the worse, that the inhabitants themselves scarce know it to be the same; it has been changing many years, and every year becomes worse and worse. It has been known to rain almost three months without interruption; and at intervals such thick smoky fogs, as nothing but the bank of Newfoundland could equal: and several times, for two or three days on a stretch, the sky is so heavily loaded, that neither sun, moon, nor star can be seen. In summer it is so insufferably hot, that till the cool of the evening there is no stirring out. Its situation, though on an eminence, never could be healthy: as between it and the Mediterranean (which is about three leagues distant) it is one continued marsh and swamp, ever covered with noxious vapours, which, when the sea-breeze sets in, blows directly on the town and the country adjacent; of the said effects of which, its unhealthy inhabitants, with their yellow meagre looks, are the most convincing proofs.

The town has nothing curious to induce a stranger to stay longer in it than three or four days, except he arrives there about Christmas; at which time it is very gay, as all the nobility of Languedoc meet there at that time to settle the affairs of the province, though it is not the capital, but effectedly near the centre. There is during that time a play, which, with an indifferent concert, are all the public amusements. The people in trade are reputed by the French themselves to be the greatest extortioners, and fure not to let a penny escape them, be the means to come at it ever so unjust; as an infallible, they had the confidence to charge an English sea officer that died there, 300 livres (twelve guineas and a half) for eight days lodging.

This city stands upon a rising ground fronting the Mediterranean, which is about three leagues to the southward; on the other side is an agreeable plain, extending about the same distance towards the mountains of the Cevennes. It is reckoned well built, and what the French call “in ferreto;” yet the streets are in general narrow and the houses dark. The inhabitants are suppos’d to amount to 40,000: they are sociable, gay and good tempered, and they trade very largely in wine cordials, oil, verdigrase, and salt-petre. They have several manufactures in silk and woollen goods. There are many Protestants here and at Nimes. The markets are well supplied with fish, poultry, butcher’s meat, and game, at reasonable rates. The wine of the country is strong and harsh; Burgundy is dear, and so is the sweet wine of Frontignan, though made in the neighbourhood of Cette. Liquors of various sorts are compounded and distilled at Montpellier. The environs are extremely pleasant, having on one side La Place de Peyrou, which forms a fine terrace. From thence, on a clear day, may be seen to the eastward the Alps, which form the frontiers of Italy; to the southward the Pyrenean mountains, which form those of Spain, each esteemed fifty leagues distant; and to the southward a most extensive view of the Mediterranean. Not far from thence is a noble aqueduct, built like two bridges one above the other; by this water is brought from a mountain at three leagues distance, into two basins in a small elegant temple at the west end of the place; and the king’s garden, where on certain days public lectures are held on botany. On the other side of the town is the episcopal, a beautiful v. 2, k. of white, bordered on each side by olive trees, from whence there is a pleasing prospect of the sea and the country adjacent to the town; near which is the citadel, a place of no strength though well walled in, as is commanded by several rising grounds, and has only a ditch. There are commonly kept there four battalions of infantry.

Kk 2 Should
M O N T R E A L, an island of north America, in the river St. Lawrence, about six leagues and a half in length, and three leagues over in the breadth parts. It belonged to the French; but was taken by the generals Amherst and Murray on the 8th of September 1760, without firing a gun. According to the terms of capitulation, all the French forces were to be sent to Old France; and consequently all Canada became subject to the Crown of Great Britain; which cession was confirmed by the peace of 1763. The soil of the island is exceedingly rich and good, producing all kinds of European fruits and vegetables in great abundance, with variety of garden fruits. The south side is the most inhabited, of course better cultivated; and besides the settlements, which are numerous, the island is adorned with villas, for the retirement of the more wealthy merchants during the summer season. No Indians are settled here; nor are they fond of settling on islands, from an hereditary distrust lest they should be cut off by the Europeans. Since this place has been in the possession of Britain, it has suffered much by fires, the houses being mostly built of wood. The town of Montreal, situated on this island, and formerly called Ville Marie, is the second place in Canada for extent, buildings, and strength; and besides possessing the advantage of a less rigorous climate; for delightfulness of situation is infinitely preferable to Quebec. It stands on the side of a hill, sloping down to the south, with many agreeable villas upon it, which with the island of St. Helen, and the river (which is here about two miles broad), form a most charming landscape. Though the city is not very broad from north to south, it covers a great length of ground from east to west, and is nearly as large and populous as Quebec. The streets are regular, forming an oblong square; the houses well built, and in particular the public edifices, which far exceed those of the capital in beauty and commodiousness; the residence of the knights hopitallers being extremely magnificent. There are several gardens within the walls, in which, however, the proprietors have consulted more than elegance, particularly the house of the Sistors of the Congregation, the Nunnery Hospial, the Recollets, Jesuits Seminary, and Governor. Besides these, there are many other gardens and beautiful plantations without the gates, as the garden of the General Hospial, and the improvements of Mr. Liniere, which exceed all the rest, and are at an agreeable distance on the north side of the town. The three churches and religious houses are plain, and contain no paintings, nor anything remarkably curious, but carry the appearance of the utmost neatness and simplicity. The city has six or seven gates, large and small; but its fortifications are mean and inconsiderable, being encompassed by a slight wall of masonry, sufficient only to overawe or prevent a surprize from the numerous tribes of Indians with whom they are surrounded, and who used to resort in vast bodies to the annual fair held here, which continued from the beginning of June till the latter end of August, when many solemnities were observed, at which the governor assisted, and guards were placed to preserve good order among such a concourse of different savage nations, all of whom are extremely fond of spirituous liquors, and when drunk commit great excesses. The fortifications were by no means capable of withstanding a regular attack; and though the garrison in 1760 consisted of eight battalions of regular troops, a numerous militia, and a great body of savages, M. Vaudreuil and Chevalier de Levis submitted without firing a gun. There are no guns mounted on the wall; only a dry ditch surrounds it, about seven feet deep, encompassed with a regular glacis. On the side of the town is a cavalier on an artificial eminence, with a parapet of logs or squared timbers and six or eight guns, called the citadel. Such is the strength of Montreal, the number of whose inhabitants may be between 5000 and 6000, extremely gay and well dressed. By the situation of the place, the inhabitants are well supplied with all kinds of river fish, some of which are unknown to Europeans, being peculiar to the lakes and rivers of this country. They have likewise plenty of black cattle, horses, hogs, and poultry. The neighbouring shores supply them with a great variety of game in the different seasons; and the island abounds with well-tafted soft springs, which form a multitude of pleasant rivulets. The city now drives a considerable trade in furs, &c. and vessels of 200 tons can come up to it. It stands 60 leagues above Quebec. 

MONTEFL, a town of Spain, in the kingdom of Arragon, with a castle, seated on the river Xiloca, 25 miles N. W. of Tervil, and 43 S. E. of Calataud. — W. Lon. 2. N. Lat. 41. 9.

MONTREUX, a town of Italy, in Sicily, and in the valley of Mazara, with an archbishop's see; seated on a rivulet, five miles W. of Palermo, and 50 N. E. of Mazara. E. Lon. 13. 13. N. Lat. 38. 14.

MONTREAL, or Mount Royal, a fortres of Germany, in the circle of the Lower Rhine, and elector of Trier; seated on the river Moelle, 22 miles N. E. of Trier. E. Lon. 7. 6. N. Lat. 49. 59.

MONTROSE, a handsome town of North Britain, in the shire of Angus, situated at the mouth of the river Esk, on the German Ocean, 26 miles north-east of Edinburgh, but 70 miles distance by road. The houses are neat, and many of them in the modern taste. The most remarkable public buildings are, the town-house, the church, and an elegant episcopal chapel. — Montrose is a parliament town, and a dukedom in the family of Graham. It stands between two rivers, the north and north Esk, over which there have been lately built two very handsome bridges, at a great expense. The salmon fisheries on these rivers are very valuable, and form a good branch of commerce.
The harbour is a fine semicircular basin defended by a handsome stone pier. A great number of trading vessels belong to this port.

Montrose (Marquis of). See Graham; and Britain. 

Montserrat, a mountain of Spain, in Catalonia, one of the most singular in the world for situation, shape, and composition. It stands single, towering over a hilly country like a pile of grotto work or Gothic spires; and its height so great, that to a beholder on the top, the neighbouring mountains appear to be sunk to a level with the plain. It is composed of steep rocks, which at a distance seem indented; whence it is said to have received the name of the Latin word *ferra* a "faw." It is impossible to describe the beauty, richness, and variety, of the landscapes discovered from the most elevated point: but the extensiveness of the prospect may be conceived by the reader, upon being told that the islands of Minorca and Majorca, which are ascribed to this holy image.

The number of professed monks, according to Mr Swinburne, is 76 (according to M. Bourgonne 60); of lay-brothers, 28; and of singing boys, 25; besides physician, surgeon, and servants. The church is a gloomy edifice; and the gilding is much filled with the smoke of 85 lamps of silver, of various forms and sizes, that hang round the cornice of the Sanctuary. Funds have been bequeathed by different devotees for furnishing them with oil. The choir above flairs is decorated with the life of Christ in good wooden carving. A gallery runs on each side of the chancel, for the convenience of the monks. A large iron grate divides the church from the chapel of the Virgin, where the image stands in a niche over the altar, below which burn four tapers in large silver candlesticks, the present of the duke of Medina Celi. In the sacristy, and passages leading it, are priests and cupboards full of relics and ornaments of gold, silver and precious stones; they point out, as the most remarkable, two crowns for the virgin and her son; of ineffable value; some large diamond rings; an excellent cameo of Meduзи’s head; the Roman emperors in alabaster; and the sword of St Ignatius. But as no offerings to this miraculous statue can be rejected or otherwise disposed of, the shelves are crowded with most whimsical 

On different parts of the mountain, as already noticed, are a number of hermitages. Each of these solitary retreats, which at a distance seem delusive of every thing, has a chapel, a cell, a well in the rock, and a little garden. The inhabitants of one of them, which is dedicated to St Beneto, has the privilege of making an annual entertainment on a certain day; on which day all the other hermits are invited, when they receive the sacrament from the hands of the mountain vicar, and after divine service dine together. They meet also at this hermitage, on the days of the saints to which their several hermitages are dedicated, to say mass, and commune with each other. But at other times they live in a very solitary and recluse manner, perform various penances, and adhere to very rigid rules of abstinence; nor do they ever eat flesh; nor are they allowed to keep within their walls either dog, cat, bird, or any living thing, left their attention should be withdrawn from heavenly to earthly affections. Most of these hermits are said to be persons of fortune and family, disguised with the world, who have retired thither to devote themselves to meditation, self denial, and contrition.

Montserrat, one of the Carribean Isles belonging to Great Britain. It is a very small, but very pleasant island, so called by Columbus from its resemblance to the famous mountain near Barcelona in Catalonia, it lies in W. Long. 61° 9'. N. Lat. 16° 50'. having Antigua to the north-east, St Christopher’s and Nevis
Moo [262] Moo

MONTERRAT to the north-west, and Guadaloupe lying south-south-east at the distance of about nine leagues. In its figure it is nearly round, about nine miles in extent every way, 27 in circumference, and is supposed to contain about 45,000 or 50,000 acres. The climate is warm, but less so than in Antigua, and is esteemed very healthy. The soil is mountainous, but with pleasant valleys, rich and fertile, between them; the hills are covered with cedars and other fine trees. Here are all the animals as well as vegetables and fruits that are to be found in the other islands, and not at all inferior to them in quality. The inhabitants raised formerly a considerable quantity of indigo, which was prior to them in quality. The inhabitants raised for.

The present situation of the island is to be found in the other heads 232 tierces of sugar. And the whole exportation of the island to Great Britain was from London and from Bristol. As to its produce, more especially of late years, has scarce any that of the sun 32 minutes 52 seconds. Its mean diameter as 15, or 2 days, 7 hours, 43 minutes, moving about 2500 miles every hour; and turns round her axis exactly in the time that she goes round the earth, which is the reason of her keeping always the same side towards us; and that her day and night taken together are as long as our lunar month.

The mean distance of the moon from the earth is 601 semi-diameters of the earth; which is equivalent to 240,000 miles. The mean eccentricity of her orbit is 774 of her mean distance, or in miles 13,000, which makes a considerable variation in that mean distance.

—Her diameter is to that of the earth as 100 to 355, as 11 to 40, 15, or 2180 miles; its mean apparent diameter is 31 minutes 161, and that of the sun 32 minutes 52 seconds. Its mean diameter as seen from the sun is 6 seconds.

The moon's surface contains 14,896,570 square miles, and its solidity 5,408,246,000 cubical ones. The density of the moon's body is to that of the earth as 48,911 to 39,214; to that of the sun, as 48,911 to 10,000; its quantity of matter to that of the earth, nearly as to 1 to 59.15: the force of gravity on its surface is to that on the surface of the earth as 139.2 to 427.8; and the moon's bulk to that of the earth as to 76 to 1. The moon has scarce any difference of feasons; because her axis is almost perpendicular to the ecliptic.

The different appearances of the moon are very numerous; sometimes she is increasing, then waning; sometimes hornsed, then semicircular; sometimes gibbous, then full and round. Sometimes, again, she illuminates us the whole night; sometimes only a part of it; sometimes she is found in the southern hemisphere, sometimes in the northern; all which variations having been first observed by Endymion, an ancient Grecian who watched her motions, she was fabled to have fallen in love with him. The source of most of these appearances is, that the moon is a dark, opaque, and spherical body, and only shines with the light she receives from the sun; whence only that half turned
turned towards him; at any instant, can be illuminated, the opposite half remaining in its native darkness. The face of the moon visible on our earth, is that part of her body turned towards the earth; whence, according to the various positions of the moon, with regard to the sun and earth, we observe different degrees of illumination; sometimes a large and sometimes a less portion of the enlightened surface being visible. — But for a particular account of the nature, phenomena, &c. of this secondary but interesting planet, see Astronomy-Index, at Moon.

New Observations on the atmosphere, Twilight, &c. of the Moon. M. Schroeter of the Royal Society of Gottingen has lately published a very curious and elaborate work in German, intitled Seleneographische Fragmente, &c. or Seleneographical Fragments, intended to promote a more accurate knowledge of the Moon’s surface. The several maps of the moon *, which have been delineated by Hevelius, Riccioli, Caffini, and Mayer, are well known to every person conversant with astronomical subjects. It is evident that these delineations can give only a very general idea of the spots, together with their relative position on the lunar disk; and as, with respect to us, the appearance of these must vary according to the direction in which the rays of the sun fall on them, the moon’s surface will not exactly correspond with the representation of it laid down in the map, except when it happens to be illuminated under the same angle as when this map was drawn. This consideration induced the author to apply himself to the invention of a more accurate mode of describing these phenomena than had hitherto been attempted. For this purpose, having provided himself with a telescope seven feet in length contrived by Dr Herchel, he resolved, repeatedly and under various angles of illumination, to observe and delineate very small portions of the lunar disk; in order that, by comparing his different drawings of the same objects, he might compile an accurate, topographical description of the moon’s surface; but, in this manner, to form a complete lunar atlas, was an undertaking too extensive for a single person. He therefore found himself obliged to prescribe more narrow limits to his design, and confined his plan to the delineation of the several portions of the moon’s surface under one angle only of illumination, and this a very small one, that he might obtain more distinct and accurate observations and drawings of the shadows; intending at the same time to examine such parts as appeared either more remarkable or less distinct than the rest, by repeated observations under various angles of illumination; and the present volume contains the result of his observations, with respect to the northern parts of the lunar disk.

The author observes, that, through a telescope which magnifies a thousand times, a lunar object of 160 feet in surface appears like a very small point; and that, to be distinguished with respect to shape, it must not be less than 300 feet in extent. He tells us, that for his observations he preferred those times when the sun’s rays fell on the moon under the least angle; that he carefully and repeatedly examined every object that could be distinguished, and either actually measured its apparent diameter and the length of its shadow, or compared these dimensions with others which he had already measured, and that he never used magnifiers of greater power than was absolutely necessary to render the object distinct. In order to facilitate the delineation, he applied to his telescope a projecting micrometer, divided into small figures, which, by means of a brass rod, could be placed at any distance from the eye, and always be kept parallel to the line of the moon’s horns. His maps or drawings are orthographical projections: and his scale is so constructed, that 20 seconds of the moon’s disk correspond with half an English inch on the map; thus the space of 4 seconds is represented in the compass of a decimal line, and, according to M. Schroeter’s computation, answers to a German mile or 3807 toises. The inconveniences and inaccuracy of the common method of measuring the lunar mountains, induced him to contrive objects capable of greater exactness and more general application: these he varied as the circumstances of the case required; but they are all trigonometrical calculations of the height of the mountain, or the depth of the cavity from the angle of illumination and from the length of the shadow.

If, as some have supposed, a great part of the moon’s surface be volcanic, it is natural to expect that the marks of eruption should from time to time be discernible. A single instance of this kind occurred to our author: ever since the 27th of August 1788, he had constantly seen a cavity, or, as he terms it, a volcanic crater, in the spot Hevelius, which he had never before perceived, though he had often examined this part of the moon with the utmost attention, and in the most favourable circumstances. According to his conjectures, this phenomenon must have commenced between the 24th of October 1787 and the 27th of August 1788.

He observed some alterations in the appearance of lunar objects, which, though too considerable to be attributed to the variation of light, were not sufficiently permanent to be considered as the effect of volcanoes. These he attributes to meteors; for though he does not suppose the moon to be surrounded with air, exactly like that which invests our globe, he thinks it probable that it may have an atmosphere of some kind, in which some of the elements of bodies, decomposed on its surface, may be suspended; and that some of the lunar mountains may emit nebulous vapours, not unlike the smoke of our volcanoes, which obscure and disguise the objects seen through them.

In regard to those bright points, which have been seen on the moon’s surface during eclipses, and at other times on her unenlightened part, and which some have supposed to be burning volcanoes; Schroeter, after the most attentive examination of them, imagines that most of them must be ascribed to the light reflected from the earth to the dark part of the moon’s disk, which returns it from the tops of its mountains, under various angles, and with different degrees of brightness. Some of these phenomena he supposes to be no more than optical illusions, arising from igneous meteors floating in our atmosphere, which happen to fall within the field of the telescope.

But the most interesting part of this work consists of the author’s “Remarks on the Formation and physical Constitution of the Moon’s Surface and Atmosphere.”
The surface of the moon appears to be much more unequal than that of our earth; and these inequalities have great variety both in form and magnitude. There are large irregular plains, on which are observed long and narrow strata of hills running in a serpentine direction; some of the mountains form extensive chains; others, which are in general the highest, stand alone, and are of a conical shape: some have craters; others form a circular ring enclosing a plain; and in the centre of many of these plains, as well as in the middle of some of the craters, other mountains are found, which have likewise these craters. These mountains are various with respect to colour, some being much darker than others.

The loft lofty mountain on the surface of our globe is supposed to be Chimboraco, which is not 20,000 feet in height: but there are many in the moon which are much higher; that which is distinguished by the name of Leibnitz, is not less than 25,000 feet. This elevation will appear more extraordinary, if compared with the moon's diameter, of which it is \( \frac{1}{4} \) th, whereas Chimboraco is not above \( \frac{1}{5} \) th of that of the earth; thus considered, the lunar mountains are near five times as high as any on our globe.

The craters of the moon are circular, and surrounded with an annular bank of hills; they are remarkable for their width, many of them being from 4 to 15 geographical miles in diameter: some are not deeper than the level of the moon's surface; others are 9000, 12,000, and 15,000 feet in depth, that of one, which our author calls Bernouilli, is above 18,000 feet. The height of the annular bank is seldom equal to the depth of the crater which it surrounds; but the quantity of matter in the one appears to be in general nearly equal to the capacity of the other. The principal mountains and cavities seem to be connected by a series of others of less magnitude; and sometimes by hilly strata, which, like the radii of a circle, may be traced to a common centre; this is generally either a mountain or crater, though not of the greatest height or depth.

These hilly strata, which, through smaller telescopes, appear like veins on the moon's surface, have often been mistaken for torrents of lava; none of which, however, do prevent its refracting the solar rays, having pointed out the circumstances, that the mountains in the dark hemisphere of the moon, near its luminous border, which are of sufficient height to receive the light of the sun, are the more feebly illuminated the more distant they are from that border; from which proofs of a refracting atmosphere, he also deduced the probability of the existence of a faint twilight, though his long series of observations had not yet fully evinced it. He had however, ascertained the existence of a twilight on Venus; and as one fortunate discovery often leads to another, he had no sooner succeeded in his observations on that planet, than he was induced to direct his attention, for a similar purpose, to the moon. In doing this, he applied the calculations and inferences he had made to some appearances he had already noticed on this satellite. It occurred to him, that if in fact there were a twilight on the moon, as there is on Venus and our earth, it could not, considering the greater rarity of its atmosphere, be so considerable: that the veils of it, allowing for the brightness of the luminous part of the moon, the strong light that is thence thrown upon the field of the telescope, and in some measure the reflected light of our earth, could only be traced on the limb, particular
fully at the cusps; and even this only at the time when our own twilight is not strong, but the air very clear, and when the moon, in one of its last phases, is in a high altitude, either in the spring, following the Moon two days after a new moon; or in the autumn, preceding the sun in the morning, with the same aspect: in a word, that the projection of this twilight will be the greater and more perceptible the more elevated the phase, and the higher the moon above the horizon, and out of our own twilight.

All the requisite circumstances do not often coincide. M. Schroeter, Fragment, p. 120, was so fortunate as to be favoured with a combination of them on the 24th of February 1793. And, the observation proved in every respect to complete, and the inferences deducible from it appeared to him so new and interesting, that he could not with hold the immediate communication of it to the public. His observations concerning both the Moon and Venus have been accordingly detailed in a paper sent to the Royal Society of London, and inserted in their Transactions for 1792; from which the following respecting the Moon are extracted.

"On the abovementioned evening, at 5h 40', two days and 12 hours after the new moon, when in consequence of the liberation the western border of the grey surface of the Marc Crater was 1° 20' distant from the western limb of the moon, the air being perfectly clear, I prepared my seven-feet reflector, magnifying 74 times, in order to observe the first clearing up of the dark hemisphere, which was illuminated only by the light of our earth, and more especially to ascertain whether in fact this hemisphere, which, as is well known, is always in what more luminous at the limb than in the middle, would emerge out of our view at many parts at once, or first only at the two cusps. Both these points appeared now, most distinctly and distinctly, tapering in a very sharp, faint, scarse anywhere interrupted, prolongation; each of them exhibiting, with the greatest precision, its farthest extremity faintly illuminated by the solar rays, before any part of the dark hemisphere could be distinguished. But this dark hemisphere began soon after to clear up at once at its border, though immediately only at the cusps, where, but more particularly at their points, this border displayed, on both at the same time, a luminous margin, above a minute, breadth, of a very pale grey light, which, compared with that of the farthest extremities of the cusps themselves, was of a very different colour, and relatively as faint as the twilight I discovered on the dark hemisphere of Venus, and that of our own earth, when compared with the light immediately derived from the sun. This light, however, faded away so gradually towards the cusp, as to render the border on that side perfectly undefined, the termination losing itself imperceptibly in the colour of the sky.

"I examined this light with all possible care, and found it of the same extent at both points, and fading away at both in the same gradual proportion. But I also, with the same caution, explored whether I could distinguish any part of the limb of the moon farther towards the cusp; since, if this crepuscular light had been the effect of the light reflected from our globe, it would undoubtedly have appeared more sensibly at the parts most remote from the glare of the illuminated hemisphere. But, with the greatest exertion of my visual powers, I could not discover any part of the, as yet, wholly darkened hemisphere, except one single speck, being the summit of the mountainous ridge Leibnitz, which was then strongly illuminated by the solar light; and indeed eight minutes elapsed before the remainder of the limb became visible; when not only separate parts of it, but the whole, displayed itself at once.

"This alone gave me certain hopes of an ample recompence and satisfied me that the principles I had laid down in my Selenotop, Fragm. § 555, et seq., concerning the atmospheres of the planets, and especially of the moon, are founded on truth. But a similar observation made on the 6th, after seven o'clock, afforded me several collateral circumstances, which strongly corroborate what I have there advanced on this subject. The whole limb of the dark hemisphere, illuminated only by the reflected light of our globe, appeared now so clear and distinct, that I could very readily discern not only the large but also the smaller spots, and among these Pluto, Arilarchus, Menelaus, Mussius, Copterius, &c. and even the small speck to the north-west of Arilarchus, marked Tab. XXVII. fig. 1. of the Fragments. I could apply the usual power, magnifying 161 times; and had full leisure, and the means, to examine everything carefully and repeatedly, and to take very accurate measurements.

"Although a just idea of so delicate a phenomenon as this crepuscular light cannot possibly be conveyed by a drawing, but must be gathered from actual inspection, I have, nevertheless, attempted a delineation of it, and of the southern and eastern cusps, fig. 1, and 2, as deduced from my measurements, especially at the southern cusp, in hopes thereby to render what I have farther to say concerning this observation more intelligible.

"The southern cusp (fig. 1.) extended from a to c, with a gradually fading but still resplendent solar light, of its usual pale yellow colour, and terminated at c with a mountain. That this was really the point of the cusp, appears not only from the general configuration of the falcated segment, which was sufficiently narrow even at its beginning at a, near which it was somewhat digged at b by a high mountain, but also from the narrower of its luminous curve at d and f, the breadth of which seldom exceeded 1°, and had a sensible interruption so near as a. This curve was throughout, from a to c, except where the glare of the solar rays spread some degree of light, bordered with the pale ash colour of the dark hemisphere, glimmering with the faint light reflected from our earth; out of which, however, rose the higher mountains g, h, i, c, which were now already illuminated by the sun; and farther on, not less than 30 lines, or, according to my usual projection, two minutes distant from the point c, was seen another mountain k, which belonged to the high ridge Leibnitz, and also received its light immediately from the sun.

"There can hence be no doubt of the termination of the cusp being at e; and this being well ascertained, I now distinguished with the greatest certainty the twilight extending from c to k. The most remarkable circumstances attending this light were, that it was
prominent, the arc, as yet situated in the dark hemisphere.

Thus far the observations; and now for the application of them.

I need hardly insist upon the proofs, that the very faint pyramidal glimmering light observed on the 24th of February at the extremities of both cups, could by no means be the immediate effect of the solar light; all the circumstances of the observations militating uniformly and decidedly against this supposition, which, were it true, would oblige us to admit a most unaccountable diminution of light, and thence also a density of the lunar atmosphere, that ought to exceed even the density of ours; a fact absolutely contradicted by all the lunar observations hitherto made. This light, indeed, was so very faint, that it disappeared at 7° 20', when the moon approached the horizon; whilst, on the other hand, Aritharchus, which had no light but what it received from the earth, was still very distinguishable; and the summit of Leibnitz (fig. 1, which, though far within the dark hemisphere, was, however, illuminated by the immediate solar rays) displayed a degree of brightness, which, although when compared with that of the cup d e f, it appeared very faint and dwindling, equalled, however, that of our Peak of Teneriff. Nor can it be conceived why this glimmering light broke off so suddenly at both the cups, without a progressive diminution. It can hardly be supposed, that similar, grey, prominent, flat areas, of the same form and dimensions, and comparatively of a faint light, which, whilst in the dark hemisphere, they derive immediately from the sun, exist on all parts of the moon; more especially as, at the places observed, the limb happened to exhibit throughout an exact spherical form, without the least sensible inequality; and as in both the bordering regions of the northern and southern hemispheres, especially in the latter, no such grey prominent planes are any where discernible. It may then be asked, why did this faint glimmering light appear at both cups, along equal arcs of the limb, of equal length and breadth, and of the same pyramidal form? and why did its farther extremity blend itself with the terrestrial light of the dark hemisphere, which, according to a great number of my selenotopo-graphic observations, is by no means the case, even with those grey prominent areas, which, being at some distance on the dark side of the terminating border, are nevertheless illuminated immediately by the sun?

Thence, therefore, could certainly not derive their light immediately from the sun; whence this appearance, like the similar ones on the planet Venus, can only be ascribed to the solar rays reflected by the atmosphere of the moon upon those planes, producing on them a very faint, gradually diminishing, glimmering light, which at last loses itself in the reflected terrestrial light, in the same manner as our twilight blends itself with the light of the moon. Every circumstance of the above observation seems to me to confirm this supposition; and hence the observation itself, which, though fingle, was however a most fortunate and complete one, must appear of no small degree of importance, since it not only confirms the observations and inferences on the long contested lunar atmos...
...atmosphere contained in my Selenotop. Fragn. but also furnishes us with many more lights concerning the atmosphere of planets in general than had been afforded us by all those observations collectively.

This, and the mathematical certainty that the phenomenon is in fact nothing but a real twilight in the lunar atmosphere, he further evinces by a series of theoretical deductions and calculations, which do not admit of being here stated. Among other results, it appears, that the lower and more dense part of the lunar atmosphere, which has the power of reflecting this bright crenular light, is only 1356 Paris feet in height, and hence it will clearly be explained, according to the different librations of the moon, ridges of mountains, even of a moderate height, situated at or near the terminating character, may partially intercept, or at times wholly prevent, this crenular light, either at one or the other cup, and sometimes at both. "I cannot hence (says our author) but consider the discovery here announce as a very fortunate one, both as it appears to me decisive, and as it may induce future observers to direct their attention to this phenomenon. Admitting the validity of this new observation, which I think cannot well be called in question, I proceed now to deduce from it the following inferences.

1. It confirms, to a degree of evidence, all the selenotopic observations I have been so successful as to make on the various and alternate changes of particular parts of the lunar atmosphere. If the inferior and more dense part of this atmosphere be in fact of sufficient density to reflect a twilight over a zone of the dark hemisphere 2° 34', or 16½ geographical miles in breadth, which shall in intensity exceed the light reflected upon its dark hemisphere by the almost wholly illuminated disk of the earth; and if, by an accidental computation, this dense part be found to measure 1356 feet in perpendicular height, it may, according to the frigid analogy, be ascertained, that the upper, and gradually more rarified frata, mufl, at least, reach above the highest mountains in the moon. And this will appear the more evident, if we reflect, that notwithstanding the inferior degree of gravitation on the surface of the moon, which Newton has estimated at somewhat less than one-fifth of that on our earth, the lower part of its atmosphere is nevertheless of so considerable a density. This considerable density will, therefore, fully account for the diminution of light observed at the cups, and on the high ridges Leibnitz and Doerfel, when illuminated in the dark hemisphere; as also for the several obstructions and returning serenity, the eruptions, and other changes, I have frequently observed in the lunar atmosphere. This observation also implies:

2. That the atmosphere of the moon is, notwithstanding this considerable density, much rarer than that of our earth. And this indeed is sufficiently confirmed by all our other lunar observations. I think I may assert, with the greatest confidence, that the clearer part of our twilight, when the sun is 4° below our horizon, and when we can conveniently read and write by the light we receive from it, surpasses considerably in intensity the light which the almost wholly illuminated disk of our earth reflects upon the dark hemisphere of the moon 2½ days before and after the new moon. But should we even admit an equal degree of intensity, it will, however, appear from computation, that our inferior atmosphere, which reflects as strong a light over 4° as that of the moon does over 2° 34', of their respective circumstances, must be at least eight times higher than that of the moon.

3. The striking diminution of light I noticed in my twelve years observations on Venus, likewise indicates, that the atmosphere of that planet, which in many respects similar to ours, is much denser than that of the moon, and that it will be still further corroborated, if we compare together the several measurements and computations made concerning the twilights of different planets. There is no doubt but that the faintest twilight of Venus, as seen either before or after the rising and setting of the sun across our twilight, is much brighter than that of the moon; and it appears, moreover, from computation, that the denser part of the atmosphere of Venus measures at least 15000 Paris feet in height, and spreds its twilight 67 geographical miles into the dark hemisphere, whilst the denser part of the lunar atmosphere, whose height does not exceed 1356 feet, produces a faint twilight not above 10½ geographical miles in breadth. Thus, as my successful observations on the twilight of Venus led me to the discovery of that of the moon, so did these latter reciprocally confirm the former; and thus, which ever way we contemplate the subject, must we be struck with the coincidence that prevails throughout.

4. But if the lunar atmosphere be comparatively so rare, it follows, that the inflection of light produced by it cannot be very considerable; and hence does the computation of M. Du Sejour, according to which the inflection of the four rays which touch the moon amounts to no more than 4½", receive an additional degree of authenticity. Besides which,

5. As the true extent of the brightest lunar twilight amounts to 2° 34', the obliquity of the ecliptic in the moon only to 1° 29'; the inclination of the orbit of the moon, on the contrary, to 5° 15', and its synodic period, during which it performs a revolution around its axis of 12h. 18; it follows, that its brightest twilight, to where it loses itself in the light reflected by the almost fully illuminated disk of our earth, must, at least at its nodes, last 2½, and that it will be still longer at other parts of the orbit, according to the situation of the nodes.

6. And lastly, it being a well known fact that the fixed stars, as they approach the moon, diminish in splendor at the most only a very few seconds before their occultations, it was natural for me, after the successful observations I had made on the twilight of the moon, to pay particular attention to this circumstance. On the 25th of February, at 6h. P.M. the sky being very clear, the limb of the dark part of the moon appeared uncommonly distinct; and only a few seconds of a degree from its edge was seen a telescopic star of about the 10th or 12th magnitude. I counted full 206° before its occultation, and 18½ of the same, without the least perceptible diminution of light. The star, however, began now gradually to fade, and after the remaining 1½, during which I observed it with all possible attention, it vanished in an instant. This observation agrees perfectly with the above computations.
The principal zone $dd$; and at $l$ a still more remarkable, circular, though imperfectly defined spot, somewhat brighter than the luminous interval between the zones, and perfectly similar to the remarkable luminous spot which I had observed in 1786 and 1787 on the same part of Jupiter, and which then led me to some very unexpected inferences concerning the atmosphere of that planet.

"These favourable circumstances led me to the following accurate observation, which I was certain would prove instructive to me. At 10th. 43° 50' I faw the spot $f$ at the middle of its parallel; and im-fig. 6. mediately after began the occultation; than which a more distinct and beautiful one was perhaps never seen.

"Immersion. The western, preceding, first satellite, disappeared behind the sharp bright limb of the moon, at 10th. 43° 12'.

The second satellite disappeared, without becoming at all indistinct, exactly at 10th. 44° 19'.

The western limb of Jupiter came in contact, most distinctly, with the eastern limb of the moon, at 10th. 46° 32' 1/5.

Jupiter's eastern limb disappeared, as distinctly, at 10th. 48° 20' 35'. This immersion took place, as represented in fig. 6, to the eastward of Aritharchus, at about the 27th degree of north latitude.

"The third satellite disappeared, after having been for about one or two seconds faint and indistinct, at 10th. 58° 57' 5'.

"The fourth satellite, which appeared the least of them all, became undiscernible near the limb, and vanished at about 11th. 2° 16'.

"Emerision. The two preceding first and second satellites were here likewise of use in determining precisely the emersion of both the limbs of Jupiter from the dark hemisphere of the moon.

"The first appearance of Jupiter's western limb was very distinctly at 11th. 43° 34'.

"Emerison of the eastern limb, as distinctly, at 11th. 45° 39' 5'. This emersion took place, as represented in fig. 7, to the north-eastward of Seneca (B. Tab. VIII. of the Frag.), at about the 23rd degree of north latitude.

"The emersion of the next, or third satellite, was not observed.

"That of the fourth was distinctly at 11th. 59° 1'.

"This observation gave me the more satisfaction, as it singularly contributed to confirm the discovery I had been so fortunate as to make of the twilight in the moon, and the height and density of the lower strata of its atmosphere.

"Experience has sufficiently proved, that a stronger will ever obscure a fainter light; and it follows hence, that the light of a bright flare approaching the moon, when full or nearly so, will lose something of its luster; but little can be inferred in favour of, an atmosphere either of the Moon or of Mars, from the observation of Cassini; in which, as Dr. Herchel has illustrated by some observations of his own, a flare in Aquarius, Phil. of the sixth magnitude, and as yet six minutes distant from Mars, diminished in light when both were seen, in the same field of the telescope. A mere apparent diminution of light, occasioned by the glare of a larger luminous object, when seen at the same time with a smaller
and another thing is a real indistinctness of the small luminous body, which increases in proportion as they approach nearer to each other.

"It was very natural for Jupiter to diminish in brightness when it approached so near to the moon, then almost at its full, as to be seen at the same time in the field of the telescope, which was in fact the circumstance of this observation: but I could not observe any progressive variation of light in the eastern and western, equally luminous, disks, proportional to their distances from the limb of the moon, much less a real indistinctness: and this neither when the limbs of the two planets were nearly in contact, nor when Jupiter was partly, or about one half covered by the moon.

"It was a sight truly gratifying to an eye accustomed to the light of the moon, or in general to familiar observations, to behold how Jupiter, at its immersion as well as emersion, being half or more than half covered by the moon, exhibited its belts and other parts as distinctly close to the limb of the moon as it does at some distance from it? and had I not already succeeded in numerous observations on the atmosphere of the moon, and very recently in those which enabled me to determine its twilight, I should perhaps have adopted the doubts the ancient astronomers entertained concerning the existence of a lunar atmosphere; and this the rather, as when Jupiter in its immersion was so far covered, that the luminous spot /, fig. 5., was close to the moon, I could plainly distinguish this spot, although it be in itself by no means very perceptible.

"Such, however, must have been the appearances, according to my new observations and measurements of the twilight of the moon; for if it be proved, that the extent of this twilight, to where it loses itself in the light reflected from the almost wholly illuminated disk of our earth, amounts to no more than an arc of 2° 34' of the circumference of the moon, and if it be hence demonstrable, that its greatest dilution does barely amount to 5° 8', and the perpendicular height of that part of the lower more condensed stratum of its atmosphere, which is capable of reflecting the solar rays, and of producing some other, perhaps more remarkable obclusions in the stars seen through it, does not exceed 5000 Paris feet, and hence cannot reach above one second of a degree above the limb of the moon: we need not wonder that so small a magnitude which loses itself in the inequalities of the limb, many parts of which are known to be considerably mountainous, should not become sensible, especially at the approach of a body of so large a diameter as Jupiter, and when so small a magnifying power is applied. And thus may I with confidence assert a perfect coincidence between this and my many other observations.

"The appearance, fig. 8., when Jupiter, at the emersion, the objects being particularly sharp and defined, came forth from behind the moon, which now covered no more than one-quarter of its diameter, was truly splendid and satisfactory: and I must here particularly mention the circumstance, that the part of the moon's dark hemisphere, between its bright terminating edge m n and its outer limb, bordering upon the emerging planet o p, was particularly opaque and hence produced a very striking effect.

"I omit entering here upon any further considerations; and shall conclude with observing, that, after the occultation was completely ended, the luminous spot had at 12h. 1' fo far advanced in its parallel d e as to have reached to within j, or at most y, of its whole length of the western limb; and that on the 28th of March, five days after a new moon; I observed an occultation of a very distinct, though telescopic, flare, by the dark hemisphere of the moon; in which, agreeably to the above observation, not the least gradual diminution of light or indistinctness could be perceived, the flare being seen to vanish on a sudden.

**Influence of the Moon on the human body, the weather, &c.** The vulgar doctrine concerning the influence of the moon on the changes of weather is very ancient, and has gained credit among the learned without sufficient examination; but it seems now to be pretty generally exploded by philosophers, as equally delusive of all foundation in physical theory, and unsupported by any plausible analogy. The common opinion is, that the lunar influence is exerted at the syzygies and quadratures, and for three days before and after each of these epochs. There are 24 days therefore, in each synodic month, over which the moon at this rate is supposed to predile; and as the whole conflicts but of 29 days 12 ½ hours only 55 days are exempt from her pretended dominion. Hence, though the changes of the weather should happen to have no connection whatever with the moon's aspects, and they should be distributed in an equal proportion through the whole synodic month, yet any one who shall predileat, that a change shall happen on some one of the 24 days aligned, rather than in any of the remaining 55, will always have the chances 24 to 55 in his favour. Men may, therefore, easily deceive themselves, especially in so unsettled a climate as ours. Moreover, the writers who treat of the signs of the weather, derive their prognostics from circumstances which neither argue any real influence of the moon as a cause, nor any belief of such an influence, but are merely indications of the state of the air at the time of observation: such are, the phase of the horns, the degree and colour of the light, and the number and quality of the luminous circles which sometimes surround the moon, and their circumstances attending the disappearance. (See the *Astronomy of Aratus* and the *Sphæra of Theon.* ) The vulgar soon began to consider these things as causes: which had been proposed to them only as signs: and the notion of the moon's influence on all terrestrial things was confirmed by her manifest effect upon the ocean. See, on this subject, Phil. Trans. vol. Ixv. part 2. p. 178. &c.

The famous Dr Mead was a believer in the influence of the sun and moon on the human body, and published a book to this purpose, intituled *De Horologiis Sihla in Lunae in Corpore Hominis*; but this opinion has been exploded by most philosophers as equally unreasonable in itself, and contrary to fact. As the most accurate and reliable barometer is not affected by the various positions of the moon, it is not thought likely that the human body should be affected by them. Several learned and ingenious men, however, still considered Dr Mead's doctrine as far from being unfounded.

**Herop. Moon.** It is remarkable, that the moon, during the week in which she is full in her harvest, rises, for...
Moon. 

The MooN-Cock, or Moon-Eye, in the manage. A horse is said to have moon-eyes when the weakness of his eyes increases or decreases according to the course of the moon; so that in the waxing of the moon his eyes are muddy and troubled, and at new moon they clear up; but still he is in danger of losing his eye-light quite.

Moonstone, a genus of siliceous earths, of a clear white colour: approaching to that of milk. When looked at in a certain position, it reflects a strong light like mother-of-pearl; in others, it shows spots of a carnation colour. It is found in pieces with obtuse angles, sometimes of a quadrangular figure. When broken, it appears evidently foliated. According to Werner it agrees in hardness and most other respects with feldspar. He tells us, likewise, that it is probably the andromal of Pline, the common giraffe of the Italians, and the excent by some time; he tells us it is clasped with the opal, and sometimes with the cat's eye. According to M. Magellan, this stone is of the chalcedony or pseudo-opal kind: it reflects a whitish light, with some various shades of few intermixed colours on a bluish bottom, like the face of the moon when high enough not to appear reddish by the interposition of earthy vapours. The iris, or rainbow-stone, seems to be no other than a moon-stone in which the yellow, purple, and blue rays are most conspicuously reflected. When looked at, it appears of a reddish brown; but on holding it in the light of the sun, we discover the figure of a rainbow. There are, however, several other stones which have the same appearance in the sun's light.

Moonwort in botany. See Lunaria.

MOOR (Sir Karel de), a capital painter of portraits, histories, and conversations, was born at Leyden, in 1656; and at first was a disciple of Gerard Douw, with whom he continued for a considerable time. He afterwards lodged successively under Abraham Vanden Tempel, Francis Meris, and Godfrey Schalcken. As soon as he began to follow his profession, the public in a short time did justice to his extraordinary merit; and he took the most effectual method to establish his reputation, by working with a much stronger desire to acquire fame than to increase his fortune. According to Mr. Pilkington, he painted portraits in a beautiful style, in some of them imitating the tate, the dignity, the force, and the delicacy of Vandyck; and in others, he shewed the fireking effect and spirit of Rembrandt. His pictures were always neatly and highly finished; he designed them excellently, and grouped the figures of his objects with great skill; his works were universally admired; and some of the most illustrious princes of Europe seemed solicitous to employ his pencil. The grand duke of Tuscany desired to have the portrait of De Moor, painted by himself, to be placed in the Florentine gallery; and on the receipt of it, that prince sent him in return a chain of gold and a large medal of the same metal. The imperial ambassador count Sinzendorf, by order of his master, engaged him to paint the portraits of Prince Eugene and the duke of Marlborough on horseback; and in that performance, the dignity and expression of the figures, and also the attitudes of the horses, appeared so masterly, that it was beheld with admiration, and occasioned many commendatory poems in elegant Latin verse to be published to the honour of the artist; and the emperor, on seeing that picture, created De Moor a knight of the holy Roman empire. He likewise had the honour to paint the portrait of Peter the great czar of Muscovy; and an extraordinary number of other portraits, for which he received very large prices.—His historical paintings were admirable; although he most frequently was employed to paint in a large size, yet he often painted small easel pictures, with subjects of history or conversations; and these are exceedingly valued, having all the merit of neat pencil and soft colouring added to an elegant taste of design. He died in 1738.

Moor, in country affairs, denotes an unlimited tract of land, usually over-run with heath.

Moor-Cock, or Mooy-cock, in agriculture, is a black, light, and sooty earth, very loofe, and without any admixture of stones; and with very little clay or sand.

The uppermost stratum of the fen-lands is usually of this earth, and it commonly constitutes a moderately thick or deep bed. Intermixed with water it cannot easily be worked up into a pafte: and when with labour worked up into somewhat of a firm mass, its surface appears spongy and porous; and as soon as dry, it easily moulders away to powder.

It is usefully soft to the touch, unless it be worked very closely between the fingers; then it throws a mixture of a small quantity of sand, both to the touch and to the eye. It seems indeed to confit almost entirely of pure vegetable matter; and this lying in such plenty on the surface of the fen-lands is the cause of their being so very fertile.

The great disadvantage of the places which have this soil, is their being liable to be glutted with water; and to remedy the inconveniences arising from thence, the farmers who rent these land have a custom of burning the soil at proper seasons. It burns very freely and easily, the surface readily catching flame: and a substance somewhat bituminous, usually contained among the soil, helps the burning.

MOURE, or Mores, (Edward), a late ingenious writer, was bred a linen-draper but quitted business to join the retinue of the muses: and he certainly had a very happy and pleasing talent for poetry, in his Trial of Selin the Periyan, he complimented lord Lyttleton in an elegant kind of panegyrick, couched under the appearance of accusation; and his Fables for the female sex, for easy verification, poigniant satire, and striking morals, approach nearer to the manner of Gay than any other of the numerous imitations of that author. He wrote, also three dramatic pieces? The Gamester, a tragedy; the Foundling, and Gil Blas, comedies. The success of these was not such as they merited; the first of them having met with a cold reception,
MOORING, for no other apparent reason but because it
too nearly touched a favourite and fashionable vice:
and the second having been condemned for its supposed
resemblance to Sir Richard Steele's Conciouat lovers,
but to which good judges have been inclined to give
it greatly the preference. Mr. Moore married a lady
of the name of Hamilton, daughter to Mr. Hamilton
table-decker to the princesses; who had herself a very
poetical turn, and has been paid to have assisted him
in the writing of his tragedy. One specimen of her
poetry, however, was handed about before their
marriage, and has since appeared in print in different
collections of songs, particularly in one called the Gold
finch. It was addressed to a daughter of the famous
Stephen Duck; and begins with the following stanzas:

Would you think it, my Duck? (for the fault
Your Jenny at last is quite covenanted grown.
The' millions if Fortune should lavishly pour,
I shall 'tis writ; if I had not more.

And after half a dozen stanzas more, in which, with
great ingenuity and delicacy, and yet in a
manner that expresses a sincere affection, she has quibbled
on our author's name, she concludes with the following lines:

You may wonder, my girl, who this dear one can be,
Whose merit can besti such a conquest as mine?
But you shant know his name, tho' I told you before,
It begins with the M, but I dare not say More.

In the year 1753, Mr. Moore commenced a weekly
miscellaneous paper intitled 'The World,' by Adam Fitz-
Adam; in which undertaking he was assisted by Lord
Chesterfield with some effays. This paper was collected
into volumes, and Mr. Moore died soon after.

MOORING, the act of confining and securing a
ship in a particular station, by chains or cables, which
are either fastened to the adjacent shore, or to anchors
in the bottom,

A ship may be either moored by the head, or by
the head and stern: that is to say, she may be secured
by anchors before her, without any behind; or she
may have anchors out, both before and behind her;
or her cables may be attached to posts, rings, or
moorings, which answer the same purpose.

When a ship is moored by the head with her own
anchors, they are disposed according to the circum-
stances of the place where she lies, and the time she is
to continue therein. Thus wherever a tide ebbs
and flows, it is usual to carry one anchor out towards
the flood, and another towards the ebb, particularly
where there is little room to range about; and the
anchors are laid in the same manner, if the vessel
is moored head and stern in the same place. The
situation of the anchors, in a road or bay, is usually
opposed to the reigning winds, or those which are most
dangerous; so that the ship rides therein with the
effort of both her cables. Thus if the ebb rides in a bay,
or road, which is exposed to a northerly wind and
heavy sea from the same quarter, the anchors plying
from the opposite bows ought to lie ebb and well from
each other; hence both the cables will retain the ship
in her station with equal effort against the action
of the wind and sea.

Moorings, in sea-language, are usually an assem-
bly of anchors, chains, and bridles, laid athwart
the bottom of a river or haven, to ride the shipping con-
tained therein. The anchors employed, on this occa-
sion have rarely more than one fluke, which is sunk
in the water near low-water mark. Two anchors
being fixed in this manner in the opposite side of
the river, are furnished with a chain extending across
from one to the other. In the middle of the chain is
a large square link, whose lower end terminates in a
twist, which turns round in the chain as about
an axis, whenever the ship veers about with the change
of the tide. To this twist link are attached the
bridles, which are short pieces of cable, well served,
whose upper ends are drawn into the ship at the
mooring-ports, and afterwards fastened to the masts
cable-bolts. A great number of moorings of this
kind are fixed in the harbours adjacent to the English
dock-yards, as Deptford, Chatham, Portsmouth,
Plymouth, &c.

MOORLANDS, a tract so called, in the north
part of Staffordshire, where the land rises gradually
into small hills, which run through the midst of Eng-
land in one continued ridge, rising higher and higher
to Scotland, and bounding many rivers. The soil
here is so foul and cold, that the know lies almost all
the year on the tops of the hills; and it is with very
rugged and barren: this, however, yields plenty of coal,
lead, copper, rance-marble, and mill-stones; and some
of the limestone hills bear such a sweet though short
grafs, as is very grateful to the oxen, of which there
is a very good breed. It is observed here, that the
wet wind always brings rain, and the eart and south
fair weather; that though this tract is full of bogs,
it is as healthy as any other part of the country; and
that it produces the same plants as the Peak of Derby.

MOORS. See Morocco.

Moors, in the Isle of Man, those who summon
the courts for the several headings; such as the lord's
bailiffs. Every Moor has the life office with the
English bailiff of the hundred.

MOOSE, or Elk. See Cervus.

MOOT, a difficult cafe, argued by the young bar-
rif ters and students at the inns of court, by way of
exercise, the better to qualify them for practice, and
to defend the causes of their clients. This, which is
called mootings, is the chief exercise of the inns of
court. Particular times are appointed for the arguing
moot-cafes: the place where this exercise is performed
was anciently called moot-hall; and there is a bailiff,
or surveyor of the moots, annually chosen by the
bench, to appoint the moot-men for the inns of cham-
cery, and to keep an account of the performance of
exercises. The word is formed either from the Saxon
mootan, gemootan, "meeting," or from the French me-
"word."

MOPSUS (fab. hist.), a celebrated prophet, son of
Manto and Apollo during the Trojan war. He was
confounded by Amphimachus, king of Colophon, who
wished to know what successes would attend his arms
in a war which he was going to undertake. He pre-
dicted the greatest calamities; but Calchas, who had
been a foothatter of the Greeks during the Trojan
war, promised the greatest felucca. Amphimachus
followed the opinion of Calchas; but the prediction
of Mopsus was fully verified. This had such an effect
upon Calchas, that he died soon after. His death
MORAI, in botany: A genus of the monogynia order, belonging to the triandria class of plants; and in the natural method ranking under the 6th order, Enfata. The corolla is hexapetalous; the three interior petals patent, the reft like those of the iris.

MORAI, is the name given at Otaheite in the South Sea to their burying-grounds, which are also places of worship. This is a pile of stone raised pyramidal upon an oblong base or square 267 feet long and 97 wide. On each side is a flight of steps; those at the sides being broader than those at the ends; so that it terminated not in a square of the same figure with the base, but in a ridge like the roof of a house. There were 11 of these steps to one of these morais, each of which was 4 feet high, so that the height of the pile was 44 feet; each step was formed of one course of white coral stone, which was neatly squared and polished; the rest of the mafs (for there was no hollow within) consisted of round pebbles, which from the regularity of their figure seemed to have been wrought. The foundation was of rock-stones, which were also squared. In the middle of the top flood an image of a bird carved in wood, and near it lay the broken one of a fifth carved in stone. The whole of this pyramid made part of one side of a spacious area or square 360 feet by 324, which was walled in with stone, and paved with flat stones in its whole extent. About 100 yards to the west of this building was another paved area or court, in which were several small mafs raised on wooden pillars about 7 feet high, which are called by the Indians ewattas, and seem to be a kind of altars, as upon these are placed provisions of all kinds, as offerings to their gods. On some of them are seen whole hogos, and on others the skulls of above 90, besides the skulls of many dogs. The principal object of ambition among the natives is to have a magnificent morai. The male deities (for they have them of both sexes) are worshipped by the men, and the female by the women; and each have morais, to which the other sex is not admitted, though they have also morais common to both.

MORAL PHILosophY, OR MORAls.

Moral Philosophy is, "The science of manners of duty; which it traces from man's nature and condition, and flows to terminate in his happiness." In other words, it is "The knowledge of our duty and felicity;" or, "The art of being virtuous and happy.

It is denominated an art, as it contains a system of rules for becoming virtuous and happy. whoever practises these rules, attains an habitual power or faculty of becoming virtuous and happy. It is likewise called a science, as it deduces these rules from the principles and connections of our nature, and proves that the observance of them is productive of our happiness.

It is an art, and a science, of the highest dignity, importance, and use. Its object is man's duty, or his conduct in the several moral capacities and connections which he sustains. Its office is to direct that conduct; to show whence our obligations arise, and where they terminate. Its use, or end, is the attainment of happiness; and the means it employs are rules for the right conduct of our moral powers.

Moral Philosophy has this in common with Natural Philosophy, that it appeals to nature or fact; depends on observation; and builds its reasonings on plain uncontroverted experiments, or upon the fullest induction of particulars of which the subject will admit. We must observe, in both these sciences, how nature is affected, and what her conduct is in such and such circumstances: or, in other words, we must trace the appearances of nature in any given instance; trace these to some general principles or laws of operation; and then apply these principles or laws to the explaining of other phenomena.

Therefore Moral Philosophy inquires, not how man might have been, but how he is, constituted: not into what principles or dispositions his actions may be artfully resolved, but from what principles and dispositions they actually flow: not what he may, by education, habit, or foreign influence, be made to be or do; but what, by his nature, or original constituent principles, he is formed to be and do. We discover the office, use, or destination of any work, whether natural or artificial, by observing its structure, the parts of which it consists, their connection or joint action. It is thus we understand the office and use of a watch, a plant, an eye, or hand. It is the same with a living creature of the rational or brute kind. Therefore, to determine the office, duty, or destination of man; or, in other words, what his business is, or what conduct he
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He is obliged to pursue; we must inspect his constitution, take every part to pieces, examine their mutual relations one to the other, and the common effort or tendency of the whole.

It has not been thus, however, that the science has always been taught. The earliest moralists did not erect systems upon a just analysis of the powers of the human mind; nor have all those who thought such a foundation necessary to be laid, deduced their theories from the very same principles. As moral truths are not capable of rigid demonstration, it appears to us, that we cannot more properly introduce the system which we have adopted, than by giving our readers a short view of the most celebrated systems that have been maintained by others. They will thus have an opportunity of judging for themselves of the different theories, and of adopting that which shall appear to them to place practical virtue on the firmerst basis.

WHILE there has been a remarkable agreement among the writers on morality, as to the particular actions which are virtuous and those which are vicious; and whilst they have uniformly taught, that it is our duty and our interest to perform the one and to avoid the other; they have yet differed exceedingly concerning the principle or motive by which men are induced to purport it. One cause of this difference in opinion respecting matters of such universal importance, may perhaps be traced to the mistakes into which philosophers are apt to fall concerning the original state of man.

It is very generally taken for granted, that the first men were savages of the lowest rank, and that the race gradually civilized itself during the course of many succeeding ages. Without mutual intercourse, the progress of civilization could never have commenced; and as the practice of justice is absolutely necessary to every species of friendly intercourse, those original savages, it is supposed, must have been just in their dealings, and just upon some principle which has its foundation in human nature. But to develop the principle by which savages are influenced in their conduct, no tedious or intricate process of reasoning can be necessary. It must have a place in every mind, and be instinctive in all its decisions. Hence it has been supposed, that the principle to which modern philosophers have given the name of the moral sense is instinctive; that it is the sole judge of virtue and vice; and that its admonitions have such authority, as to enforce obedience without regard to the consequences of any action.

Other philosophers, who deny that the moral sense is instinctive, and who yet suppose that the original state of man was savage, are forced to pile hypothesis upon hypothesis, each unnatural in itself, and all contradictory to one another, in order to account for the commencement of civilization and the formation of society. It has been supposed, that the desire of self-preservation and the love of power are the governing principles in human nature; that in the savage state every man had a right to every thing which he could seize by fraud or force; that all had an innate propensity to invade each other’s property; and that hence war, rapine, and bloodshed prevailed universally, till the savages discovered the expediency of uniting under some form of government for their mutual protection.

But before the original state of man had been made the basis of such opposite theories as these, it would surely have been proper to inquire upon what grounds that state has been supposed to be savage. To us these grounds appear to be nothing better than mere speculations; the dreams of poets, and the fables of the philosophers as bend systems to their own systems. In the authentic history of our species, there is no evidence, indeed there can be no evidence, that the first men were savages; and every thing which we know of human nature leads us to believe, that had they been so, the race could never have been civilized but by the miraculous interpolation of some superior being. The only record of the earliest ages of the world to which the smallest credit is due, represents all the nations of the earth as having sprung from one pair, and that pair as having been instructed in their duty by their beneficent Creator. If this be the fact, and no sufficient theist can controvert it, the precepts of morality would be originally conveyed from one generation to another; not in a systematical or scientific form, but as the laws of the Universal Sovereign, whose authority is demanded implicit obedience. Accordingly we find, that the first teachers of morals were men of superior rank as well as of eminent talents, who formed collections of maxims derived from their ancestors, with the view of perfecting subordination, punishing manners, and educating youth. Such were the proverbs of Solomon, the words of Agur, and the wisdom of the son of Sirach. These instructors did not analyze the human mind into its various faculties, and build a system of morals either upon a particular instinct pointing to the supreme good, or upon the fitness of things discovered by reason. Short isolated sentences were the mode in which they conveyed their precepts; which they prefaced by observing, that “the fear of the Lord is the beginning of knowledge”; and enforced by the assurance, that “length of days, and long life, and peace, should they add to those who obeyed them.”

The sayings of the celebrated wise men of Greece were collections of apophthegms, made in the same manner and delivered with similar views. Thales and Pythagoras, who founded the one the Ionic and the other the Italic school, made collections of precepts for the conduct, as well as of a state as of a private life. Neither the crimes nor the thoughts of bad men (said Thales) are concealed from the gods. The only method of being just is to avoid doing that which we blame in others.” Of Pythagoras it is related by Porphyry and Laertius, that from Samos he repaired to Delos, and after presenting an offering of cakes to Apollo, there received, or pretended to receive, moral dogmas from the priestess; which he afterwards delivered to his disciples under the character of divine precepts. Amongst these were the following: That, “next to gods and demons, the highest reverence is due to parents and legislators; and that the laws and customs of our country are to be religiously observed.”

To these maxims or apophthegms, which, for the sake of delighting the ear and aiding the memory, were
were delivered in verse, succeded, as has been supposed, the mode of instruction by fable or allegory. But the truth seems to be, that this method, of communicating moral and political wisdom was as ancient as the other; for we have a beautiful specimen of it in the ninth chapter of the book which relates the transations of the judges of Israel. The tales of Efop, too, which were written at a very early period, remain lasting models of this species of art among the Greeks.

When the instructors of mankind had proceeded thus far as to give an artificial form to their precepts, they soon advanced a step farther, and reduced their observations into classes or predicaments. Pythagoras, who visited Egypt, has been supposed to have learned from its priests the method of arranging the virtues into distinct classes. But it is the opinion of an excellent writer, founded on the previous aspects of ethics, and on the comprehensive talents of the Samian philosopher, that the honour of the invention ought to be ascribed to himself. Be this as it may, it was observed by the inventor, that "all the maxims of morality might be referred to the duties which men owe to themselves, and the duties which they owe to each other." Hence the four cardinal virtues of the ancients, prudence, temperance, fortitude, and justice; of which the first three refer to the individual, and the fourth to society.

Hitherto lessons in morality had not taken a systematic form; but they were gradually approaching to it. Socrates was perhaps the first Pagan philosopher who established all his precepts on one sure and steady basis. In his lectures and discourses, he seems to have had one great object in view, to connect the moral maxims which were fitted to regulate the conduct of mankind, with sublime conceptions respecting the character and government of a supreme Being. The first principles of virtuous conduct which are common to all mankind, are, according to this excellent moralist, laws of God: and the conclusive argument by which he supports this opinion is, that no man departs from these principles with impunity. "It is frequently possible (says he) for men to screen themselves from the penalty of human laws, but no man can be unjust or ungrateful without suffering for his crime; hence I conclude, that these laws must have proceeded from a more excellent legislator than man." From this it would appear, that in the opinion of Socrates, confidence, or the moral sense, approving of any action, is the criterion by which it is known to be virtuous, and the will of God, that which obliges men to perform it.

Socrates himself left no writings behind him, nor, as far as we know, offered any regular and complete theory of ethics. His disciples, however, who were numerous and distinguished, became the founders of the celebrated Greek sects. Among them the first great question was, "what are the foundations of virtue?" and the second, "what are the distinctions between good and evil, happiness and misery?" The answers given to these important questions divided the philosophers and their disciples into distinct orders.

In answer to the former question, Plato taught, that "virtue is to be pursued for its own sake; and that being a divine attainment, it cannot be taught, but is the gift of God." This seems to differ in nothing but the name from the doctrine of those moderns who place the sole foundation of virtue in the approbation of the moral sense. The founder of the academy indeed has no such phrase as moral sense in any of his writings with which we are acquainted; but if virtue cannot be taught, and if it is to be pursued for its own sake, it must in itself be good, and the object of some feeling, whether called sense, infinite, or passion. His solution of the second question agitated among the sects is not indeed very consistent with this necessary inference from his answer to the first; but for his inconsistency, we may, "Our highest good (he says) consists in the contemplation and knowledge of the first good, which is mind or God; and all those things which are called good by men, are in reality such as far as they are derived from the first and highest good. The only power in human nature which can acquire a resemblance to the supreme good, is reason; and this resemblance consists in prudence, justice, fidelity, and temperance."

Aristotle, the founder of the Peripatetic school, was of the pupil of Plato; but of the two great moral philosophers he gives solutions somewhat different from those of his master. "Virtue (according to him) is either theoretical or practical. Theoretical virtue consists in the due exercise of the understanding; practical, in the pursuit of what is right and good. Practical virtue is acquired by habit and exercise."

This theory seems to differ little from that adopted by Cudworth, Clarke, and Price, which shall be considered afterwards. With respect to man or goods, the doctrine of Aristotle is very rational. "Pleasures (he says) are essentially different in kind. Disgraceful pleasures are wholly unworthy of the name. The purest and noblest pleasure is that which a good man derives from virtuous actions. Happiness, which consists in a conduct conformable to virtue, is either contemplative or active. Contemplative happiness, which consists in the pursuit of wisdom, is superior to active happiness, because the understanding is the higher part of human nature, and the objects on which it is employed are of the noblest kind. The happiness which arises from external possessions is inferior to that which arises from virtuous actions; but both are necessary to produce perfect felicity."

The Stoics, another celebrated sect of Greek philosophers, maintained, that "nature impels every individual to pursue whatever appears to him to be good."

According to them, "self-preservation and defence are the first law of animated nature. All animals necessarily derive pleasure from those things which are fitted to them; but the first object of pursuit is not pleasure, but conformity to nature. Every one, therefore, who has a right discernment of what is good, will be chiefly concerned to conform to nature in all his actions and pursuits. This is the origin of moral obligation."

With respect to happiness or good, the Stoical doctrine was altogether extravagant: They taught, that "all external things are indifferent, and cannot affect the happiness of man; that pain, which does not belong to the mind, is no evil; and that a
wife man will be happy in the midst of torture, because virtue itself is happiness (b).

As the Stoics held that there is but one substance, partly active and partly passive, in the universe (see *Metaphysics*, *N. 261, 262*), and as they called the active principle *God*, their doctrine, which makes virtue consist in a conformity to nature, bears no small resemblance to that of those moderns who rest moral obligation on the Divine will. It was therefore on better grounds than has been sometimes supposed, that Warburton, when characterizing the founders of the three principal sects in Greece, represented *Plato* as the patron of the moral sects; *Aristotle*, of the essential differences; and *Zeno*, of arbitrary will. These principles, when separated from each other, and treated in the manner of the ancients, may not each be able to bear the superstructure which was raised upon it; but the principles of most of the other sects were much less pure, and infinitely more dangerous.

Cudworth, whose testimony when relating the doctrines of antiquity is entitled to the fullest credit, affirms, that Aristippus, the founder of the Cyanean school, Democritus, and Protagoras, with their followers among the atomists, taught, that "the distinction between virtue and vice is merely arbitrary; that nothing is just or unjust, sacred or profane, but as it is agreeable or contrary to established laws and customs; that what is just to day, human authority may make unjust to morrow; and that present pleasure is the sovereign good of man."

With these impieties, the moral doctrines of Epicurus have very unjustly been confounded. The physical and metaphysical systems of that philosopher are indeed strange compositions of ingenuity and absurdity, truth and falsehood; and the moral precepts of many of his followers were in the highest degree licentious and impure. But his own life was exemplary; and his ethical system, if candidly interpreted, is much more rational than that of the Stoics; though it must be confessed, that no sect produced men of more determined virtue than the school of Zeno.—According to Epicurus, "the end of living, or the ultimate good which is to be sought for its own sake, is happiness. The happiest life which belongs to man, is that state in which he enjoys as many of the good things, and suffers as few of the evils incident to human nature as possible; passing his days in a smooth course of tranquility. Pleasure is, in its own nature good, as pain is in its nature evil. The one is therefore to be pursued, and the other to be avoided, for its own sake. Pleasure and pain are not only good and evil in themselves, but they are the measure of what is good or evil in every object of desire and aversion; for the ultimate reason why we pursue one thing and avoid another is, because we expect pleasure from the former, and apprehend pain from the latter. That pleasure, however, which prevents the enjoyment of a greater pleasure, or produces a greater pain, is to be shunned; and that pain, which either removes a greater pain, or procures a greater pleasure, is to be endured."

Upon these self-evident maxims, Epicurus builds his system of ethics, and proves, with great force of argument, "that a steady course of virtue produces the greatest quantity of happiness, of which human nature is capable." Without a prud' homme of the body, and a steady government of the mind to guard the one from deceit and the other from the clouds of prejudice, happiness is unattainable. By temperance we enjoy pleasure, without suffering any consequent inconvenience. *Sobriety* enables us to content ourselves with simple and frugal fare. *Gentleness*, as opposed to an irritable temper, greatly contributes to the tranquillity and happiness of life, by preserving the mind from perturbation, and arming it against the assaults of calumny and malice. *Fortitude* enables us to bear those pains which prudence cannot shun, and banishes fear from the mind; and the practice of *justice* is absolutely necessary to the existence of society, and by consequence to the happiness of every individual. These reasonings come home to every man's bosom; and had not this philosopher, by denying the providence, if not the being, of God, most unhappily excluded from his system the very possibility of a future state of retribution, his moral philosophy would have been the most practical, and of course the most useful, of any that was taught in the schools of Greece. This enormous defect, however, laid it open to the grossest corruptions; and by his followers it was in fact corrupted so as to countenance the most impure and criminal pleasures of fene.

These several systems of ethics continued to be cultivated with more or less purity through all the revolutions of the Grecian states, and they were adopted by the Romans after Greece itself became a province of the empire. They had been introduced into Egypt during the reigns of the Ptolemies, and were taught with much celebrity in the schools of Alexandria. The philosophy which was most cultivated in those schools was that of Plato, but from a desire of uniformity which took possession of the Alexandrian Platonists, many of the dogmas of Aristotle and Zeno, as well as the extravagant fictions of the calf, were incorporated with the principles of the old academy. The patrons of this heterogeneous mass have been called *eclectic* philosophers, because they professed to select from each system those doctrines which were rational and important, and to reject every thing which was false or futile; but they added nothing to the purity of Plato's ethics, and they increased the obscurity and mysticisms of his physics and metaphysics.

After the subversion of the Roman empire, every species of philosophy, if syllogistic wrangling deserve not that name, was banished for ages from the schools of Europe; and ethics, properly so called, gave place to ecclesiastical avarice, and to the study of the civil and canon law. When the Greeks, whom the fury and fanaticism of Mahomet II. had driven from Constantinople, introduced into Italy the knowledge of their own language, the cabinets of ancient philosophy were again unlocked; the systems of the different sects were adopted with the utmost avidity; and, without

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(a) Since this short history was written, a very pleasing view of Stoicism has been given to the public in Ferguson's *Principles of moral and political Science*; a work which the student of ethics will do well to consult. Perhaps the amiable author may unintentionally have softened the austerities of the Porch, by transmuting into them something of the mild spirit of the gospel; but if so, he has much improved the system of Zeno,
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Accurate investigation of their respective merits, men became Platonists, Peripatetics, or Stoics, as fancy or caprice prompted them to choose their leaders. The avers of Aristotle in particular, had not left authority over his modern admirers than it had of old in the Lyceum at Athens. At length the spirit of Luther and the genius of Bacon broke their fetters, and taught men to think: for themselves as well as science as in religion. In physics, the effects produced by the writings of Bacon were great and rapid: for in physics the ancient theories were totally and radically wrong.—With respect to morals, however, the case was different. Each of the celebrated schools of antiquity was in possession of much moral truth, blended indeed with error: and long after the Stagirite and his rivals had lost all influence in physical science, philosophers of eminence followed them implicitly in the science of ethics.

At this day, indeed, there is hardly a theory of morals at all distinguished, to which something very familiar may not be found in the writings of the ancients.—Hobbes adopted the principles of Democritus and Protagoras, and taught expressly that there is no criterion of justice or injustice, good or evil, besides the laws of each state; and that it is absurd to inquire at any peril except the established interpreters of the law, whether an action be right or wrong, good or evil (a). These impious absurdities have been often confuted. Cudworth, who composed his True Intellectual System of the Universe in order to trace the metaphysical atheism of Hobbes to its source, and to expose it to the public in all its weakness, undertook likewise to overthrow his ethical system, intitled Of Eternal and Immutable Morality. That work was left unfinished: but the theory of its great author was adopted, illustrated, and very ably supported, by the Doctors Clarke and Price.

According to these three admirable scholars, "we feel ourselves irrefistibly determined to approve some actions, and to disapprove others. Some actions we cannot but conceive of as right, and others as wrong; and of all actions we are led to form some idea, as either fit to be performed, or unfit, or as neither fit nor unfit to be performed, i.e. as indifferent. The power within us which thus perceive and determines, they declare to be the understanding; and they add, that it perceives or determines immediately or by intuition, because right and wrong denote simple ideas. As there are some propositions, which when attended to necessarily determine all minds to believe them, so are there some actions whose natures are such, that when observed all rational beings immediately and necessarily approve them. He that can impartially attend, it is said, to the nature of his own perceptions, and determine that when he conceives gratitude or beneficence to be right, he perceives nothing true of them, or understands nothing, but only suffers from a sense, has a turn of mind which appears unaccountable: for the more we examine, the more indisputable it will appear to us, that we express necessary truth, when we say of some actions that they are right, and of others that they are wrong." It is added, that "we cannot perceive an action to be right without approving it, or approve it without being conscious of some degree of satisfaction and complacency; that we cannot perceive an action to be wrong without disapproving it, or disapprove it without being displeased with it; and that the just must be liked, the unjust disliked, the just loved, the unjust hated." By the patrons of this system, obligations to action and rightness of action, are held to be coincident or identical. "Virtue, they affirm, has a real, full, obligatory power, antecedently to all laws, and independently of all will; for obligation is involved in the very nature of it. To affirm that the performance of that which to omit would be wrong is not obligatory, unless conducive to private good, or enjoined by a superior power, is a manifest contradiction."* Few men have deferred better of letters and philosophy than Cudworth, Clarke, and Price; and yet their theory of morals appears to us to be contradictory and unintelligible. It is certainly romantic, and founded upon principles which, if they be denied, no man by argument can be compelled to grant. There is, say they, an absolute right and wrong, fitness and unfitness, in actions; but if so, the actions which are right and fit must be right and fit for something, because fitness, which respects no end, is wholly inconceivable. To say that any particular action is fit, and yet fit for no particular purpose, is just as absurd as to say that the angles at the base of an isosceles triangle are equal, but neither to one another, nor to any other angles: and we may with no less propriety talk of the relation of equality attaching to a particular angle, and to nothing else with which the angle is equal, than of the absolute fitness or rightness of any action or course of actions. If it be said that such actions are fit and right, because they tend to promote the harmony of the world and the happiness of men, this may be granted; but it overturns the intellectual theory from its very foundation. Actions which are fit and right only for their consequences, are approved and liked for the sake of those consequences; and the happiness of men, among whom the virtuous person himself is to be included, is the motive or ultimate obligation to their performance.

Similar to this theory, and liable to the same objections is that which resolves moral approbation into a sense of propriety; for if actions be approved because they are proper, it must be because they are proper for some end or purpose, propriety in the abstract being a word without meaning.

Many philosophers, feeling the force of these and of similar objections to the intellectual theory of Cudworth, Clarke, and Price, as well as to a sense of propriety in the abstract, have had recourse to another hypothesis apparently better founded. Observing that all mankind decide on the morality of characters and actions instantaneously, without weighing their consequences in the balance of reason, they suppose that such decisions are made by an infinitesimal common nature, implanted in the human breast by the hand that formed it. To this infinitesimal of them give the

(a) Doctrinas de jure et injurio, bono et malo, preter leges in unaquaque civitate institutias, authenticas esse nullas: et utrum aliqua action justa vel injuriosa, bona vel mala futura sit, a nemine inquirendum esse, prae terquam ab illis, quibus legum fuerunt interpretationem civitas demandaverit. De civ. 2. P. 343.
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the name of confidence, and others that of moral sense, in contradiction to external sense, the other great and universal inlet of human knowledge. By this moral sense we intuitively discover an essential difference in the quality of all thoughts and actions, and a general distinction of them into good and evil, just as the tongue and palate discover an essential difference in the tastes of all objects, and a general distinction of them into pleasant and unpleasant. The ablest advocates for this intuitive system agree, that the moral sense is the immediate and involuntary criterion of only a few general truths, which, in their joint operation upon the mind, lay the foundation of all morals. Others have carried it to what we think a very dangerous extreme; as, by affirming that we cannot prove, in regard to our moral feelings, that they are conformable to any extrinsic and external relations of things, they seem to wish that reason were the immediate and involuntary criterion of only a few general truths, which, in their joint operation upon the mind, lay the foundation of all morals. Were this true, it would in many cases be impossible to distinguish the prejudices of early education from the pure dictate of original instinct, and the most pernicious conduct might be justified with the approbation of what would be deemed the ultimate test of virtue and vice.

To remedy the defects of the intellectual and intuitive theories of morality, Mr Hume blended them together; and, upon the broader basis of reason and internal sense co-operating with each other, he reared a system which, though different from those of all his predecessors, he rendered plausible, and supported with his usual ingenuity.

According to him, sentiment and reason concur in almost all moral determinations; and he proves, that for this purpose "there is implanted in the human breast a disinterested principle of benevolence or sympathy which makes men take pleasure in the happiness of others.

The merit or demerit of actions consists wholly in their utility or natural tendency to add to the sum of human happiness; and the same he holds to be true of qualities whether bodily or mental. This utility or natural tendency is the office of reason to discover; for that faculty alone can trace relations and consequences. Such qualities or actions as reason discovers to be useful, either to the individual or to society, the instinctive principle of benevolence makes us instantly approve, and this approbation constitutes their morality. Thus, temperance, fortitude, courage, and industry, &c. reason discovers to be useful to him who possesses them; and upon this discovery they are approved of the sentiment of sympathy. They are therefore moral qualities, and the sources of the private virtues. In like manner, generosity, cheerfulness of temper, mercy and justice, are discovered to be useful to society; and are accompanied with the approbation of that sentiment of sympathy which makes every man feel a satisfaction in the felicity of all other men. They therefore constitute the social virtues. Of every quality and every action, the merit or demerit, and of consequence the degree of approbation or disapprobation which is bestowed upon it, is in exact proportion to its utility and the circumstances of the case in which it occurs. The social virtues are therefore greater than those which are private, and one social virtue is greater than another; but every quality and every action which is useful, either to society or to the individual, is more or less virtuous, provided the good of the individual be considered as subordinate to the good of the public."

This theory is ingenious: and in placing the merit of actions in their utility, it furnishes a criterion of virtue which can be employed by reason; but it seems not to be wholly free from error, and it is obviously defective. By pretending that the same sentiment of approbation is given to useful actions voluntarily performed, and to useful qualities which are merely constitutional, Mr Hume confounds the merit of virtuous habits with the value of natural talents. Yet every man's confitutions will surely tell him, that the feeling or sentiment which attaches to deeds of justice, clemency, and beneficence, is very different from that which attaches to beauty of form, strength of body, vigour of mind, and mere extent of capacity. All these actions and qualities are useful; but when we approve of the former, besides attending to their utility, we consider them as in the man's power, and attribute the merit of them immediately to himself. When we approve, or rather admire, the latter on account of their utility, we know them to be not in the man's power, and we attribute the merit of them immediately to the Author of nature.

But the defects of this theory are in practice more pernicious than its errors. The author well observes that the end of all moral speculations is to teach us our duty; and, by proper representations of the deformity of vice and beauty of virtue, to beget correspondent habits, and engage us to avoid the one and embrace the other; but the theory under review holds out no motive sufficient in all cases for this purpose.

It is indeed true, as Mr Hume affirms, that the virtues which are immediately useful or agreeable to the person possessed of them, are desirable in a view to self-interest, and that a regard to self-interest ought to engage us in their pursuit. It is likewise true, that the virtues which are useful and agreeable to others, are generally more desirable than the contrary qualities: for as by the constitution of our nature no enjoyment is sincere without some reference to company and society; so no society can be agreeable, or even tolerable, where a man feels his presence unwelcome, and discovers all around him symptoms of disgust and aversion. These considerations he deems sufficient to enforce the duties of humanity, clemency and beneficence; but he states a case himself, in which they would certainly fail to make a man abtain from his neighbour's property. The greater part of property he considers, and rightly considers, as having its foundation in human laws, which are so calculated as to preserve the peace and promote the general good of the society, at the unavoidable expense sometimes of the individual. Now, in particular incidents, a sensible knave, by secretly purloining from the hoards of a worthless miser, might make himself comfortable and independent for life, without causing any breach in the social union, and even without hurting a single individual. What then should hinder him from acting thus? His self-interest would be promoted; and if he possessed a generous spirit, he might gratify his sentiment of benevolence or sympathy by doing good with his money to the poor, which the miser never did. For enforcing the uniform practice of justice in such cases as this, Mr Hume's theory of morals contains no adequate motive; but a very sufficient
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A system of ethics, built upon religion, is said to be 'the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness.' So that with them 'the good of mankind' is the subject, 'the will of God' the criterion or rule, and 'everlasting happiness' the motive, of human virtue. The moral sense, supposing it real, they consider as a very inadequate rule of conduct, as being in many cases difficult to be distinguished from prejudice; and many of them confidently deny its existence. The other rules, such as the fins of things, abstract right, the truth of things, the law of reason, &c. are considered either as unintelligible, or as relative to some end by which the rules must themselves be tried. The two great questions, which in the system of these religious philosophers demand solution, are: 1/β, By what means shall a man in every case discover precisely what is the will of God? and, 2/β, what evidence have we that there will be a future state of retribution and of everlasting happiness!

Of these two questions, the latter belongs wholly to religion; and to solve it they call in the aid of revelation, as well as that of which is called the religion of nature. The former question is in the province of morality: and to find answers to it which shall apply to every case, is the whole business of their system.

The will of God respecting human conduct may be discovered by reasoning a priori from his existence and attributes, or a posteriori from the tendency of his works. Being himself independent and all-perfect, it is inconceivable that his view in creating the world could be any other than to communicate some portion of his own felicity. (See METAPHYSICS, n° 312.) This conclusion is agreeable to what we perceive of his works, in which there are a thousand contrivances, all tending to give happiness to man, and to all animated nature; and not one of which the natural tendency is to inflict pain, or prove ultimately injurious. Mankind are linked together by various ties, and made to depend in a great measure upon each other's conduct. That conduct, therefore, which is naturally productive of the greatest sum of human happiness, must be agreeable to the will of God; or, in other words, virtuous conduct. That, of which the natural tendency is to the reverse, must be vicious; and that conduct, if there be any such, which tends to produce neither happiness nor misery, must be indifferent, i.e. neither morally good nor morally evil. It is to be observed, however, that as, previous to their own obedience or disobedience, all men stand in the same relation to their Creator, it must be his will that an equal portion of the happiness of which human nature is capable be communicated to all by whom that nature is shared. Whence it follows, that only such conduct as, if universally purged by all men in the same fixation and circumstances, would be productive of the greatest sum of human happiness, on the whole, can be agreeable to the will of the Creator; and that, in judging of the morality of actions, we are not to regard their immediate consequences in any particular case, but their natural and ultimate tendency if performed in all cases.

This is a criterion of virtue which differs widely from the local or occasional utility set up by Mr. Hume; for the particular consequences of an action and its general tendency may often be at variance, so that what might in certain circumstances be immediately useful, would yet be highly criminal and ultimately pernicious. The general tendency of actions, too, may be always known, and known with the utmost certainty; the whole of their particular consequences can never be discovered. One thing, however, is evident, that if all men in their respective stations would regulate their conduct by the natural tendency of action, the particular and general consequences of their conduct would be the same, and the greatest happiness would result from it of which human nature is in this world capable. And therefore, since it is only through the perverseness of some persons or persons concerned, that the particular consequences of any action, of which the natural tendency is to produce misery, can ever bring happiness to a single individual; it can no more be the will of God that we make these occasional and distorted consequences the rule of our conduct, than it can be his will that the vices of other men should be the basis of our virtues. According to this scheme of morals, which reëst all obligation on private happiness, the whole difference between an act of prudence and an act of duty, is this: That in the former case we consider only what we shall gain or lose in this world; in the latter, what we shall gain or lose in the world to come.

Although the patrons of this theory question the reality of the moral sense as an infallible, they allow that a sentiment of approbation or disapprobation of actions, according as they are virtuous or vicious, is generated by the associating principle (see INSTINCT, and METAPHYSICS, n° 97.); and that this sentiment, though fallacious, operates instantaneously as if it were infallive. They infilt that our earliest actions are the result of imitation; that when we first begin to trace consequences, education and the desire of immediate enjoyment are our only guides; that as our mind expands and our knowledge increases, the hopes and fears of futurity become the motives, and the will of God the rule of our conduct; and that long practice in virtue, upon these principles, produces habits by which we go on with satisfaction in the same course, without looking forward, on every particular occasion, to the ultimate consequences and first motives of our actions. Thus do habits of justice, benevolence, clemency, and moral approbation, spring, through a proper course of discipline, out of the selfish principle; and when these habits are completely formed and deeply rooted, man has attained the utmost perfection of which he is capable in this state of probation, and is fitted for another of retribution and happiness.

That these philosophers have not a just view of the defects and man nature, when they deny that there is any innate excellency principal of benevolence in man, we shall endeavour to show.
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CHAP. I. Of Man and his Connections.

MAN is born a weak, helpless, delicate creature, unprovided with food, clothing, and whatever else is necessary for subistence or defence. And yet, exposed as the infant is to numberless wants and dangers, he is utterly incapable of supplying the former, or securing himself against the latter. But, though thus feeble and exposed, he finds immediate and sure resources in the affection and care of his parents, who refuse no labours, and forego no dangers, to nurse and rear up the tender babe. By these powerful instincts, as by some mighty chain, does nature link the parent to the child, and form the strongest moral connection on his part, before the child has the least apprehension of it. Hunger and thirst, with all the sensations that accompany or are connected with them, explain themselves by a language strongly expressive, and irresistible moving. As the several senses bring in percepts and informations of surrounding objects, we may perceive in the young spectator early signs of a growing wonder and admiration. Bright objects and striking sounds are beheld and heard with a fort of commotion and surprise. But, without relating on any, he eagerly pafes on from object to object, still pleased with whatever is most new. Thus the love of novelty is formed, and the passion of wonder kept awake. By degrees he becomes acquainted with the most familiar objects, his parents, his brethren, and those of the family who are most conversant with him. He contracts a fondness for them, is uneasy when they are gone, and charmed to see them again. These feelings become the foundation of a moral attachment on his side; and by this reciprocal sympathy he forms the domestic alliance with his parents, brethren, and other members of the family. Hence he becomes interested in their concerns; and feels joy or grief, hope or fear, on their account, as well as his own. As his affections now point beyond himself to others, he is denominated a good or ill creature, as he stands well or ill affected to them. These, then, are the first links of the moral chain; the early rudiments, or outlines, of his character; his first rude efforts towards agency, freedom, manhood.

When he begins to make excursions from the nursery, and extends his acquaintance abroad, he forms his child a little circle of companions; engages with them in play, or in quest of adventures; and leads, or is led by them, as his genius is more or less aspiring. Though this is properly the season in which appetite and passion have the ascendancy, yet his imagination and intellectual powers open space; and as the various images of things pass before the mental eye, he forms a variety of tales; relishes some things, and dislikes others, as his parents, companions, and a thousand other circumstances, lead him to combine agreeable or disagreeable fets of ideas, or reprefent to him objects in alluring or odious lights.

As his views are enlarged, his active and social powers expand themselves in proportion; the love of action, of imitation, and of praise, emulation, curiosity, docility, a passion for command, and fondness of change. His passions are quick, variable, and plant to every impression; his attachments and disgusts quickly succeed each other. He compares things, distinguishes actions, judges of characters, and loves or hates them, as they appear well or ill affected to himself, or to those he holds dear. Mean while he soon grows sensible of the consequences of his own actions, as they attract applause, or bring contempt: he triumphs in the former; and is ashamed of the latter, wants to hide them, and blushes when they are discovered. By means of these powers he becomes a fit subject of culture, the moral tie is drawn closer, he feels that he is accountable for his conduct to others as well as to himself, and thus is gradually ripening for society and action.

As man advances from childhood to youth, his passions as well as perceptions take a more extensive range. New fentes of pleasure invite him to new pursuits; he grows sensible to the attractions of beauty, feels a peculiar sympathy with the sex, and forms a more tender kind of attachment than he has yet experienced. This becomes the cement of a new moral relation, and gives a softer turn to his passions and behaviour. In this turbulent period he enters more deeply into a relish of friendship, company, exercise, and diversion; the love of truth, of imitation, and of design, grows upon him; and as his connections spread among his neighbours, fellow-citizens, and countrymen,
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By these simple but powerful springs, whether periodic or fixed, the life of man, weak and indigent as he is, is preserved and secured, and the creature is prompted to a constant round of action, even to supply his own numerously and ever-returning wants, and to guard against the various dangers and evils to which he is obnoxious. By these links men are connected with each other, formed into families, drawn into particular communities, and all united as by a common league into one fyllem or body, whose members feel and sympathize one with another. By this admirable adjustment of the condition of man to his state, and the gradual evolution of his powers, order is maintained, society upheld, and human life filled with that variety of passion and action which at once enlivens and diversifies it.

This is a short sketch of the principal movements of the directing power of the human mind. Yet these movements are not the whole of man; they impel to action, but do not direct it: they need a regulator to guide their motions, to measure and apply their forces; and accordingly they have one that naturally superintends and directs their action. We are conscious of a principle within us, which examines, compares, and weighs things; notes the differences, observes the forces, and foresees the consequences, of affections and actions. By this power we look back on past times, and forward into futurity, gather experiences, estimate the real and comparative value of objects, lay out schemes, contrive means to execute them, and settle the whole order and economy of life. This power we commonly distinguish by the name of reason or reflection, the business of which is not to suggest any original notions or fentiments, but to canvass, range, and make deductions from them.

We are intimately conscious of another principle within us, which approves of certain passions, affections, and actions, and disapproves of their contraries. In consequence of the decisions of this inward judge we denominate some actions and principles of conduct right, benevolent, good; and others wrong, dishonest, ill. The former excite our esteem, moral complacency, and affection, immediately and originally of themselves, without regard to their consequences, and whether they affect our interest or not. The latter do as naturally and necessarily call forth our contempt, scour, and aversion. That power by which we perceive this difference in affections and actions, and feel a consequent relish or dislike, is commonly called conscience or the moral sense.

That there is such a power as this in the mind of every man of sound understanding, is a fact which cannot be controverted; but whether it be an instinctive power, or the result of early and deep rooted associations, has been long and ably debated. The question is of importance in the science of human nature, as well as in ascertaining the standard of practical virtue; but to us it appears that the contending parties have carried their respective opinions to dangerous extremes.

When it is affirmed, as it sometimes has been, that reason has nothing to do in ethical science, but that in every possible situation our duty is pointed out and the performance of it enforced by mere sentiment, the consequence seems to be, that virtue and vice are nothing.
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An attempt to prove that we have from nature no such powers, thing permanent in themselves, but change their nature according to local circumstances. Certain it is, that sentiment has in similar situations approved of very different practices in different ages and different nations. An attempt to establish the universal practice of justice, and of parents protecting their children, whether well or ill formed, whether strong or weak; but in Sparta we know that theft, if dexterously practised, was approved, and not unfrequently rewarded; and that the example of lame and deformed children was not only permitted but absolutely enjoined. There is nothing which our conscience or moral sense condemns with greater severity, or views as a crime of a deeper dye, than children unkind treatment of their aged parents; yet there are savagery among whom ininitive of all kinds ought to prevail in greater purity than in civilized nations, whose moral sense permits them to put their aged and decrepitud parents to death. If this sense be inactive, and the socal judge of right and wrong, how comes it to decide so differently on the same line of conduct in different ages and distant countries? The instincts of brutes, in similar circumstances, prompt uniformly to similar actions in every age and in every region where the species is found; and the external senses of man afford in all nations the same unvaried evidence concerning their respective objects. To these observations we may add, that instincts must be calculated for the state of nature, whatever that state may be, and therefore cannot be supposed capable of directing our steps through all the labyrinths of polished society, in which duties are to be performed that in a state of nature would never have been thought of.

But though for these reasons it is apparent that mere sentiment, whether called conscience or the moral sense, would alone be a very unsafe guide to virtue in every individual case that may occur, we think that those who resolve all such sentiment into habit and the effect of education, without giving any part of it to nature, advance an opinion which is equally ill-grounded and not less dangerous. For there are, indeed, men who affirm that all benevolence is hypocrisy; friendship a cheat, public spirit a farce; fidelity a snare to procure trust and confidence; and that while all of us at bottom pursue only our private interest, we wear those fair disguises, in order to put those off their guard with whom we have to deal, and to expel them the more to our wiles and machinations. Others again, too virtuous to accute themselves and all mankind of direct knavery, yet inflict, that whatever affection one may feel, or imagine he feels, for others, no passion is or can be disinterested; that the most generous friendship, however sincere, is only a modification of self-love; and that even unknown to ourselves we seek only our own gratification, while we appear the most deeply engaged in schemes for the liberty and happiness of mankind.

Surely the mildest of these representations is an exaggerated picture of the selfishness of man. Self-love is indeed a very powerful as well as an essential principle in human nature; but that we had likewise an instinctive principle of benevolence, which, without any particular regard to our own interest, makes us feel pleasure in the happiness of other men, is a fact which we think admits of very complete proof. For, as Mr. Hume well argues, "when a man grieves for a friend who could be of no service to him, but on the contrary good in need of his constant attendance and protection, it is possible to suppose that such partial tenderness springs from self-love, which has no foundation in nature? What interested (as the same deep thinker) can a fond mother have in view, who loses her health by her affiduous attendance on the sick child, and afterwards languishes and dies of grief when freed by its death from the slavery of attendance? — Have we no satisfaction (continues he) in one man company above another's, and no desire of the welfare of our friend, even though absence or death should prevent us from all participation in it? Or what is it commonly that gives us any participation in it, even while alive and present, but our affection and regard to him?" Nor is it to contemporaries and individuals alone, that, independent of all interest, we feel a benevolent attachment. We constantly bestow praise on actions calculated to promote the good of mankind, though performed in ages very distant and in countries most remote; and he who was the author of such actions is the object of our esteem and affection. There is not perhaps a man alive, however selfish in his disposition who does not applaud the sentiment of that emperor, who, recollecting at supper that he had done nothing in that day for any one, exclaimed with regret, that the day had been lost! yet the utmost facility of imagination can discover no appearance of interest that we can have in the generosity of Titus, or find any connection of our present happiness with a character removed so far from us both in time and in place. But, as Mr. Hume justly observes, if we even feign a character consiling of all the most generous and beneficent qualities, and give instances in which these display themselves, after an eminent and most extraordinary manner, for the good of mankind, we shall instantly engage the esteem and approbation of all our audience, who will never so much as inquire in what age or country the accomplished person lived.

These are facts which cannot be controverted; and they are wholly unaccountable, if there be not in human nature an instinctive sentiment of benevolence or sympathy, which feels a disinterested pleasure in the happiness of mankind. But an end in which we feel pleasure we are naturally prompted to pursue; and therefore the same sentiment impels every man, with greater or less force, to promote the happiness of other men, which by means of it becomes in reality his own good, and is afterwards purveyed from the combined motives of benevolence and self-enjoyment. For in obeying this sentiment we all feel an inward complacency, self-appropriation, or consciousness of worth or merit; and in disobeying it, which cannot be done but with reluctance, we feel remorse, or a consciousness of unworthiness or a demerit. It appears, however, from history, that the sentiment, as it is instinctive, points only to the good of mankind, without informing us how that good is to be promoted. The means proper for this purpose must be discovered by reason; and when they are brought into view, this sentiment, confidence, or moral sense, instantly shows us that it is our duty to pursue them.

Hence we see how different lines of conduct may in similar circumstances be approved of as virtuous in different
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Which are different in nature and kind from the passions and affections.

Section 33. Of Moral Obligation.

Of Moral Obligation, the extent of those powers.

Section 34. The Division of the passions.

Section 35. Of the private passions.

Section 36. Of public or social affections.

Section 37. Of Duty, or Moral Obligation.

It is by the end or design of any power or move. The means that we must direct its motions, and estimate the force of degree of force necessary to its just action. If it want powers, the force requisite for the obtaining its end, we reckon it defective; if it has too much, so as to be carried beyond it, we say it is overcharged; and in either case it is imperfect and ill-contrived. If it has just enough to reach the scope, we esteem it right and as it should be. Let us apply this reasoning to the passions.

The defence and security of the individual being the Measure of aim of the defensive passions, that security and defence the defence must be the measure of their strength or indulgence. If they are so weak as to prove insufficient for that end, or if they carry us beyond it, i.e. raise unnecessary motions, or continue longer than is needful, they are unfit to answer their original design, and therefore are in an unfound and unnatural state. The exercise of fear or of resentment has nothing desirable in it; nor can
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Without a certain degree of them, we are naked and exposed. With too high a proportion of them, we are miserable, and often injurious to others. Thus cowardice or timidity, which is the excess of fear, instead of saving us in danger, gives it too formidable an appearance, makes us incapable of attending to the best means of preservation, and disarms us of courage, our natural armour. Post-haste, which is the want of a due measure of fear, leads us needlessly into danger, and lulls us into a pernicious security. Revenge, i.e. excessive resentment, by the violence of its consequences, robs us of the presence of mind which is often the best guard against injury, and inclines us to pursue the aggressor with more savagery than self-defence requires. Pujillanimity, or the want of a just indignation against wrong, leaves us quite unguarded, and tends to sink our mind into a passive enraptured tameness. Therefore, "to keep the defensive passions duly proportioned to our dangers, is their natural pitch and tenor."

The private passions lead us to pursue some positive species of private good: that good therefore which is the object and end of each must be the measure of their respective force, and direct their operation. If they are too weak or flagitious to engage in the pursuit of their several objects, they are evidently deficient; but if they defeat their end by their impotency, then are they strained beyond the just tone of nature. Thus vanity, or an excessive passion for applause, betrays into such meannesses and little arts of popularity, as makes us forfeit the honour we so anxiously court. On the other hand, a total indifference, about the effect of mankind, removes a strong guard and spur to virtue, and lays the mind open to the most abandoned executions. Therefore, "to keep our private passions and desires proportioned to our wants, is the just measure and pitch of this class of affections."

The defensive and private passions do all agree in general, in their tendency or conduciveness to the interest or good of the individual. Therefore, when there is a collision of interest, as may sometimes happen, that aggregate of good or happiness, which is composed of the particular goods to which they respectively tend, must be the common standard by which their comparative degrees of strength are to be measured: that is to say, if any of them, in the degree in which they prevail, are incompatible with the greatest aggregate of good or most extensive interest of the individual, then are they unequal and disproportionate. For in judging of a particular system or constitution of powers, we call that the supreme or principal end in which the aims of the several parts or powers coincide, and to which they are subordinate; and reckon them in due proportion to each other, and right with regard to the whole, when they maintain that subordination of subordination, under which the state of every part is decided. Therefore, "to proportion our defensive and private passions in such measure to our dangers and wants as best to secure the individual, and obtain the greatest aggregate of private good or happiness, is their just balance or comparative standard in cafe of competition."

In like manner as the public or social affections point at the good of others, that good must be the measure of their force. When a particular social affections, as gratitude or friendship, which belongs to a particular social connection, viz. that of a benefactor or of a friend, is too feeble to make us act the grateful or friendly part, that affection, being insufficient to answer its end, is defective and unfixed. If, on the other hand, a particular passion of this class counteract or defeat the interest which is designed to promote, by its violence or disproportion, then is that passion excessive and irregular. Thus natural affections, if it degenerates into a passionate fondness, not only hinders the parent's from judging coolly of the interest of their offspring, but often leads them into a most partial and pernicious indulgence.

As every kind of affections points at the good of its particular object, it is possible there may be sometimes social affections a collision of interests or goods. Thus the regard due to a friend may interfere with that which we owe to a community. In such a competition of interests, it is evident that the greatest is to be chosen; and that is the greatest interest which contains the greatest sum or aggregate of public good, greatest in quantity as well as duration. This then is the common standard by which the respective forces and subordinations of the social affections must be adjusted. Therefore we conclude, that "this class of affections are found and regular when they prompt us to pursue the interest of individuals in an entire consistency with the public good"; or, in other words, "when they are duly proportioned to the dangers and wants of others, and to the various relations in which we stand to individuals or to society."

Thus we have found, by an induction of particulars, the natural pitch or tenor of the different orders of affection, considered apart by themselves, Now, as the virtue or perfection of every creature lies in following its nature, or acting suitably to its just proportion and harmony of its several powers; therefore, "the virtue of a creature endowed with such affections as must confute in observing or acting agreeably to their natural pitch and tenor."

But as there are no independent affections in the Balance of the mind, no passion that stands by itself, affection, without some relation to the rest, we cannot pronounce of any one, considered apart, that it is either too strong or too weak. Its strength and just proportion must be measured not only by its subserviency to its own immediate end, but by the respect it bears to the whole system of affection. Therefore, we say a passion is too strong, not only when it defeats its own end, but when it impairs the force of other passions, which are equally necessary to form a temper of mind fitted to a certain economy or state; and too weak, not merely on account of its insufficiency to answer its end, but because it cannot fulfil its part or office in the balance of the whole system. Thus the love of life may be too strong when it takes from the regard due to one's country, and will not allow one bravely to encounter dangers, or even death, on its account. Again, the love of fame may be too weak when it throws down the fences which render virtue more secure, or weakens the incentives which make it more active and public spirited.

If it be asked, "How far may the affections towards Limits of private good or happiness be indulged?" One limit private affections was before fixed for the particular indulgence of each, viz. their subordination to the common aggregate of good to the private system. In these therefore a due
regard is always supposed to be had to health, reputation, fortune, the freedom of action, the unimpaired exercise of reason, the calm enjoyment of one's self, which are all private goods. Another limit now results from the balance of affection just named, viz. "The security and happiness of others!" or, to express it more generally, "a private affection may be fairly indulged, when, by that indulgence, we do not violate the obligations which result from our higher relations or public connections." A just respect therefore being had to these boundaries which nature has fixed in the breast of every man, what should limit our pursuits of private happiness? Is nature fallen and pernicious? or, does the God of nature envy the happiness of his offspring?

Whether there is ever a real collision of interests betwixt the public and private system of affections, or the ends which each class has in view, will be afterwards considered; but where there is no collision, there is little or no danger of carrying either, but especially the public affections, to excess, provided both kinds are kept subordinate to a discreet and cool self-love, and to a calm and universal benevolence, which principles stand as guards at the head of each system. This then is the conduct of the passions, considered as particular and separate forces, carrying us out to their respective ends; and this is their balance or economy, considered as compound powers, or powers mutually related, acting in conjunction towards a common end, and consequently as forming a system or whole.

Now, whatever adulterous or maintains this balance, whatever in the human constitution is formed for directing the passions so as to keep them from defeating their own ends or interfering with each other, must be a principle of a superior nature to them, and ought to direct their measures and govern their proportion. But it was found that reason or reflection is such a principle, which points out the tendency of our passions, weighs their influence upon private and public happiness, and shows the best means of attaining either. It having been likewise found that there is another directing or controlling principle, which we call conscience or the moral sense, which, by a native kind or authority, judges of affections and actions, pronouncing some just and good, and others unjust and ill; it follows, that the passions, which are mere impulse or blind forces, are principles inferior and subordinate to this judging faculty. Therefore, if we would follow the order of nature, i.e. observe the mutual respects and the subordination which the different parts of the human constitution bear one to another, the passions ought to be subjected to the direction and authority of the leading or controlling principles.

We conclude, therefore, from this induction, that "the constitution or just economy of human nature consists in a regular subordination of the passions and affections to the authority of conscience and the direction of reason." That subordination is regular, when the proportion formerly mentioned is maintained; that is to say, "when the defensive passions are kept proportioned to our dangers; when the private passions are proportioned to our wants; and when the public affections are adapted to our public connections, and proportioned to the wants and dangers of others." But the natural state, or the found and vigorous con-

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Moral affections are the sentiments of passions, in the just measure and balance of which we found a right temper to consult.” For this is entirely a matter of experience, in which we must examine, as in any other natural inquiry, “what are the genuine feelings and operations of nature, and what affections or symptoms of them appear in the given instance.”

The defensive passions, as anger and fear, give us rather pain than pleasure, yet we cannot help feeling them when provoked by injury, or exposed to harm. We account the creature imperfect that wants them because they are necessary to his defence. Nay, we shoulcl in some measure condemn ourselves, if we did not have the necessary degree of resentment and censure. But if our resentment exceeds the wrong received, or our caution the evil dreaded, we then blame ourselves for having over-acted our part. Therefore, while we are in danger, to be totally destitute of them we reckon a blameable defect, and to feel them in a just i.e. necessary measure, we approve, as suited to the nature and condition of such a creature as man. But our security obtained, to continue to indulge them, we not only disapprove as hurtful, but condemn as unmoral, unbecoming, and man spirited; Nor will such a conduct afford any self-approving-joy when we cooly reflect upon it.

With regard to the private passions, such as love of life, pleasure, ease, and the like, as these aims at private good, and are necessary to the perfection and happiness of the individual, we shall reckon any creature destitute, and even blameable, that was destitute of them. Thus, we condemn the man who immoderately respects his fortune, impairs his health, or exposes his life; we not only pity him as an unfortunate tell, with a voice irresistibly audible and command-}

56 Why the private.

With regard to the public affections, as compassion, natural affections, friendship, benevolence, and the like, we approve, admire, and love them in ourselves; and, in all in whom we discover them, with an esteem and approbation, if not different in kind, yet surely far superior in degree, to what we feel towards the other passions. These we reckon necessary; just; and excellently suited to our nature and slate; and the creature which wants them we call defective, ill constituted, a kind of abortion. But the public affections we esteem as self-worthy, originally and externally amiable.

But among the private affections we make an obvious and constant distinction, viz. between those particular passions which urge us with a sudden violence, and uneasy kind of perturbation, to pursue the good of their respective objects, as pity, natural affection, and the like; and those calm dispassionate affections and desires which prompt us more steadily and uniformly to promote the happiness of others. The former we generally call passions, to distinguish them from the latter sort, which go more commonly by the name of affections or calm desire. The first kind we approve indeed, and delight in; but we feel still higher degrees of approbation and moral complacency towards the latter, and towards all limitation of the particular infinities, by the principle of unlimited benevolence. The more objects the calm affections take in, and the worther these are, their dignity rises in proportion, and with this our approbation keeps in exact pace. A character, on the other hand, which is quite divided of these public affections, which feels no love for the species, but instead of it entertain's malice, rancour, and ill will, we reckon totally immoral and unnatural.

Such then are the distinctions and dispositions we feel when these several orders of affection pass before the mental eye.

Th to what extent in which we feel ourselves moved, in the manner above described, towards those affections and passions, as they come under the mind’s review, and in which we are, instantaneously and independently of our choice or volition, prompted to a corresponding conduct, we call a state of moral obligation. Let us suppose, for instance, a parent, a friend, a benefactor, reduced to a condition of the utmost indigence and distress, and that it is in our power to give them immediate relief. To what conduct are we oblige? what duty does nature dictate and require in such a case? Attend to nature, and nature will tell, with a voice irresistibly audible and commanding to the human heart, with an authority which no man can silence without being self-condemned, and which no man can elude but at his peril, “that immediate relief ought to be given.” Again, let a friend, a neighbour, or even a stranger, have lodged a deposit in our hands, and after some time reclaim it; we sooner do these ideas of the confidence reposed in us, and of property not transferred, but deposited, occur, than we immediately and unavoidably feel and recognize the obligation to restore it. In both these cafes we should condemn and even loathe ourselves if we acted otherwise, as having done, or omitted doing, what we ought not, as having acted beneath the dignity of our nature;— contrary to our most intimate sense of right and wrong:—we should accuse ourselves as guilty of ingratitude, injustice, and inhumanity,—and be conscious of deserving the cenitire, and therefore dread the resentment, of all rational beings. But in complying with the obligation, we feel joy and self-approbation, are conscious of an inviolable harmony between our nature and duty, and think ourselves entitled to the applause of every impartial spectator of our conduct.

To describe therefore what we cannot perhaps define, a state of moral obligation, is “that state in which a creature, endowed with such senses, powers, and affections as man, would condemn himself, and think he deserved the condemnation of all others, should he refuse to fulfill it; but would approve himself, and expect the approbation of all others, upon complying with it.”

And
And we call him a moral agent, who is in such a
state of being as is subject to moral obligation. Therefore, as
man's structure and constitution produce the character of
moral obligation, we conclude that he is a moral
agent. But as man may sometimes act without knowing
what he does, as in cases of frenzy or sleep, or in many natural functions; or, knowing what he
does, he may act without choice or affection, as in cases of
necessity or compulsion; therefore to denominate an
action moral, i.e. approveable, or blamable, it must be
done knowingly and willingly, or from affection and choice.
A morally good action, then, is to fulfill a moral obligation
knowingly and willingly. And a morally bad
action or an immoral action, is, "to violate a moral
obligation knowingly and willingly." As not an action,
but a series of actions, constitute a character; as not an affection but a series of affections,
constitute a temper; and as we denominate things by
the gross, a fortiori, or by the qualities which chiefly
prevail in them; therefore to call that a "moral character,
in which a series of morally good actions prevail," and a "moral
good temper, in which a series of morally
good actions have the ascendancy," is
an action or character.
Moral character and temper good and bad.
How we come by the idea of moral obligation.
Moral obligation, the living, irresistible charms of moral
obligation, which immediately attracts the cor-
respondent passions, and prompts us to fulfill its lawful
duties.
We need not apprehend any danger from the
quickness of its decisions, nor be frightened because it looks
like infinity, and has been called so. Would we approve
one for deliberating long, or reasoning the matter much at leisure, whether he should relieve a
suffering parent, feed a starving neighbour, or re-
store the truth committed to him? Should we not suspect
the reasoner of knavery, or of very weak affections
to virtue? We employ reason, and worthily
employ it, in examining the condition, relations, and
other circumstances of the agent or patient, or of
those with whom either of them are connected, or,
in other words, the state of the case: and in complicated
cases, where the circumstances are many, it may
require no small attention to find the true state of the
case; but when the relations of the agent or patient and
the circumstances of the action are obvious, or come out such after a fair trial, we should scarce
approve him who demurs on the obligation to that
duty which the case suggests.
From what has been said, it is evident, that it is not Pleasure,
the pleasure or agreeable sensations which accompany
the exercise of the several affections, nor those
consequent to the actions, that constitute moral obligation,
or excite in us the idea of it. That pleasure is
independent of the idea of obligation; and frequently we
are obliged, and acknowledge ourselves under an
obligation, to such affections and actions as are attended
with pain; as in the trials of virtue, where we are
obliged to sacrifice private to public good, or a present
pleasure to a future interest. We have pleasure
in serving an aged parent, but it is neither the perception
nor prospect of that pleasure which gives us the
idea of obligation to that conduct.

We have now taken a general prospect of man and the survey
of his moral powers and connections, and on these proceed.

We need not the idea of obligation as
moral cases.

The same proceeding

We have therefore

The nature of

The Supreme Being has been fit to blend in the inward
whole of things, a prodigious variety of discordant and
contrary principles, light and darkness, pleasure and pain,
good and evil. There are multifarious natures, higher
and lower, and many intermediate ones between the
wide-
Of Perception and Affection.

MORAL PHILOSOPHY.

Part I.

wide-distant extremes. These are differently situated, variously adjusted, and subjected to each other, and all of them subordinate to the order and perfection of the whole. We may suppose more placed as in a centre amidst innumerable orders of beings, by his outward frame drawing to the material system, and by his inward connected with the intellectual or moral, and of course affected by the laws which govern both, or affected by that good and that ill which result from those laws. In this infinite variety of relations with which he is surrounded, and of contingencies to which he is liable, he feels strong attractions to the good, and violent repulsions or aversions to the ill. But as good and ill are often blended, and wonderfully complicated one with the other, as they sometimes immediately produce and run up into each other, and at other times lie at great distances, yet by means of intervening links introduce one another; and as these effects are often brought about in consequence of hidden relations and general laws, of the energy of which he is an incompetent judge; it is easy for him to mistake good for evil, and evil for good, and consequently he may be frequently attracted by such things as are destructive, or repel such as are salutary. Thus, by the tender and complicated frame of his body, he is subjected to a great variety of ills, to sickness, cold, heat, fatigue, and innumerable accidents. Yet his knowledge is so narrow withal, and his reason so weak, that in many cases he cannot judge, in the way of investigation or reasoning, of the connections of these effects with their respective causes, or of the various latent energies of natural things.—He is therefore informed of this connection by the experience of certain senses or organs of perception, which, by a mechanical instantaneous motion, feel the good and the ill, receiving pleasure from one, and pain from the other. By these, without any reasoning, he is taught to attract or choose what tends to his welfare, and to repel and avoid what tends to his ruin. Thus, by his senses of taste and smell, or by the pleasure he receives from certain kinds of food, he is admonished which agree with his constitution; and by an opposite sense of pain he is informed which do not suit, or are destructive of it; but is not by means of this instructed in the inward natures and constitutions of things.

Some of these senses are armed with strong degrees of uneasiness or pain, in order to urge him to seek after such objects as are a food to them. And these respect his more immediate and pressing wants; as the sense of hunger, thirst, cold, and the like; which, by their painful importunities, compel him to provide food, drink, raiment, shelter. Those instincts by which we are thus prompted with some kind of commotion or violence to attract and pursue good, or to repel and avoid ill, we call appetites and passions. By our senses then we are informed of what is good or ill to the private system, or the individual; and by our private appetites and passions we are impelled to one, and restrained from the other.

In consequence of this machinery, and the great train of wants to which our nature subjects us, we are engaged in a continued series of occupations, which often require much application of thought or great bodily labour, or both. The necessities of life, food, clothes, shelter, and the like, must be provided; conveniences must be acquired to render life still more easy and comfortable. In order to obtain these, arts, industry, manufactures, and trade, are necessary. And to secure to us the peaceable enjoyment of their fruits, civil government, policy, and laws, must be contrived, and the various bulwarks of public life carried on: thus, while man is concerned and busied in making provision, or obtaining security for himself, he is by degrees engaged in connections with a family, friends, neighbours, a community, or a commonwealth. Hence arise new wants, new interests, new cares, and new employments. The passions of one man interfere with those of another. Interests are opposed. Competitions arise, contrary courses are taken. Disappointments happen, distinctions are made, and parties formed. This opens a vast scene of distraction and embarrassment, and introduces a mighty train of good and ill, both public and private. Yet amidst all this confusion and hurry, plans of action must be laid, consequences foreseen or guarded against, inconveniences provided for; and frequently particular resolutions, must be taken, and schemes executed, without reasoning or delay.

Now what provision has the Author of our nature made for this necessitous condition? how has he fitted for it the actor, man, for playing his part in this perplexed and busy scene?

Our supreme Parent, watchful for the whole, has by public not left himself without a witness here neither, and every kind and hath made nothing imperfect, but all things are double one against the other. He has not left man to be informed, only by the cool notices of reason, of the good or ill, the happiness or misery of his fellow-creatures. He has made him sensible of their good and happiness, but especially of their ill and misery, by an immediate sympathy, or quick feeling of pleasure and of pain.

The latter we call pity or compassion. For the former, though every one who is not quite divested of humanity, feels it in some degree, we have not got a name, unless we call it congratulation or joyful congratulation.

For the pity or compassion. The former, though every one, who is not quite divested of humanity, feels it in some degree, we have not got a name, unless we call it sympathy, or that good humour which arises on seeing others pleased or happy. Both these feelings have been called in general the public of common sense, or notoriety, by which we feel for others, and are interested in their concerns as really, though perhaps less sensibly than in our own.

When we see our fellow-creatures unhappy through the fault or injury of others, we feel resentment or indignation against the unjust causers of that misery. If we are conscious that it has happened through our fault or injurious conduct, we feel shame; and both these classes of senses and passions, regarding misery and wrong, are armed with such sharp sensations of pain, as not only prove a powerful guard and security to the species, or public system, against those ills it may, but serve also to lessen or remove those ills it does, suffer. Compassion draws us out of ourselves to bear a part of the misfortunes of others, powerfully solicits us in their favour, melts us at the sight of their distress, and makes us, in some degree, unhappy till they are relieved from it. It is peculiarly well adapted to the condition of human life, because it is much more and oftener in our power to do mischief than good, and to prevent or lessen misery than to communicate
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74. Public affections.

There are other particular infinitesimal passions which interest us in the concerns of others, even while we are most busy about our own, and which are strongly attractive of good, and repulsive of ill to them. Such are natural affection, friendship, love, gratitude, desire of fame, love of society, of one's country, and others that might be named. Now as the private appetites and passions were found to be armed with strong feelings of desire and uneasiness, to prompt man the more effectually to subdue labours, and to encounter dangers in pursuit of those goods that are necessary to the preservation and welfare of the individual, and to avoid those ills which tend to his destruction; in like manner it was necessary, that this other class of desires and affections should be prompted with as quick sensations of pain, not only to counteract the strength of their antagonists, but to engage us in a virtuous activity for our relations, families, friends, neighbours, country. Indeed our sense of right and wrong will admonish us that it is our duty, and reason and experience further assure us that it is both our interest and best security, to promote the happiness of others; but that sense, that reason, and that experience, would frequently prove but weak and ineffectual prompters to such a conduct, especially in cases of danger and hardship, and amidst all the importunities of nature, and that constant hurry in which the private passions involve us, without the aid of those particular kind affections which mark out to us particular fibres of duty, and with an agreeable violence engage and fix us down to them.

75. Contrary balance of passions.

It is evident, therefore, that those two classes of affection, the private and public, are set one against the other, and designed to control and limit each other's influence, and thereby to produce a just balance in the whole*. In general, the violent sensations of pain and uneasiness which accompany hunger, thirst, and the other private appetites, or too great fatigue of mind as well as of body, prevent the individual from running to great excesses in the exercise of the higher functions of the mind, as too intense thought in the search of truth, violent application to business of any kind, and different degrees of romantic heroism. On the other hand, the finer senses of perception, and those general desires and affections which are connected with them, the love of action, of imitation, of truth, honour, public virtue, and the like, are widely placed in the opposite scale, in order to prevent us from sinking into the dregs of the animal life, and debasing the dignity of man below the condition of brutes. So that, by the mutual reaction of those opposite powers, the bad effects are prevented that would naturally result from their acting singly and apart, and the good effects are produced which each are severally formed to produce.

The same wholesome opposition appears likewise in the particular counter-workings of the private and public affections one against the other. Thus compulsion is adapted to counterpoise the love of ease, of pleasure, and of life, and to disfurn or to set bounds to renunciation; and resentment of injury done to ourselves, or to our friends who are dearer than ourselves, prevents an effeminate compassion or consolation, and gives us a noble contempt of labour, pain, and death.

Natural affection, friendship, love of one's country, may, zeal for any particular virtue, are frequently more than a match for the whole train of selfish passions.

—On the other hand, without that intimate overruling passion of self-love, and those private desires which are connected with it, the social and tender infinities of the human heart would degenerate into the wilderst doze, the most torturing anxiety, and disturbing frenzy.

But not only are the different orders or classes of Contrasts among those of the same classes are mutual clogs. Thus, how many are withheld from the violent outrages of resentment by fear? and how easily is fear controlled in its turn, while mighty wrongs awaken a mighty resentment! The private passions often interfere, and therefore moderate the violence of each other; and a calm self-love is placed at their head, to direct, influence, and control their particular attractions and repulsions. The public affections likewise restrain one the other: and all of them are put under the control of a calm dispassionate benevolence, which ought in like manner to direct and limit their particular motions. Thus mofl part, if not all the passions, have a twofold aspect, and serve a twofold end. In one view they may be considered as powers, impelling mankind to a certain course, with a force proportioned to the apprehended moment of the good they aim at. In another view they appear as weights, balancing the action of the powers, and controlling the violence of their impulses. By means of these powers and weights a natural peace is settled in the human breast by its all-wise Author, by which the creature is kept tolerably steady and regular in his course, amidst that variety of stages through which he must pass.

But this is not all the provision which God has made for the hurry and perplexity of the scene in which perceptions man is defined to act. Amidst those infinite attractions and repulsions towards private and public goods, and ill, mankind either cannot often foresee the consequences or tendencies of all their actions towards one or other of these, especially where those tendencies are intricate and point different ways, or those consequences remote and complicated; or, though, by careful and cool enquiry, and a due improvement of their rational powers, they might find them out, yet, disdained as they are with business, amined with studies, dissipated by pleasure, and disturbed by passion, they either have or can find no leisure to attend to those consequences, or to examine how far this or that conduct is productive of private or public good on the whole. Therefore, were it left entirely to the flow and sober deductions of reason to trace those tendencies, and make out those consequences, it is evident, that in many particular instances the businesse of life must stand still, and many important occasions of action be lost, or perhaps the grossest blunders be committed. On this account, the Deity, befores that general approbation which we bestow on every degree of kind affection, has moreover implanted in man many particular perceptions or determinations to approve of certain qualities or actions, which, in effect, tend to the advantage of society, and are connected with
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With private good, though he does not always see that
tendency, nor mind that connection. And these per−
ceptions or determinations do without reasoning point
out, and, antecedent to views of interest, prompt to a
conduct beneficial to the public, and useful to the pri−
ivate system. Such is the fire of candor and equity,
that absence of fraud and falsehood, the senfe of
utility, justice, gratitude, greatness of mind, forti−
citude, clemency, decorum; and that disapprobation
of knavery, injustice, ingratitude, meannefs of spiri−
tuality, cruelty, and iniquity, which are natural to
the human mind. The former of their dispositions,
and the actions flowing from them, are approved, and
those of the latter kind disapproved by us, even ab−
strated from the view of their tendency or condu−
civenef: to the happiness or misery of others, or of
ourselves. 1 In one we discern a beauty, a superior
excellency, a congilony to the dignity of man; in the
other a disformity, a littleness, a debasement, of human
nature.

There are other principles also connected with the
good of society, or the happiness and perfection of the
individual, though that connection is not immedi−
ately apparent, which we behold with real complacency
and approbation, though perhaps inferior in degree, if not
in kind, such as gravity, modesty, simplicity of deport−
ment, temperance, prudent economy; and we feel some
degree of contempt and dislike where they are want−
ing, or where the opposite qualities prevail. These
and the like perceptions or feelings are either different
modifications of the moral sense, or subordinate to it, and
plainly serve the same important purpose, being ex−
pedient monitors, in the several emergencies of a vari−
ous and diversified life, of what is right, what is
wrong, what is to be pursued, and what avoided; and,
by the pleanant or painful confidences which attends
them, exerting their influence as powerful prompters
to a suitable conduct.

From a flight inspection of the above-named prin−
ciples, it is evident they all carry a friendly aspect to
society and the individual, and have a more immediate
or a more remote tendency to promote the perfec−
tion or good of both. This tendency cannot be always
foreseen, and would be often mistaken or feldom ad−
tended to by a weak, fufy, short-sighted creature like
man, both rash and variable in his opinions, a dupe to
his own partialities or to the depofits of others, liable to
ficknefs, to want, and to error. Principles, therefore,
which are fo nearly linked with private fecurity and
public good, by directing him, without operofe
reasoning, where to find one, and how to promote the
other; and, by prompting him to a conduct conduci−
tive to both, are admirably adapted to the exigencies of
his prefeft state, and wisely calculated to obtain the
ends of universal benevolence.

It were easy, by confidering the subject in another
light, to fhow, in a curious detail of particulars, how
wonderfully the infide of man, or that allifying train of
moral powers and affections with which he is en−
deed, is fitted to the several stages of that progreffive
and probationary state through which he is defined
to pass. As our faculties are narrow and limited, and
rise from very small and imperfect beginnings, they
must be improved by exercife, by attention, and re−
peated trials. And this holds true, not only of our in−
telleftual, but of our moral and active powers. The
former are liable to errors in speculation, the latter
to blunders in practice, and both often terminate in mis−
fortunes and pains. And thofe errors and blunders
are generally owing to our affections, or to our too
forward and warm animadversion of the partial goods
they naturally purfue, or to our fear of those partials if
they naturally repel. Thofe misfortunes, therefore,
lead us back to consider where our minds lay, and
whence our errors flowed; and confequently are fa−
latory pieces of trial, which tend to enlarge our
views, to correct and refine our affections, and con−
fquently improve both our intellectual and moral
powers. Our affections then are the rude materials of
our virtue, which Heaven has given us to work up
to refine and polish into an harmonious and divine
piece of workmanship. They furnish out the whole
machinery, the calms and storms, the lights and shades
of human life. They how mankind in every attitude
and variety of character, and give virtue both its
strengths and triumphs. To conduct them well in
every state, is merit; to abuse or misapply them, is
demerit.

The different fets of affections, powers, and affections,
Te a pro−
which unfold themselves in those fucceffive fages, are greffeved
both necessary and adapted to that rising and progre−
ffive state. Enlarging views and growing connec−
tions require new affections and new habits; and
thus the mind, by these continually expanding and
finding a progreffive exercife, rises to higher im−
provements, and pushes forward to maturity and per−
fecion.

In this beautiful economy and harmony of our
structure, both outward and inward, with that state
we may at once defcern the great lines of our duty
traced out in the fairft and brighteft characterts, and
compendate with admiration a more auguf: and mar−
vellous fenee of divine wisdom and goodness laid in
the human breast, than we shall perhaps find in the whole
compass of nature.

From this detail it appears, that man, by his or−
iginal frame, is made for a temperate, compaffionate,
benevolent, active, and progreffive flate. He is strongly
attracted of the good, and repuljive of the ill which be−
fals others as well as himself. He feels the highest
approbation and moral complacency in thofe affections,
and in thofe actions, which immediately and direc−
tly reflect the good of others, and the highest dif−
approbation and abhorrence of the contrary. Befides
this, he has many particular perceptions or infinu−
tes of approbation, which, though perhaps not of the fame
kind with the others, yet are accompanied with cor−
rrespondent degrees of affection, proportioned to their
repective tendencies to the public good. Therefore,
by acting agreeably to these principles, man acts
agreeable to his structure, and fulfils the benevolent
intentions of its author. But we call a thing good
when it answers its end, and a creature good, when
he acts in a conformity to his confitution. Con−
fquently, man muft be denominated good or virtuous
when he acts fitually to the principles and defination
of his nature.
MORAL PHILOSOPHY.

PART II.

Of Duty or Virtue.

CHAP. I. The principal definitions of Duty or Virtue.

WE have now considered the constitution and combinations of man, and on those erected a general system of duty or moral obligation, contant to reason, approved by the most sacred and intimate sense, suitable to his mixed condition, and confirmed by the experience of mankind. We have also traced the final causes of his moral faculties and affections to those noble purpotes they answer, with regard both to the private and the public system.

From this induction it is evident, that there is one order or clas of duties which man owes to himself: another to society; and a third to God.

The duties he owes to himself are founded chiefly on the defensive and private passions, which prompt him to pursue whatever tends to private good or happiness, and to avoid or ward off whatever tends to private ill or misery. Among the various goods which allure and solicit him, and the various ills which attack or threaten him, "to be intelligent and accurate in selecting one, and rejecting the other, or in preferring the most excellent goods, and avoiding the most terrible ills, when there is a competition among either, and to be different in using the best means to attain the goods and avoid the ills, is what we call prudence."

This, in our inward frame, corresponds to sagacity, or quickness of sense, in our outward." "To proportion our defensive passions to our dangers, we call fortitude which always implies " a just mixture of calm resignation, and animosity, and well governed caution."

And this firmness of mind answers to the strength and musling of the body. And "duty to adjust our private passions to our wants, or to the respective moment of the good we effect or pursue, we call temperance;" which does therefore always imply, in this large sense of the word, "a just balance or command of the passions." "

The second class of duties arises from the public or social affections, "the just harmony or proportion of which to the dangers and wants of others, and to the several relations we bear, commonly goes by the name of justice." This includes the whole of our duty to society, to our parents, and the general polity of nature; particularly gratitude, friendship, sincerity, natural affection, benevolence, and the other social virtues. This, being the noblest temper, and fairest composition of the soul, corresponds to the beauty and fine proportion of the pagon. The virtues comprehended under the former clas, especially prudence and fortitude, may likewise be transferred to this; and according to the various circumstances in which they are placed, and the more refined or more extensive sphere in which they operate, may be denominated private, economical, or civil prudence, fortitude, &c. Those direct our conduct with regard to the wants and dangers of those less or greater circles with which we are connected.

The third class of duties respects the deity, and arises from the public affections, and the several glorious duties to relations which he sustains to us as our creator, benefactor, God, angel, judge, &c.

We chose to consider this set of duties in the last place; because, though prior in dignity and excellency, they seem to be last in order of time, as thinking it the most simple and easy method to follow the gradual progress of nature, as it takes its rise from individuals, and spreads through the social system, and still ascends upwards, till at length it stretches to its Almiglty Parent and Head, and so terminates in those duties which are highest and last.

The duties resulting from these relations are, reverence, gratitude, love abnegation, dependence, obedience, worship, praise; which, according to the model of our finite capacities, must maintain some sort of proportion to the grandeur and perfection of the object whom we venerate, love, and obey. "This proportion or harmony is expressed by the general name of piety or devotion," which is always stronger or weaker according to the greater or less apprehended excellency of its object. This sublime principle of virtue is the enlivening soul which animates the moral system, and that cement which binds and sustains the other duties which man owes to himself or to society.

This then is the general temper and constitution of confidence in virtue, and those are the principal lines or divisions of duty. To those good dispositions which respect the several objects of our duty, and to all actions which flow from such dispositions, the mind gives its function or testimony. And this function or judgment concerning the moral quality, or the goodness of actions or dispositions, moralists call confidence. When it judges of an action that is to be performed, it is called an antecedent confidence; and when it passes sentence on an action which is performed, it is called a subsequent confidence. The tendency of an action to produce happiness, or its external conformity to a law, is termed its material goodness. But the good dispositions from which an action proceeds, or its conformity to law in every respect, constitutes its formal goodness.

When the mind is ignorant or uncertain about the moment of an action or its tendency, to private or public good; or when there are several circumstances in the case, some of which, being doubtful render the mind dubious concerning the morality of the action; this is called a doubtful or scrupulous confidence; if it mistakes concerning the same, it is called an erroneous confidence. If the error or ignorance is involuntury or involuntary, the action proceeding from that error, or from that ignorance, is reckoned innocent, or not imputable. If the error or ignorance is simple or accidental, i.e. the effect of negligence, or of affectation and wilful inadvertence, the conduct flowing from such error, or such ignorance, is criminal and imputable. Not to follow one's confidence, though erroneous and ill-informed, is criminal, as it is the guide of life; and to counteract it, shows a depraved and incorrigible spirit. Yet to follow an erroneous confidence is like-
**Part II.**

**MORAL PHILOSOPHY.**

Of Man's duty to Himself.

Man is criminal, if that error which misled the conscience was the effect of meditation, or of any criminal passion.

*Hutcheson.*

Mor. Init. lib. 2. c. 3.

If it be asked, "How an erroneous conscience shall be rectified, since it is supposed to be the only guide of life, and judge of morals?" we answer, in the very same way that we would rectify reason if at any time it should judge wrong, as it often does, viz. by giving it proper and sufficient materials for judging right, i.e., by inquiring into the whole state of the case, the relations, connections, and several obligations of the actor, the consequences and other circumstances of the action, or the furnishing of private or public good which results, or is likely to result, from the action or from the omission of it. If those circumstances are fairly and fully stated, the conscience will be just and impartial in its decision: for, by a necessary law of our nature, it approves and is well affected to the moral form; and if it seems to approve of vice or immorality, it is always under the notion or mask of some virtue. So that, strictly speaking, it is not conscience which err; for its sentence is always conformable to the view of the case which lies before it; and is just, upon the supposition that the case is truly such as it is represented to it. All the fault is to be imputed to the agent, who neglects to be better informed, or who, through weakness or wickedness, hastens to pass sentence from an imperfect evidence.

**CHAP. II. Of Man's duty to Himself. Of the Nature of Good, and the Chief Good.**

Every creature, by the constitution of its nature, is determined to love himself; to pursue whatever tends to his preservation and happiness, and to avoid what ever tends to his hurt and misery. Being endowed with sense and perception, he must necessarily receive pleasure from some objects, and pain from others. Those objects which give pleasure are called good; and those which give pain, evil. To the former he feels that attraction or motion we call desire, or love; to the latter, that impulse we call aversion, or hatred.—To objects which suggest neither pleasure nor pain, and are apprehended of no use to procure one or ward off the other, we feel neither desire nor aversion; and such objects are called indifferent. Those objects which do not of themselves produce pleasure or pain, but are the means of procuring either, we call useful or noxious. Towards them we are affected in a subordinate manner, or with an indirect and remote rather than a direct and immediate affection. All the original and particular affections of our nature lead us out to and ultimately rest in the first kind of objects, viz. those which give immediate pleasure, and which we therefore call good, directly so. The calm affection of self-love alone is conversant about such objects as are only consequentially good, or merely useful to ourselves.

But, besides those sorts of objects which we call good, merely and solely as they give pleasure, or are means of procuring it, there is an higher and nobler species of good, towards which we feel that peculiar movement we call approbation or moral complacency; and which we therefore denominate moral good. Such are our affections, and the consequent actions to them.

The perception of this is, as has been already observed, quite distinct in kind from the perception of other species; and though it may be connected with pleasure or advantage by the benevolent constitution of nature, yet it constitutes a good independent of that pleasure and that advantage, and far superior not in degree only but in dignity to both. The other, viz. the natural good, consists in obtaining those pleasures which are adapted to the peculiar fancies and passions susceptible of them, and is as various as are those fancies and passions. This, viz. the moral good, lies in the right conduct of the several fancies and passions, or their just proportion and accommodation to their respective objects and relations; and this is of a more simple and invariable kind.

By our several fancies we are capable of a great variety of pleasing sensations. Those constitute differing ends or objects ultimately purifiable for their own sake. To these ends, or ultimate objects, correspond peculiar appetites or affections, which prompt the mind to pursue them. When these ends are attained, there it rests, and looks no farther. Whatever therefore is purifiable, not on its own account, but as subservient or necessary to the attainment of something else that is intrinsically valuable for its own sake, be that value ever so great or ever so small, we call a mean, and not an end. So that ends and means constitute the materials or the very essence of our happiness. Consequently happy, i.e., human happiness, cannot be one simple uniform thing in creatures constituted, as we are, with such various fancies of pleasure, or such different capacities of enjoyment. Now, the same principle, or law of our nature, which determines us to pursue any one end or species of good, prompts us to pursue every other end or species of good of which we are susceptible, or to which our Maker has adapted an original propension. But, amidst the great multiplicity of ends or goods which form the various ingredients of our happiness, we perceive an evident gradation or subordination fitted to that gradation of fancies, passions, and affections, which prevails in our mixed and various constitution, and to that ascending series of connections which open upon us in the different stages of our progressive state.

Thus the goods of the body, or of the external senses, gradation seem to hold the lowest rank in this gradation or scale of goods. These we have in common with the brutes; and though many men are brutish enough to pursue the goods of the body with a more than brutal fury, yet, when at any time they come in competition with goods of an higher order, the unanimous verdict of mankind, by giving the last the preference condemns the first to the meanest place. Goods consisting in exterior social connections, as fame, fortune, power, civil authority, seem to succeed next, and are chiefly valuable as the means of procuring natural or moral good, but principally the latter. Goods of the intellect are still superior, as taste, knowledge, memory, judgment, &c. The highest are moral goods of the mind, directly and ultimately regarding ourselves, command of the appetites and passions, prudence, fortitude, benevolence, &c. These are the great objects of our pursuit, and the principal ingredients of our happiness.
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Thofe of the body are health, strength, agility, hardines, and patience of change, neatness, and decency.

Good health; and a regular easy flow of spirits, are in themselves sweet natural enjoyments, a great fund of pleafure, and indeed the proper feaoning which gives a flavour and poignancy to every other pleafure.

The want of health unites us for moft duties of life, and is efpecially an enemy to the focial and humane affections, as it generally renders the unhappy fufferer peevish and fullen, difgusted at the allotments of Providence, and confequently apt to entertain fufpicions and gloomy fentiments of its Author. It obftructs the free exercife and full improvement of our reafon, makes us a burden to our friends, and ufeless to fociety. Whereas the uninterrupted enjoyment of good health is a conftant fource of good humour, and good humour is a great friend to opened and benignity of heart, enables us to encounter the various ill and difappointments of life with more courage, or to fustain them with more patience; and, in short, conduces much, if we are otherwife duly qualified, to our acting our part in every exigency of life with more firmnefs, confciency, and dignity. Therefore it imports us much to preferve and improve an habit or enjoyment, without which every other external entertainment is taftelrefs, and moft other advantages of little avail.

And this is best done by a ftrict temperance in diet and regimen, by regular exercife, and by keeping the mind fereene and untruffled by violent paflions, and unfubdued by intempe and conftant labours, which greatly impair and gradually deftroy the firft conftitutions.

Strength, agility, hardines, and patience of change, fuppo.sw health, and are unattainable without it; but they imply fomething more, and are neceffary to guard it, to give us the proper unifome of life and limbs, and to secure us againft many otherwife unavoidable ill.

The exercife of the neceffary manual, and of moft of the elegant arts of life, depends on strength and agility of body: perfonal dangers, private and public dangers, the demands of our friends, our families, and country, require them; they are neceffary in war, and ornamental in peace; fit for the employment of a country and a town life, and they exalt the entertainments and diversions of both. They are chiefly obtained by moderate and regular exercife.

Few are fo much raifed above want and dependence, or fo exempted from bufinefs and care, as not to be often expofed to inequalities and changes of diet, exercife, air, climate, and other irregularities. Now, what can be fo effectual to foee one againft the füch difficulties arising from fuch unavoidable alterations, as hardines, and a certain verfatility of conftitution which can bear extraordinary labours, and fubmit to great changes, without any feeble unifome or bad unfollows. This is best obtained, not by an over-great delicacy and minute attention to forms, or by an invariable regularity in diet, hours, and way of living, but rather by a bold and difcreet latitude of regimen. Besides, deviations from eftablifhed rules and forms of living, if kept within the bounds of fobriety and reafon, are friendly to thought and original fentiments, animate the dull scene of ordinary life and bufinefs, and agr-eably flir the paflions, which flagnate or breed ill-humour in the calms of life.

Neatnefs, cleanlinefs, and decency, to which we may add dignity of countenance, and demeanour, feem to have something refined and moral in them: at leaft we generally fee much in them indications of an orderly, gen-tele, and well-governed mind, confcientious of an inward worth, or the refpeft due to one's nature. Whereas naifnefs, florventinefs, awkwards, and indecency, are fhewed symptoms of fomething mean, carelefs, and deficient, and betray a mind untaught, illiberal, unconfcientious of what is due to one's felf or to others. How much cleanlinefs conduces to health, needs hardly to be mentioned; and how neceffary it is to maintain one's character and rank in life, and to render us agreeable to others as well as to ourfelves, is as evident as it is general. The firft are in themselves the moft easy, natural, and commodious, give one boldnefs and prefence of mind, a modeld allure, an defcern both awful and alluring; they beleaf candour and greatnefs of mind, raife the moft agreeable prejudices in one's favour, render fociety engaging, command refpeft, and often love, and give weight and authori-ty both in converfation and bufinefs; in fine, they are the colouring of virtue, which fhow it to the greatest advantage in whomfoever it is; and not only imitate, but in some measure supply it where it is wanting. Whereas the laft, viz. rudenefs, effetution, indecorum, and the like, have all the contrary effects; they are burdenome to one's felf, a difhonneur to our nature, and are certainly obnoxious. The former qualifications of goods are fettled by a liberal defcription, by preferring a juft fenfe of the dignity of our nature, by keeping the bold and polite company, but, above all, by acquiring thofe virtuous and ennobling habits which become the human countenance and form, in which we receive a cominges, openneas, fimplicity, graces andiffins; and there are others, which to our fene of decorum appear uncomely, affected, difjunguens, and awkward, quite unfuitable to the native dignity of our face and form. 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Now the belt, and indeed the only way to obtain a How fame folded and lasting fame, is an uniform indefensible course and power are attainable.

Fortune, power, &c., whatever is called influence and weight among mankind, are goods of the second division, that is, valuable and pursuable only as they are useful, or as means to a farther end, viz. procuring or preferring the immediate objects of enjoyment or happiness to ourselves or others. Therefore love such goods on our own account, and to pursue them as ends, not the means of enjoyment, must be highly preposterous and absurd. There can be no measure, no limit, to such pursuit; all must be whim, caprice, extravagance. Accordingly such appetites, unlike all the natural ones, are increased by possession, and whetted by enjoyment. They are always precarious, and never without fears, because the objects lie without one's self; they are found without sorrow and vexation, because no accession of wealth or power can satisfy them. But if those goods are considered only as the materials or means of private or public happiness, then the fame obligations which bind us to pursue the latter, bind us likewise to pursue the former. We may, and no doubt we ought, to seek such a measure of wealth as is necessary to supply all our real wants, to raise above servile dependence, and provide us with such conveniences as are suited to our rank and condition in life. To be regardless of this measure of wealth, is to expose ourselves to all the temptations of poverty and corruption; to forfeit our natural independence and freedom; to degrade, and consequently to render the rank we hold, and the character we hold in society, valueless, if not contemptible. When these important ends are secured, we ought not to murmur or repine that we possess no more; yet we are not excluded by any obligation, moral or divine, from seeking more, in order to give us that happiness and most god-like of all powers, the power of doing good. A supine indolence in this respect is both absurd and criminal; avarice, as it robs us of an inexhaustible fund of the most refined and durable enjoyments; and criminal, as it renders us so far useless to the society to which we belong. "That pursuit of wealth which goes beyond the former end, viz. the obtaining the necessities, or such conveniences of life, as, in the estimation of reason, not of vanity or passion, are suited to our rank and condition, and yet is not directed to the latter, viz. the doing good, is what we call avarice." And "that pursuit

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The pleasures they give.

Knowledge and taste.

Improving our intellectual powers, their immediate exercise on their proper objects yields the most rational and refined pleasures. Knowledge, and a right taste in the arts of imitation and design, as poetry, painting, sculpture, music, architecture, afford not only an innocent, but a most fertile and sublime entertainment. By these the understanding is instructed in ancient and modern life, the history of men and things, the energies and effects of passions, the consequences of virtue and vice; by these the imagination is at once entertained and nourished with the beauties of nature and art, lighted up and spread out with the novelty, grandeur, and harmony of the universe; and, in fine, the passions are agreeably roused, and suitably engaged, by the greatest and most interesting objects that can fill the human mind. He who has a taste formed to these ingenious delights, and plenty of materials to gratify it, can never want the most agreeable exercise and entertainment, nor once have reason to make that fashionable complaint of the tediousness of time. Nor can he want a proper subject for the discipline and improvement of his heart. For, being daily conversant with beauty, order, and design, in inferior subjects, he bids fair for growing in due time an admirer of what is fair and well proportioned in the conduct of life and the order of society, which is only order and design exerted in their highest subject. He will learn to transfer the numbers of poetry to the harmony of the mind and of well-weighed passions; and, from admiring the virtues of others in moral paintings, come to approve and imitate them himself. Therefore, to cultivate a true and correct taste must be both our interest and our duty, when the circumstances of our station give leisure and opportunity for it, and when the doing is not inconsistent with our higher obligations or engagements to society and mankind.

It is but attained by reading the best books, where good taste has more the ascendancy than learning, and which contain more to practice than to speculation; by studying the best models, i.e., those which profess to imitate nature most, and approach the nearest to it, and by conversing with men of the most refined taste, and the greatest experience in life.

As to the other intellectual goods, what a fund of entertainment must it be to investigate the truth and various relations of things, to trace the operations of nature to general laws, to explain by these its manifold phenomena, to understand that order by which the universe is upheld, and that economy by which it is governed! to be acquainted with the human mind, the connections, subordinations, and uses of its powers, and to mark their energy in life! how agreeable to the ingenious inquirer, to observe the manifold relations and combinations of individual minds in society, to distinguish the causes why they flourish or decay, and from thence to ascend, through the vast scale of beings, to that general mind which pervades over all, and operates unseen in every system and in every age, through the whole compass and progression of nature! Devoted to such entertainments as these, the contemplative have abandoned every other pleasure, retired from the body, to speak, and quelled themselves from social intercourse; for these, the luxury have often preferred to the hurry and din of life the calm retreats of contemplation; for these, when once they came to take them, even the gay and voluptuous have thrown up the labors pursuits of sense and appetite, and acknowledged their mental enjoyments to be the most refined, and indeed the only luxury. Besides, by a just and large knowledge of nature, we recognize the perfections of its author; and thus piety, and all those pious affections which depend on just sentiments of his character, are awakened and confirmed; and a thousand superstitious fears, that arise from partial views of his nature and works, will of course be excluded. An extensive prospect of human life, and of the periods and revolutions of human things, will conduct much to the giving a certain greatness of mind, and a noble contempt to those little competitions about power, honour, and wealth, which disturb and divide the bulk of mankind; and promote a calm endurance of those inconveniences and ills that are the common appendages of humanity. Add to all, that a just knowledge of human nature, and of those hinges upon which the fates and fortunes of men turn, will prevent our thinking either too highly or too meanly of our fellow creatures. Give not, then, scope to the exercise of friendship, confidence, and good will, at the same time brace the mind with a proper care and distrust (those nerves of prudence), and give a greater mystery in the conduct of private as well as public life. Therefore, by cultivating our intellectual abilities, we shall best promote and secure our interest, and be qualified for acting our part in society with more honour to ourselves, as well as advantage to mankind. Consequently, to improve them to the utmost of our power is our duty; they are talents committed to us by the Almighty Head of society, and we are accountable to him for the use of them.

The intellectual virtues are best improved by accurate and impartial observation, extensive reading, and tuned unconfinned converse with men of all characters, especially with those who, to private study, have joined the widest acquaintance with the world, and greatest practice in affairs; but, above all, by being much in the world, and having large dealings with mankind. Such opportunities contribute much to direct one of prejudices and a servile attachment to crude systems, to open one's views, and to give that experience on which the most useful because the most practical knowledge is built, and from which the surest maxims for the conduct of life are deduced.

The highest goods which enter into the composition of human happiness are moral goods of the mind, directly and ultimately regarding ourselves; as command of the affections and passions; prudence and caution, magnanimity, fortitude, humility, love of virtue, love of God, renunciation, and the like. These sublime goods are goods by way of eminence, goods recommended and enforced by the most intimate and awful (sense and conscientious of our nature; goods that constitute the quintessence, the very temper of happiness, that form and completion of our soul which renders us approvable and lovely in the sight of God; goods, in short, which are the elements of all our future perfection and felicity.

Most of the other goods we have considered depend their morality on ourselves, and partly on accidents which we meet. can neither foresee nor prevent, and result from causes which we cannot influence or alter. They are such goods as we may possess to-day and lose to-morrow, and
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and which require a felicity of constitution, and talents to attain them in full vigour and perfection, and a felicity of conjunctions to secure the possession of them. Therefore, did our happiness depend altogether or chiefly on such transient and precarious possessions, it was itself most precarious, and the highest folly to be anxious about it.—But though creatures, constituted as we are, cannot be indifferent about such goods and multy suffer in some degree, and consequently have our happiness incomplete without them, yet they weigh but little in the scale when compared with moral good. By the benevolent constitution of our nature, these are placed within the sphere of our activity, so that no man can be delirious of them unless he is first wanting to himself. Some of the widest and best of mankind have wanted most of the former goods, and all the external kind, and felt most of the opposite ills, such at least as arise from without; yet by polishing the latter, i.e. the moral goods, have declared they were happy; and to the conviction of the most impartial observers have appeared happy. The world of men have been surrounded with every outward good and advantage of fortune, and have pleased great parts; yet, for want of moral rectitude, have been and have confounded themselves, notoriously and exquisitely miserable. The exercise of virtue has supported its votaries, and made them exult in the largest share of its goods. There are particularly three virtues which go to the establishment of mankind, and the just displeasure of Almighty God.

Fortitude is that calm and steady habit of mind which either moderates our fears, and enables us bravely to encounter the prospect of ill, or renders the mind serene and invincible under its immediate pressure. It lies equally distant from rashness and cowardice; and though it does not hinder us from feeling, yet prevents our complaining or thinking under the stroke. It always includes a generous contempt of, or at least a noble superiority to, those precarious goods of which we can injure neither the possession nor continuance. The man therefore who possesseth this virtue in this ample sense of it, stands upon an eminence, and sees human things below him; the tempest indeed may reach him, but he stands secure and collected against it upon the baits of conscious virtue, which the fevered storms can seldom shake, and never overthrow.

Humility is another virtue of high rank and dignity, though often mistaken by proud mortals for meanness and pufillanimity. It is opposed to pride, which commonly includes in it a false or over-rated estimation of our own merit, an ascription of it to ourselves, as its only and original cause, an unwise comparison of ourselves with others, and in consequence of that supposed superiority, an arrogant preference of ourselves, and a supercilious contempt of them. Humility, on the other hand, seems to denote that modest and ingenuous temper of mind, which arises from a just and equal estimate of our own advantages compared with those of others, and from a sense of our deriving all originally from the Author of our being. Its ordinary attendants are meekness, a gentle forbearance, and an easy unassuming humanity with regard to the imperfections and faults of others; virtues rare indeed, but of the fairest complexion, the proper offspring of a lofty and pure parent, the best ornament of such imperfect creatures as we are, precious in the sight of God, and which sweetly allure the hearts of men.

Resignation is the mild and heroic temper of mind which arises from a sense of an infinitely wise and good providence, and enables one to acquiesce with a cordial affection in its just appointments. This virtue has something very particular in its nature, and sublime in its efficacy. For it teaches us to bear ill, not only with patience, and as being unavoidable, but it transforms, as it were, ill into good, by leading us to consider it, and every event that has the least appearance of ill, as a divine dispensation, a wife and benevolent temperament of things, sublunient to universal good, and of course including that of every individual, especially of such as calmly stoop to it. In this light, the administration itself, nay every act of it, becomes an object of affection, the evil disappears, or is converted into a balm which both heals and nourisheth the mind. For though the first unexpected access of ill may surprise the soul into grief, yet that grief, when the mind calmly reviews its object, changes into contentment, and is by degrees exalted into veneration and a divine compoence. Our private will is left in that of the Almighty, and our security against every real ill rests on the same bottom as the throne of him who lives and reigns for ever.

Before we finish this section, it may be fit to observe, Chiefly goods, that as the Deity is the supreme and inexhaustible object; source of good, on whom the happiness of the whole and formal creation
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creation depends; as he is the highest object in nature, and the only object who is fully proportioned to the intellectual and moral powers of the mind, in whom they ultimately rest, and find their most perfect exercise and completion; he is therefore termed the Chief good of man, objectively considered. And virtue, or the proportioned and vigorous exercise of the several powers and affections on their respective objects, as above described, is, in the schools, termed the chief good, formally considered, or its formal idea, being the inward temper and native constitution of human happiness.

From the detail we have gone through, the following corollaries may be deduced.

First, It is evident, that the happiness of such a progressive creature as man can never be at a stand, or continue a fixed invariable thing. His finite nature, let it rise ever so high, admits still higher degrees of improvement and perfection. And his progression in improvement or virtue always makes way for a progression in happiness. So that no possible point can be assigned in any period of his existence in which he is perfectly happy, that is, so happy as to exclude higher degrees of happiness. All his perfection is only comparative. 2. It appears that many things must conspire to complete the happiness of so various a creature as man, subject to so many wants, and susceptible of such different pleasures. 3. As his capacities of pleasure cannot be all gratified at the same time, and must often interfere with each other in such a precarious and fleeting state as human life, or be frequently disappointed, perfect happiness, i. e. the uninterfered enjoyment of the several pleasures of which he is capable, is an unattainable in our present state. 4. That state is most to be fought after, in which the fewest competitions and disappointments can happen, which least of all impair any sense of pleasure, and opens an inexhausted source of the most refined and lasting enjoyments. 5. That state which is attended with all those advantages, is a state of course of virtue. 6. Therefore, a state of virtue, in which the moral goods of the mind are attained, is the happiest state.

Chapter III. Duties of Society.

Section I. Filial and Fraternal Duty.

As we have followed the order of nature in tracing the history of man, and those duties which he owes to himself, it seems reasonable to take the same method with those he owes to society, which constitute the second class of his obligations.

His parents are among the earliest objects of his attention; he becomes sooner acquainted with them, repels a peculiar confidence in them, and seems to regard them with a fond affection, the early propinquities of his future piety and gratitude. Thus does nature dictate the first lines of filial duty, even before a just sense of the connection is formed. But when the child is grown up, and has attained to such a degree of understanding, as to comprehend the moral tie, and be sensible of the obligations he is under to his parents: when he looks back on their tender and disinterested affection, their incessant cares and labours in nursing, educating, and providing for him, during that state in which he had neither prudence nor strength to care and provide for himself, he must be conscious that he owes to them these peculiar duties.

1. To reverence and honour them, as the instruments of nature in introducing him to life, and to that state of comfort and happiness which he enjoys; and therefore to esteem and imitate their good qualities, to alleviate and bear with, and spread, as much as possible a decent veil over their faults and weaknesses.

2. To be highly grateful to them, for those favours which it can hardly ever be in his power fully to repay: to show this gratitude by a strict attention to their wants, and a solicitous care to supply them; by a submissive deference to their authority and advice, especially by paying great regard to in the choice of a wife, and of an occupation; by yielding to, rather than peevishly contending with, their humours, as remembering how oft they have been persecuted by his; and, in fine, by footage their cares, lightening their sorrows, supporting the infirmities of age, and making the remainder of their life as comfortable and joyful as possible.

As his brethren and sisters are the next with whom the creature forms a social and moral connection, to brethren he owes a fraternal regard; and with them and sisters, he ought he to enter into a strict league of friendship, mutual sympathy, advice, assistance, and a generous intercourse of kind offices, remembering their relation to common parents, and that brotherhood of nature which unites them into a closer community of interest and affection.

Section II. Concerning Marriage.

When man arrives to a certain age, he becomes connected by a peculiar sympathy and tenderness towards the other sex: the charms of beauty engage his attention, and call forth new and softer dispositions than he has yet felt. The many amiable qualities exhibited by a fair outside, or by the mild allurement of female manners, or which the prejudiced spectator without much reasoning supposes those to include, with several other circumstances both natural and accidental, point his view and affection to a particular object, and of course contrive that general rambling regard, which was lost and useles among the undistinguished crowd, into a peculiar and permanent attachment to one woman, which ordinarily terminates in the most important, venerable, and delightful connections in life.

The state of the brute creation is very different from that of human creatures. The former are clothed with the grounds of this connection, which is generally armed by their structure, easily finds what is necessary to their subsistence, and soon attains their vigour and maturity; so that they need the care and aid of their parents but for a short while; and therefore we see that nature has assigned to them vagrant and transient amours. The connection being purely natural, and merely for propagating and rearing their offspring, no sooner is that end answered, than the connection dissolves of course. But the human race are of a more tender and defenceless constitution; their infancy and non-age continue longer; they advance slowly to strength of body and maturity of reason; they need constant attention, and a long series of cares and labours, to train them up to decency, virtue, and the various arts of life. Nature has, there-
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The mind is apt to be dissipated in its views and acts of friendship and humanity; unless the former be directed to a particular object, and the latter employed in a particular province. When men once indulge in this dissipation, there is no stopping their career; they grow insensible to moral attractions; and, by obstructing or impairing the decent and regular exercise of the tender and generous feelings of the human heart, they in time become unqualified for, or averse to, the forming a moral union of souls, which is the cement of society, and the source of the purest domestic joys. Whereas a rational, undepraved love, and its fair companion, marriage, collect a man's views, guide his heart to its proper object, and, by confining his affection to that object, do really enlarge its influence and use. Besides, it is but too evident from the conduct of mankind, that the common ties of humanity are too feeble to engage and interest the passions of the generality in the affairs of society. The connections of neighbourhood, acquaintance and general intercourse, are too wide a field of action for many, and those of a public or community are so for more; and in which they either care not, or know not how to exert themselves. Therefore nature, ever wise and benevolent, by implanting that strong sympathy which reigns between the individuals of each sex, and by urging them to form a particular moral connection, the union of many domestic endearments has measured out to each pair a particular share of action, proportioned to their views, and adapted to their respective capacities. Besides, by interlocking them deeply in the concerns of their own little circle, she has connected them more closely with society, which is composed of particular families, and bound them down to their good behaviour in that particular community to which they belong. This moral connection is marriage, and this share of action is a family.

2. A con spiration of councils and endeavours to promote the common interest of the family, and to educate their common offspring. In order to observe these laws, it is necessary to cultivate, both before and during the married state, the finest decency and chaste of manner; and, a just sense of what becomes their respective characters.

3. The union must be inviolable, and for life. The nature of friendship, and particularly of this species of it, the education of their offspring, and the order of society and of successions, which would otherwise be extremely perplexed, do all seem to require it. To preserve this union, and render the matrimonial state more harmonious and comfortable, a mutual esteem and tenderness, a mutual deference and forbearance, a communication of advice, and assistance and authority, are absolutely necessary. If either party keep within their proper departures, there need be no disputes about power or superiority, and there will be none. They have no separate, no separate interests, and therefore there can be no just ground for opposition of conduct.

From this detail, and the present state of things, in Polygamy, which there is pretty near a parity of numbers of both sexes, it is evident that polygamy is an unnatural state; and though it should be granted to be more fruitful of children, which however, it is not found to be, yet it is by no means so fit for rearing minds, which seems to be so much, if not more, the intention of nature than the propagation of bodies.

Sect. III. Of Parental Duty.

The connection of parents with their children is a natural consequence of the matrimonial connection, and the duties which they owe them result as naturally from that connection. The noble state of children, subject to so many wants and dangers, requires their incessant care and attention; their ignorant and uncultivated minds demand their continual instruction and culture. Had human creatures come into the world with the full strength of men, and the weakness of reason and reasoning of parents which prevail in children, they would have been too strong or too stubborn to have submitted to the government and indulgence of their parents. But as they were destitute of a progress in knowledge and virtue, it was proper that the growth of their bodies should keep pace with that of their minds, left the purposes of that propagation should have been defeated. Among other admirable purposes which this gradual expansion of their outward as well as inward structure serves, this is one, that it affords ample scope to the exercise of many tender and generous affections, which fill up the domestic life with a beautiful variety of duties and enjoyments; and are of course a noble discipline for the heart, and an hardy kind of education for the more honourable and important duties of public life.

The aforementioned weak and ignorant state of children seems plainly to invest their parents with such authority and power as is necessary to their support, protection, and education; but that authority and power can be continued to extend no farther than is necessary to answer those ends, and to last no longer than that weakness and ignorance continue; wherefore, the foundation or rod of the authority and power...
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The first class of duties which parents owe their children respect their natural life; and these comprehend protection, nurture, provision, introducing them into the world in a manner suitable to their rank and fortune, and the like.

The second order of duties regards the intellectual and moral life of their children, or their education in such arts and accomplishments as are necessary to qualify them for performing the duties they owe to themselves and to others. As this was found to be the principal design of the matrimonial alliance, so the fulfilling that design is the most important and dignified of all the parental duties. In order therefore to fit the child for acting his part wisely, and worthily as a servant, as a citizen, and a creature of God, both parents ought to combine their joint wisdom, authority, and power, and each party to employ those talents which are the peculiar excellency and ornament of their respective sex. The father ought to lay out and superintend their education, the mother to execute and manage the detail of which he is capable. The former should direct the manly exertion of the intellectual and moral powers of his child. His imagination, and the manner of those exertions, are the peculiar province of the latter. The former should advise, protect, command, and, by his experience, masculine vigour, and that superior authority which is commonly ascribed to his sex, brace and strengthen his pupil for active life, for gravity, integrity, and firmness in suffering. The business of the latter is to bend and soften her male pupil, by the charms of her conversation, and the softness and decency of her manners, for social life, for politeness of taste, and the elegant decorums and enjoyments of humanity; and to improve and refine the tenderness and modesty of her female pupil, and form her to all those mild domestic virtues which are the peculiar characteristiques and ornaments of her sex.

To conduct the opening minds of their sweet charge through the several periods of their progress, to afford them in each period, in throwing out the latent seeds of reason and ingenuity, and in gaining fresh acceptions of light and virtue; and at length, with all these advantages, to produce the young adventurers upon the great theatre of human life, to play their several parts in the sight of their friends, of society, and mankind!

Sect. IV. Herilie and Servile Duty.

In the natural course of human affairs, it must necessarily happen that some of mankind will live in plenty and opulence, and others be reduced to a state of indigence and poverty. The former need the labours of the latter and the latter provision and support

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Hitherto we have considered only the domestic economical duties, because these are first in the progress of nature. But as man passes beyond the little circle of a family, he forms connections with relations, friends, neighbours, and others; from whence results a new

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The condition of service.

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With regard to captives taken in war, it is barbarous and inhuman to make perpetual slaves of them, unless some peculiar and aggravated circumstances of guilt have attended their hostility. The bulk of the subjects of any government engaged in war may be fairly esteemed innocent enemies; and therefore they have a right to that clemency which is consistent with the common safety of mankind, and the particular security of that society against which they are engaged. Though ordinary captives have a grant of their lives, yet to pay their liberty as an equivalent is much too high a price. There are other ways of acknowledging or returning the favour, than by renouncing what is far dearer than life itself. To those who, under pretence of the necessities of commerce, derive the unnatural trade of bargaining for human flesh, and confining their innocent but unfortunate fellow creatures to eternal servitude and misery, we may address the words of a fine writer; "Let avarice defend it as it will, there is an honest reluctance in humanity against buying and selling, and regarding those of our own species as our wealth and possessions."
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A new train of duties of the more private social kind, as "friendship, chivalry, courtesy, good-natured kindness, charity, forgiveness, hospitality."

Man is admirably formed for particular social attachments and duties. There is a peculiar and strong propensity in his nature to be affected with the sentiments and dispositions of others. Men, like certain musical instruments, are fit to each other, so that the vibrations or notes excited in one rattle correspondent notes and vibrations in the other. The impulses of pleasure or pain, joy or sorrow, made on one mind, are by an instantaneous sympathy of nature communicated in some degree to all; especially when hearts are (as an humane writer expresses it) in unison of kindreds; the joy that vibrates in one communicates to the other also. We may add, that though joy thus imparted swells the harmony, yet grief vibrated to the heart of one affects the heart of another. We may add, that though joy thus imparted swells the harmony, yet grief vibrated to the heart of another, they increase and multiply prodigiously. There is a most moving eloquence in the human countenance, air, voice, and gesture, wonderfully expressive of the most latent feelings and passions of the soul, which darts them like a subtle flame into the hearts of others, and rakes correspondent feelings there: friendship, love, good-humour, joy, spread through every feature, and particularly from the eyes their softer and fiercer fires with an irresistible energy. And in like manner the opposite passions of hatred, enmity, ill humour, melancholy, diffuse a fullen and faddening air over the face, and, flashing from eye to eye, kindle a train of similar passions. By these, and other admirable pieces of machinery, men are formed for society and the delightful interchange of friendly sentiments and duties, to increase the happiness of others by participation, and their own by reound; and to diminish, by dividing, the common stock of their misery.

The first emanations of the social principle beyond the bounds of a family lead us to form a nearer conjunction of friendship or good-will with those who are any wise connected with us by blood or domestic alliance. To them our affection does commonly exert itself in a greater or less degree, according to the nearness or distance of the relation. And this proportion is admirably fitted to the extent of our powers and the indigence of our state; for it is only within those closer circles of connubialty or alliance that the generality of mankind are able to display their abilities or benevolence, and consequently to uphold their connection with society and subferviency, to a public interdict. Therefore it is our duty to regard these closer connections as the next department to that of a family, in which nature has marked out for us a sphere of activity and usefulness; and to cultivate the kind affections which are the cement of those engaging alliances.

Frequently the view of distinguishing moral qualities in some of our acquaintance may give birth to that more noble connection we call friendship, which is far superior to the alliances of connubialty. For there are of a superficial, and often of a transitory nature, of which, as they hold more of infirmity than of reason, we cannot give such a rational account. But friendship derives all its strength and beauty, and the only existence which is durable, from the qualities of the heart, or from virtues and lovely dispositions. Or, should there be wanting, they or some shadow of them must be supposed present. Therefore friendship may be defined to be, "The union of two souls by means of virtue, the common object of the mutual affection." Without virtue, or the supposition of it, friendship is only a servile league, an alliance of interest, which must dissolve of course when that interest decays or subsides no longer. It is not to much any particular passion, as a composition of some of the noblest feelings and passions of the mind. Good friends, a just taste and love of virtue, a thorough candor and benevolence of heart, or what we usually call a good temper, and a generous sympathy of sentiments and affections, are the necessary ingredients of this virtuous connection. When it is grafted on esteem strengthened by habit, and mellowed by time, it yields infinite pleasure, ever new and ever growing; is a noble support amidst the various trials and vicissitudes of life, and an high felicity to most of our other enjoyments.

To form and cultivate virtuous friendship, must be very improving to the temper, as its principal object is virtue, let off with all the allurement of countenance, air, and manners, shining forth in the native graces of manly honor, sentiments and affections, and rendered visible as it were to the friendly spectator as a conduct unaffectedly great and good; and as its principal exercises are the very energies of virtue, or its effect and emanations. So that wherever this amiable attachment prevails, it will extol our admiration and attachment to virtue, and, unless imputed in its course by unnatural prejudices, run out into a friendship to the human race. For as no one can merit, and none ought to usurp the sacred name of friend, who hates mankind; so whoever truly loves them, poises the most essential quality of a true friend.

The duties of friendship are a mutual esteem of each other, unbiirded by interest, and independent of it, a generous confidence as far distant from suspicion as from reserve, an inviolable harmony of sentiments and dispositions of deeds and interests, a fidelity unbroken by the changes of fortune, a constancy unalterable by the distance of time or place, a resignation of one's personal interest to those of one's friend, and a reciprocal, unequivocal, unreserved exchange of kind offices. But, amidst all the exertions of this moral connection, humane and generous as it is, we must remember that it operates within a narrow sphere, and its immediate operations respect only the individual; and therefore its particular impulses must still be subordinate to a more public interest, or be always directed and controlled by the more extensive connections of our nature.

When our friendship terminates on any of the other Love and sex, in whom beauty or agreeableness of perfon and beauty, external gracefulness of manners conspire to express and heighten the moral charm of a tender honet heart, and sweet, ingenious, modest temper, lighted up by good sense; it generally grows into a more soft and endearing attachment. When this attachment is improved...
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proved by a growing acquaintance with the worth of its object, is conducted by discretion, and issues at length, as it ought to do, in the moral connection formerly mentioned, it becomes the source of many amiable duties, of a communication of passions and interests, of the most refined decencies, and of a thousand nameless deep-felt joys of reciprocal tenderness and love, flowing from every look, word, and action. Here friendship acts with double energy, and the natural conspires with the moral charms to strengthen and secure the love of virtue. As the delicate nature of female honour and decorum, and the inexpressible grace of a chaste and moral conduct is, of the reverence due to mankind, our duty, and the infinite love, flowing from every look, word, and action, of the woman's sex and the scorn of ours, and to the amiable duties, of a communication of love into her own sex and the scorn of ours, and to the amiable duties, of a communication of love into every look, word, and action.

This inferior order of virtues is wanting. So seduced by its own sex and the scorn of ours, and to the amiable duties, of a communication of love into every look, word, and action, of the public, does not require a proportionable retaliation, it is agreeable to the general law of benevolence, and to the particular end of the passion (which is to prevent injury and the misery occasioned by it), to forgive personal injuries, or not to return evil for evil. This duty is one of the noble refinements which Christianity has made upon the general maxims and practice of mankind, and enforced, with a peculiar strength and beauty, by sanctions no less alluring than awful. And indeed the practice of it is generally its own reward; by expelling from the mind the most dreadful intruders upon its repose, those rancorous passions which are begot and nurtured by resentment, and by disarming and even subduing every enemy one has, except such as have nothing left of men but the outward form.

The most enlarged and humane connection of the Hospital private kind seems to be the hospitable alliance, from which all the amiable and disinterested duties we owe to strangers. If the exercise of passions of the most private and infinitive kind is beheld with moral approbation and delight, how lovely and venerable must those appear which result from a calm philanthropy, are founded in the common rights and connection of society, and embrace men, not of a particular sex, party, or nation, but all in general without distinction, and without any of the little partialities of self-love.
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**Sect. VI. Social duties of the Commercial kind.**

The next order of connections are those which arise from the ways and weaknesses of mankind, and from the various situations in which their different situations place them. These we may call commercial connections, and the duties which result from them commercial duties, as justice, fair-dealing, sincerity, fidelity to compact, and the like.

Though nature is perfect in all her works, yet she has observed a manifest and eminent difficulty among them. To all such as lie beyond the reach of human skill and power, and are properly of her own department, she has given the finishing hand. These man may design after and imitate, but he can never rival them, nor add to their beauty or perfection. Such are the forms and structure of vegetables, animals, and many of their productions, as the honey-comb and the spider’s web, and the like. There are others of her works which she has of design left unfinished, as it were, in order to exercise the ingenuity and power of man. She has presented him a rich profusion of materials of every kind for his convenience and use; but they are rude and unpolished, or not to be come at without art and labour. Therefore he must apply, in order to adapt them to his use, and to enjoy them in perfection. Thus nature has given him an infinite variety of herbs, grain, fruits, mineral, wood, water, earth, air, and a thousand other crude materials, to supply his numerous wants. But he must flow, plant, dig, refine, polish, build, and, in short, manufacture the various productions of nature, in order to obtain even the necessaries, and much more the conveniences and elegancies of life. These then are the price of his labour and industry, and, without that, nature will sell him nothing. But as the wants of mankind are many, and the single strength of individuals small, they could hardly find the conveniences and elegancies of life, without uniting their ingenuity and strength in acquiring these, and without mutual intercourse of good offices. Some men are better formed for some kinds of ingenuity and labour, and others for other kinds; and different soils and climates are enriched with different productions, that men, by exchanging the produce of their respective labours, and supplying the wants of one another with the superfluities of another, do in effect diminish the labours of each, and increase the abundance of all. This is the foundation of all commerce, or exchange of commodities and goods, one with another; in order to facilitate which, man have contrived different species of coin, or money, as a common standard by which to estimate the comparative values of their respective goods. But to render commerce sure and effectual, justice, fair-dealing, sincerity, and fidelity to compact, are absolutely necessary.

Justice or fair-dealing, or, in other words, a disposition to treat others as we would be treated by them, is a virtue of the first importance, and indispensable from the virtuous character. It is the cement of society, or that pervading spirit which connects its members, inspires its various relations, and maintains the order and subordination of each part to the whole. Without it, society would become a den of thieves and banditti, hating and hated, devouring and devoured, by one another.

And here it may be proper to take a view of Mr. Hume’s suppos’d case of the sensible knave and the worthless miser (§ 16). and consider what would be the duty of the former according to the theory of those moralists who hold the will of God to be the criterion or rule, and everlasting happiness the motive of human virtue.

It has been already observed, and the truth of the observation cannot be controverted, that by secretly purloining from the coffers of a miser part of that gold which there lies useless, a man might in particular circumstances, promote the good of society, or that perpetual happiness which to himself would be the criterion or standard of justice. Very different, however, is the conclusion which must be drawn by those who consider the natural tendency of actions, if universally performed, as the criterion of their merit or demerit in the sight of God. Such philosophers attend not to the particular consequences of a single action in any given case, but to the general consequences of the principle from which it flows, if that principle were universally adopted. You cannot (say they) permit one action and forbid another, without flowing a difference between them. The same fort of actions, therefore, must be generally permitted or generally forbidden. But were every man allowed to act for himself the circumstances in which the good of society would be promoted, by secretly abetting the superfluous wealth of a worthless miser, it is plain that no property could be safe; that all incitements to industry would be at once removed; and that whatever might be the immediate consequences of any particular thefts, the general and necessary consequences of the principle by which it was authorized must soon prove fatal. Were one man to purloin part of the riches of a real miser, and to consider his conduct as vindicated by his intention to employ those riches in acts of generosity, another might by the same fort of casuistry think himself authorized to appropriate to himself part of his wealth; and thus theft would spread through all orders of men, till society would be dissolved in separate, hostile, and fugitive families, mutually dreading and shunning each other. The general consequences, therefore, of encroaching upon private property tend evidently and violently to universal misery.

On the other hand, indeed, the particular and immediate consequences of that principle which considers every man’s property as sacred, may in some cases, such as that supposed, be in a small degree injurious to a few families in the neighbourhood of the miser and the knave. But that injury can never be of long duration; and it is infinitely more than counterbalanced by the general good consequences of the principle from which it accidentally results; for these consequences extend to all nations and to all ages. Without a sacred regard to property, there could neither be arts nor industry nor confidence among men, and happiness would for ever vanish from this world. But the communication of happiness being the end which...
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which God had in view when he created the world, and all men standing in the same relation to him, it is impossible to suppose that he does not approve, and will not ultimately reward, those voluntary actions of which the natural tendency is to increase the sum of human happiness; or that he does not disapprove, and will not ultimately punish, those which naturally tend to aggravate human misery. The conclusion is, that a strict adherence to the principle of justice is universally, and in all possible circumstances, a duty from which we cannot deviate without offending our Creator, and ultimately bringing misery upon ourselves.

Sincerity, or veracity, in our words and actions, is another virtue or duty of great importance to society, being one of the great bands of mutual intercourse, and the foundation of mutual trust. Without it, society would be the domination of mistrust, jealousy, and fraud, and conversation a traffic of lies and disimulation. It includes in it a conformity of our words with our sentiments, a correspondence between our actions and dispositions, a strict regard to truth, and an irreconcilable abhorrence of falsehood. It does not indeed require, that we expose our sentiments indiscriminately, or tell all the truth in every case; but certainly it does not, and cannot admit the least violation of truth or contradiction to our sentiments. For if these bounds are once passed, no possible limit can be assigned where the violation shall stop, and no pretence of private or public good can possibly counterbalance the ill consequences of such a violation.

Fidelity to promises, compacts, and engagements is likewise a duty of such importance to the security of commerce and interchange of benevolence among mankind, that society would soon grow intolerable without the strict observance of it. Hobbes and others who follow the same track, have taken a wonderful deal of pains to puzzle this subject, and to make all the virtues of this sort fort merely artificial, and not at all obligatory, antecedent to human conventions. No doubt compacts suppose people who make them: and promises persons to whom they are made: and therefore both suppose some society, more or less, between those who enter into these mutual engagements. But is it not a compact or promise binding, till men have agreed that they shall be binding? or are they only binding, because it is our interest to be bound by them or to fulfil them? Do not we highly approve the man who fulfils them, even though they should prove to be against his interest? and do not we condemn him as a knave who violates them on that account? A promise is a voluntary declaration by words, or by an act equally significant; of our resolution to do something in behalf of another, or for his service. When it is made, the person who makes it is by all suppos'd under an obligation to perform it. And he to whom it is made may demand the performance as his right. That perception of obligations is a simple idea, and is on the same footing as our other moral perceptions, which may be described by inferences, but cannot be defined. Whether we have a perception of such obligation quite distinct from the interest, either public or private, that may accompany the fulfilment of it must be referred to the conscience of every individual. And whether the mere sense of that obligation apart from its concomitant, is not a sufficient inducement or motive to keep one's promise, without having recourse to any selfish principle of our nature, must be likewise appealed to the conscience of every honest man.

It may, however, be not improper to remark, that in this, as in all other instances, our chief good is combined with our duty. "Men act from expectation. Expectation is in most cases determined by the affurances and engagements which we receive from others. If no dependence could be placed upon these assurances, it would be impossible to know what judgement to form of many future events, or how to regulate our conduct with respect to them. Confidence, therefore, in promises, is essential to the intercourse of human life, because without it the greatest part of our conduct would proceed upon chance. But there could be no confidence in promises, if men were not obliged to perform them." Tho' therefore, who allow not to the perceptions of the moral sense all that authority which we attribute to them, must still admit the obligation to perform promises; because such performance may be shown to be agreeable to the will of God, in the very same manner in which upon their principles we have shown the uniform practice of justice to be so.

Fair dealing and fidelity to compacts require that we take no advantage of the ignorance, passion, or incapacity of others, from whatever cause that incapacity arises;—that we be explicit and candid in making bargains, just and faithful in fulfilling our part of them. And if the other party violates his engagements, redress is to be sought from the laws, or from those who are intrusted with the execution of them. In fine, the commercial virtues and duties require that we only do not invade, but maintain the rights of others;—that we be fair and impartial in transferring, bartering, or exchanging property, whether in goods or service: and be inviolably faithful to our word and our engagements, where the matter of them is not criminal, and where they are not exerted by force. See Promise.

Sect. VII. Social Duties of the Political Kind.

We are now arrived at the last and highest order of duties respecting society, which result from the exercise of the most generous and heroic affections, and are founded on our most enlarged connections.

The social principle in man is of such an expansive nature, that it cannot be confined within the circuit of a family, of friends, or a neighbourhood; it spreads into wider systems, and draws men into larger confederacies, communities, and moral dominions. It is in those only that the higher powers of our nature attain the highest improvement and perfection of which they are capable. These principles hardly find objects in the solitary state of nature. There the principle of action rises no higher at first than natural affection towards one's offspring. There personal or family wants entirely engross the creature's attention and labour, and allow no leisure, or, if they did, no exercise for views and affections of a more enlarged kind. In so great all are employed in the same way, in providing for the animal life. And even after their utmost labour and care, single and unaided by the industry of others, they find but a forry supply of their wants, and a feeble precarious security against dangers from wild beasts; from inclement skies and fea-
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From the mistakes or pertinacious passions of our fellow-creatures; from their preference of themselves to their neighbours; and from all the little circumstances of self-love. But in society, the mutual aids which men give and receive shorten the labours of each, and the combined strength of reason of individuals give security and protection to the whole body. There is both a variety and subordination of genius among mankind. Some are formed to lead and direct others, to contrive plans of happiness for individuals, their execution, and, in short, to refine and civilize human life. Others, who have not such good heads, may have as honest hearts, a truly public spirit, love of liberty, hatred of corruption and tyranny, a generous submission to laws, order, and public institutions, and an extensive philanthropy. And others, who have none of those capacities either of heart or head, may be well formed for manual exercises and bodily labour. The former of these principles has no scope in solitude, where a man's thoughts and concerns do all either centre in himself or extend no farther than a family; into which little circle all the duty and virtue of the solitary moral is crowded. But society finds proper objects and exercises for every genius, and the noblest objects and exercises for the noblest geniuses, and for the highest principles of the human constitution; particularly for that warmest and most sublime passion which God hath kindled in our bosoms, the inclination of doing good, and reverencing our nature; which may find here both employment and the most exquisite satisfaction. In society, a man has not only more leisure, but better opportunities, of applying his talents with much greater perfection and success, especially as he is furnished with the joint advice and assistance of his fellow creatures, who are now more closely united one with the other, and sustain a common relation to the same moral system or community. This then is an object proportioned to his most enlarged social affections; and in serving it he finds scope for the exercise and refinement of his highest intellectual and moral powers. Therefore society, or a state of civil government, rests on these two principal pillars. "That in it we find security against those evils which are unavoidable in solitude—and obtain those goods, some of which cannot be obtained at all, and others not so well, in that state where men depend solely on their individual fagacity and industry."

From this short detail it appears, that man is a social creature, and formed for a social state; and that society, being adapted to the highest principles and destinations of his nature, must of necessity be his natural state.

The duties suited to that state, and resulting from those principles and destination, or, in other words, from our social passions and social connections, or relation to a public system, are, love of our country, reformation, and obedience to the laws, public spirit, love of liberty, sacrifice of life and all to the public, and the like.

Love of our country, is one of the noblest passions that can warm and animate the human breast. It includes all the limited and particular affections to our parents, friends, neighbours, fellow-citizens, and countrymen. It ought to direct and limit their more confined and partial affections within their proper and natural bounds, and never let them encroach on those sacred and first regards we owe to the great public to which we belong. Were we solitary creatures, detached from the rest of mankind, and without any capacity of comprehending a public interest, or without affections leading us to desire and pursue it, it would not be our duty to mind it, nor criminal to neglect it. But as we are parts of the public system, and are not only capable of taking in large views of its interests, but by the strongest affections connected with it, and prompted to take a share of its concerns, we are under the most sacred ties to procure its security and welfare with the utmost ardour, especially in times of public trial. This love of our country does not import an attachment to any particular soil, climate or spot of earth, where perhaps we first drew our breath, though those natural ideas are often associated with the moral ones, and, like external signs or symbols, help to ascertain and bind them; but it imports an affection to that moral system, or community, which is governed by the same laws and magistrates, and whose several parts are variously connected one with the other, and all united upon the bottom of a common interest. Perhaps indeed every member of the community cannot comprehend so large an object, especially if it extends through large provinces, and over vast tracts of land; and still less can he form such an idea, if there is no public, i.e. if all are subject to the caprice and unlimited will of one man; but the preference the generality flow to their native country, the concern and longing after it which they express when they have been long absent from it; the labours they undertake and sufferings they endure to save or serve it, and the peculiar attachment they have to their countrymen, evidently demonstrate that the passion is natural, and never fails to exert itself when it is fairly engaged from foreign gloats; and is directed to its proper object. Wherever it prevails in its genuine vigour and extent, it swallows up all selfish and selfish regards; it conquers the love of ease, power, pleasures, and wealth; nay, when the amiable partialities of friendship, gratitude, private affection, or regards to a family, come in competition with it, it will teach us bravely to sacrifice all, in order to maintain the rights, and promote or defend the honour and happiness of our country.

Reformation and obedience to the laws and orders of government, to which we belong, are political duties and necessary to the very being of society, without which obedience it must soon degenerate into a state of licentiousness and anarchy. The welfare, nay, the nature of civil society, requires that there should be a subordination of orders, or diversity of rank and conditions in it;—that certain men, or orders of men, be appointed to superintend and manage such affairs as concern the public safety and happiness;—that all have their particular provinces assigned them,—that such a subordination be settled among them as none of them may interfere with another; and finally, that certain rules or common measures of action be agreed on, by which each is to discharge his respective duty to govern or be governed, and all may concour in securitg the order.
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Part II.

Duties of Society.

Public duties of every citizen.

A society thus constituted by common reafon, and formed on the plan of a common interest, becomes immediately an object of public attention, public veneration, public obedience, a public and inviolable attach- ment, which ought neither to be seduced by bribes, nor awed by terrors; an object, in fine, of all those extensive and important duties which arise from so glorious a confederacy. To watch over such a system; to contribute all he can to promote its good by his reason, his ingenuity, his strength, and every other ability, whether natural or acquired; to refist, and, to the utmost of his power, defeat every incoachment upon it, whether carried on by a secret corruption or open violence; and to sacrifice his ease, his wealth, his power, nay life itself; and, what is dearer still, his family and friends, to defend or save it, is the duty, the honour, the interest, and the happiness of every citizen; it will make him venerable and beloved while he lives, be lamented and honoured if he falls in so glorious a cause, and transmit his name with immortal renown to the lateft polterity.

As the people are the fountain of power and authority, the original feat of majesty, the authors of public laws, and the creators of officers to execute them; if they fhall find the power they have conferred abused by their trustees, they being majoly violated by tyranny or by usurpation, their authority prostituted to support violence or fome corruption, the laws grown pernicious through accidents unforefeen or unavoidable, or rendered ineffectual through the infidelity and corruption of the executors of them; then it is their right, and what is their right is their duty, to fubmit that delegated power, and call their trustees to an account; to refi, the usurpation, and extirpate the tyranny; to reftore their fullied majesty and proftituted authority; to fuspend, alter, or abrogate those laws, and punish their unfaithful and corrupt officers. Nor is it the duty only of the united body; but every member of it ought, according to his refpective rank, power, and weight in the community, to concur in advancing and supporting these glorious defigns.

Refiflence, therefore, being undoubtedly lawful in extraordinary emergencies, the question, among good reafoners, can only be with regard to the degree of neceflity which can justify refi, and render it expedient or commendable. And here we must acknowledge, that, with Mr Hume, "we fhall always incline to their fide that draw the bond of allegiance vol. 1. very clofe, and who confider an infringement of it as the laft refuge in desperate cafes, when the public is in the highest danger from violence and tyranny. For besides the mischiefs of a civil war, which commonly attends insurrection, it is certain, that where a defi- nation to rebellion appears among any people, it is one chief caufe of tyranny in the rulers, and forces them into many violent measures, which, had they been accompanied with fubmiffion and obedience, they would never have embraced. Thus the tyrannicide, or allaughter approved of by ancient maxims, instead of keeping tyrants and usurpers in awe, made them ten times more fierce and unrelenting; and is now juftly abolished on that account by the laws of nations, and universally condemned as a base and treacherous method of bringing to juftice those disturbers of society."

CHAP. IV. Duty to God.

Of all the relations which the human mind sustains, Divine con- that which fubsifts between the Creator and his crea- tures.
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169 Existence of God.

It does not appear, from any true history or experience of the mind's progress, that any man, by any formal deduction of his discursive power, ever reasoned himself into the belief of a God. Whether such a belief is only some natural inclination of soul, or is derived from father to son, and from one man to another, in the way of tradition, is or is suggested to us in conformity of an immutable law of our nature, on holding the auglilt aspect and beautiful order of the universe, we will not pretend to determine. What seems most agreeable to experience is, that a sense of beauty and grandeur, and the admirable force of one thing to another, in its vast appearance, leads the mind necessarily and unavoidably to a perception of a design, or of a designing cause, the origin of all, by a progressive as simple and natural as that by which a beautiful picture or a fine building suggests to us the idea of an excellent artist. For it seems to hold universally true, that whenever we discern a tendency or co-operation of things towards a certain end, or producing a common effect, there, by a necessary law of association, we apprehend design, a designing energy or cause. No matter whether the objects are natural or artificial, still that suggestion is unavoidable, and the connection between the effect and its adequate cause obstructs itself on the mind, and it requires no nice search or elaborate deduction of reason to trace or prove that connection. We are particularly satisfied of its truth in the subject before us by a kind of direct intuition; and we do not seem to attend to the maxim we learn in schools, "That there cannot be an infinite series of causes and effects producing and produced by one another." That maxim is familiar only to metaphysicians; but all men of sound understanding are led to believe the existence of a God. We are conscious of our existence, of thoughts, sentiments, and passion, and sensible withal that these came not of ourselves; therefore we immediately recognize a parent-mind, an original intelligence, from whom we borrowed those little portions of thought and activity. And while we not only feel kind affections in ourselves, and discover them in others, but likewise behold round us such a number and variety of creatures, endowed with natures nicely adjusted to their several stations and economies, supporting and supported by each other, and all sustained by a common order of things, and sharing different degrees of happiness according to their respective capacities, we are naturally and necessarily led up to the Father of such a numerous off-pring, the fountain of such widespread happiness. As we conceive this Being before all, above all, and greater than all, we naturally, and without reasoning, ascribe to him every kind of perfection, wisdom, power, and goodness without bounds, existing through all time, and pervading all space. We apply to him those glorious epithets of our Creator, Præparator, Benefactor, the supreme Lord and Lawgiver of the whole society of rational and intelligent creatures. Not only the imperfections and wants of our being and condition, but some of the noblest affections and affections of our minds, connect us with this great and universal nature. The mind, in its progress from object to object, from one character and prospect of beauty to another, finds some blemish or deficiency in each, and soon exhausts or grows weary and dissatisfied with its object; it sees no character of excellency among men equal to that pitch of esteem which it is capable of exerting; no object within the compass of human things adequate to the strength of its affection; nor can it stay any where in this self-expansive progress, or find repose after its highest flights, till it arrives at a Being of unbounded greatness and worth, on whom it may employ its sublimest powers without exhausting the subject, and give scope to the utmost force and fulness of its love without fatiety or disgust. So that the nature of this Being corresponds to the nature of man; nor can his intelligent and moral powers obtain their entire end, but on the supposition of such a Being, and without a real sympathy and communication with him. The native propensity of the mind to reverence whatever is great and wonderful in nature, finds a proper object of homage in him who spreads out the heavens and the earth, and who sustains and governs the whole of things. The admiration of beauty, the love of order, and the complacency we feel in goodnesses, must rise to the highest pitch, and attain the full vigour and joy of their operations, when they unite in him who is the fum and source of all perfection.

It is evident from the slightest survey of morals, immediately that how punctual ever one may be in performing the duties which result from our relations to mankind, yet to be quite deficient in performing those which arise from our relation to the Almighty, must argue a strange perversion of reason or depravity of heart. If imperfect degrees of worth attract our veneration, and if the want of it would imply an insensibility, or, which is worse, an aversion, to merit, what manner of affection or immorality of character must it be that is not affected with, and much more to be ill-affected to, a Being of superlatively worth! To love society, or particular members of it, and yet to have no sense of our connection with its Head, no affection to our common Parent and Benefactor; to be concerned about the approbation or censure of our fellow-creatures, and yet to feel nothing of this kind towards him who sees and weighs our actions with unerring wisdom and justice, and can fully reward or punish them, betrays equal madness and partiality of mind. It is plain, therefore, beyond all doubt, that we are not surprised at the great Father of all, in whom every lovely and adorable quality combines to inspire veneration and homage.

As it has been observed already, that our affections depend on our opinions of their objects, and generally keep pace with them, it must be of the highest importance, and seems to be among the first duties we owe to the Author of our being, to form the least imperfect, since we cannot form perfect, conceptions of his character and administration. For such conceptions, thoughly imbied, will render our religion rational, and our dispositions refined. If our opinions are diminutive and distorted, our religion will be super-

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nation, what dependence, what generous confidence, what hope in God and his all wise providence, must arise in the soul that is possest of such amiable views of him? All those exercises of piety, and above all a superlative esteem and love, are directed to God as to their natural, their ultimate, and indeed their only adequate object; and though the immense obligations we have received from him may excite in us more lively feelings of divine goodness than a general and abstractive contemplation of it, yet the affections of gratitude and love are of themselves the generous difinterested kind, not the result of self-interest, or views of reward. A perfect character, in which we always suppose infinite goodness, guided by unerring wisdom, and supported by almighty power, is the proper object of perfect love; which, as such, we are forcibly drawn to pursue and to aspire after. In the contemplation of the divine nature and attributes, we find at last what the ancient philosophers fought in vain, the SUPREME AND SOVEREIGN GOOD; from which all other goods arise, and in which they are all contained. The Deity therefore challenges our supreeme and sovereign love, a sentiment which, whatsoever indulges, must be confounded in the love of virtue, in the desire to imitate its all-perfect pattern, and in a cheerful security that all his great concerns, those of his friends and of the universe, shall be absolutely safe under the conduct of unerring wisdom and unbounded goodness. It is in his care and providence alone that we come short of the perfection and various blemishes of our own, as it is in his happiness of all, finds perfect serenity; a serenity neither ruffled by partial ill nor foured by private disappointment.

When we consider the unalloyed purity and absolute perfection of the divine nature, and reflect withal on the imperfection and various blemishes of our own, we must link, or be convinced we ought to link, into the deepest humility and prostration of soul before him who is so wonderfully great and holy. When, further, we call to mind what low and languid feelings we have of the divine presence and majesty, what his finibility of his fatherly and universal goodness, nay, what ungrateful returns we have made to it, how far we come short of the perfection of his law and the dignity of our own nature, how much we have indulged to the selfish passions, and how little to the benevolent ones; we must be conscious that it is our duty to repent of a temper and conduct so unworthy our nature and unbecoming our obligations to its Author, and to resolve and endeavour to act a better and better part for the future.

Nevertheless, from the character which his works exhibit of him, from those delays or alleviations of punishment which offenders often experience, and from the merciful tenor of his administration in many other instances, the sincere penitent may entertain good hopes that his Parent and Judge will not be solicitous or impatient to mark iniquity, but will be propitious and favourable to him, if he honestly endeavours to avoid his former practices, and forbode his former habits, and to live in a greater conformity to the divine will for the future. If any doubts or fears should still remain, how far it may be consistent with the rectitude and equity of the divine government to let his iniquities pass unpunished, yet he cannot think it unfruitful to his paternal clemency and wisdom to contrive a method of retrieving the penitent offender, that shall unite and reconcile the majesty and mercy of his government. If reason cannot of itself suggest such a scheme, it gives at least some ground to expect it. But though natural religion cannot let in moral light and assurance on fo interesting a subject, yet it will teach the humble thief to wait with great submission for any farther intimations it may please the supreme Governor to give of his will; to examine with candour and impartiality whatever evidence shall be proposed to him of a divine relation, whether that evidence is natural or supernatural; to embrace it with generation and cheerfulness, if the evidence is clear and convincing; and finally, if it bring to light any new relations or connections, natural religion will peruse its sincere votary faithfully to comply with the obligations, and perform the duties which result from those relations and connections. This is the simple, the completion of morality!

We must farther observe, that all those affections and motives, which we supposed to regard the Deity as their immense, primary, and absolute object, are vital energies of the soul, and consequently exert themselves into act, and, like all other energies, gain strength or greater activity by that exertion. It is the very life of our understanding, our affections, and our wills; it often inflates times, and by descendent and incommunicable acts, to contemplate and adore the great Original of our existence, the Parent of all beauty and of all good; to express our veneration and love by an awful and devout recognition of his perfections; and to evidence our gratitude by celebrating his goodness, and thankfully acknowledging all his benefits. It is likewise our duty, by proper exercises of sorrow and humiliation, to confess our ingratitude and folly; to signify our dependence on God, and our confidence in his goodness, by imploing his blessing and gracious concurrence in assiting the weaknesses and curing the corruptions of our nature; and finally, to tell forth the sense of his authority, and our faith in his government, by devoting ourselves to do his will, and resigning ourselves to his disposal. These duties are not therefore obligatory, because the Deity needs or can be profited by them; but as they are apparently decent and moral, suitable to the relations he sustains of our Creator, Benefactor, Legislator, and Judge; expressive of our state and obligations; and improving to our tempers, by making us more rational, social, god-like, and consequently more happy.

We have now considered Internal piety, or the External worship of the mind, that which is in spirit and in worship, truth; we shall conclude the section with a short account of that which is External. External worship is founded on the same principles as internal, and of as strict moral obligation. It is either private or public. Devotion that is inward, or purely intellectual, is too spiritual and abstractive an operation for the bulk of mankind. The operations of their minds, such especially as are employed on the most sublime, immaterial objects, must be assisted by their outward organs, or by some help from the imagination; otherwise they will soon be dispelled by sensible impressions, or grow tiresome if too long continued. Ideas are such fleeting things, that they must be fixed; and so fable, that they must be expressed and delineated, as it were, by sensible marks and images; otherwise we cannot...
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Chapter I. Of Practical Ethics, or the Culture of the Mind.

We have now gone through a particular detail of the several duties we owe to ourselves, to society, and to God. In considering the first order of duties, we shall touch upon the methods of acquiring the different kinds of goods which we are led by nature to pursue; only we left the consideration of the method of acquiring the moral goods of the mind to a chapter by itself, because of its singular importance. This chapter then will contain a brief enumeration of the arts of acquiring virtuous habits, and of forming virtuous ones, as far as is consistent with the brevity of such a work: a subject of the utmost difficulty as well as importance in morals; to which, nevertheless, the least attention has been generally given by moral writers. This will properly follow a detail of duty, as it will direct us to such means or helps as are most necessary and conducive to the practice of it.

In the first part of this inquiry we traced the order in which the passions shoot up in the different periods of human life. That order is not accidental, or dependent on the caprice of men, or even the influence of custom and education, but arises from the original constitution and laws of our nature; of which this is one, viz. "That sensible objects make the first and strongest impressions on the mind." These, by means of our outward organs, being conveyed to the mind, become objects of its attention, on which it reflects when the outward objects are no longer present, or in other words, when the impressions upon the outward organs cease. These objects of the mind's reflection are called ideas or notions. Towards these, by another law of our nature, we are not altogether indifferent; because correspondent movements of desire or aversion, love or hatred, arise, according as the objects which they denote make an agreeable or disagreeable impression on our organs. These ideas and affections which we experience in the first period of life, we refer to the body, or to sense; and the taste which is formed towards them, we call a pleasure, or a merely natural taste; and the objects corresponding to them we in general call good or pleasant.

But as the mind moves forward in its course, it extends its views, and receives a new and more complex set of ideas, in which it observes uniformity, variety, similarity, symmetry of parts, reference to an end, novelty, grandeur. These compose a vast train and diversity of imagery, which the mind compounds, divides, and moulds into a thousand forms, in the absence of those objects which first introduced it. And this more complicated imagery fuses a new train of desires and affections, full as spiritedly and engaging as any which have yet appeared. This whole class of perceptions or impressions is referred to the imagination, and forms an higher taste than the sensible, and which has an immediate and mighty influence on the finer passions of our nature, and is commonly termed a fine taste.

The objects which correspond to this taste we use to call beautiful, great, harmonious, or wonderful, in general by the name of beauty.

The mind, full pushing onwards and increasing its moral ideas stock of ideas, ascends from these to a higher species of objects, viz. the order and mutual relations of minds to each other, their reciprocal affections, characters, actions, and various affections. In these it discovers a beauty a grandeur, a decorum, more interesting and alluring than any of the former kinds. These objects, or the notions of them, passing in review before the mind, do, by a necessary law of our nature, call forth another and nobler set of affections, as admiration, esteem, love, honour, gratitude, benevolence, and others of the like tribe. This class of perfections, and their correspondent affections, we refer, because of their objects (manners), to a moral sense, and call the taste or temper they excite, moral. And the objects which are agreeable to this temper we denominate by the general name of moral beauty, in order to distinguish it from the other which is termed natural.

These different sorts of ideas or notions are the materials about which the mind employs itself, which it blends, ranges, and diversifies ten thousand different ways. It feels a strong propensity to connect and associate those ideas among which it observes any similitude or any aptitude, whether original and natural, or customary and artificial, to suggest each other. See Association.

But whatever the reasons are, whether similitude, laws of co-existence, causality, or any other aptitude or relation, association, why any two or more ideas are connected by the mind at all, it is an established law of our nature, "that when two or more ideas have often started in company,
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company, they form so strong an union, that it is very difficult ever after to separate them. Thus the

error cannot separate the idea of merit from his misdeeds; the

courtier that of dignity from his title or ribbon; the

mifer that of his piles from his hog. It is these

associations of worth or happiness with any of the different

kinds of objects or images before specified, that form our

taste or complex idea or good. By another law of our

nature, our affections follow and are governed by this
taste. And to these affections our character and conduct

are similar and proportioned; on the general tenor of

which our happiness principally depends.

As all our leading passions then depend on the di-

rection which our taste takes, and as it is always of

the same strain with our leading associations, it is worth

while to inquire a little more particularly how these

are formed, in order to detect the secret sources from

whence our passions derive their principal strength,

their various rife and falls. For this will give us the

true key to their management, and let us into the right

method of correcting the bad and improving the

good.

No kind of objects make so powerful an impres-

sion on us as those which are immediately impressed on

our senses, or strongly painted on our imaginations.

Whatever is purely intellectual, as abstratcd or scien-
tific truths, the fubtle relations and differences of

things, has a fainter sort of existence in the mind; and

though it may entertain and inform the memory, the

judgment, or the reasoning power, gives hardly any

impulse at all to the active powers, the passions, which

are the main springs of motion. On the other hand,

were the mind entirely under the direction of the

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and impr:ressible only by such objects as are pre,

and strike some of the outward organs, we should then

be precisely in the state with the brute creation, and be

governed solely by instinct or appetite, and have no

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us: Nature has therefore endowed us with a middle

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faculty, wonderfully adapted to our imaginations.
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with the title of men of pleasure, their imaginations being pregnant with moral images, with which they were ever failing to emulate, or, if they cannot do that, to palliate their gross pursuits. Thus admiration of state, of greatness, and merit, fine art, love, generous sympathy, mutual confidence, giving and receiving pleasure, are the ordinary ingredients with which they feed their gallantry and pleasurable entertainments; and by which they impose on themselves, and endeavour to impose on others, that their amours are the joint issue of good sense and virtue.

These affections, variously combined and proportioned by the imagination, form the chief private passions, which govern the lives of the generality, as the love of action, of pleasure, power, wealth, and fame; they influence the enemies, and affect the public passions, and raise joy or sorrow as they are gratified or disappointed. So that in effect these affections of good and evil, beauty and deformity, and the passions they raise, are the main hinges of life and manners, and the great sources of our happiness or misery. It is evident, therefore, that the whole of moral culture must depend on giving a right direction to the leading passions, and duly proportioning them to the value of the objects of good or pur chased, under what name ever they may appear.

Now, in order to give them this right direction and due proportion, it appears, from the foregoing detail, that those affections of ideas, upon which the passions depend, must be duly regulated; that is to say, as an exorbitant passion for wealth pleasure, or power, flows from an association or opinion that more beauty and good, whether natural or moral, enters into the enjoyment or possessin of them. If these passions to their just proportion, we must begin with correcting the opinions, or breaking the false associations, or, in other words, we must decamp the complex phantom of happiness or good, which we fondly admire; disunite those ideas that have no natural alliance; separate the original idea of wealth, power, or pleasure, from the foreign mixtures incorporated with it, which enhance its value, or give it its chief power of enchant and seduce the ingenuous minds. For instance, let it be considered how poor and inconsiderable a thing wealth is, if it is disjoined from real use, or from ideas of capacity in the possessor to do good; from independency, generosity, probity, affections, and social communication with others. By this standard let its true value be fixed; let its misapplication, or unbeneficent enjoyment, be accounted for, and infamous, and nothing worthy or estimable be ascribed to the mere possession of it, which is not borrowed from its generative use.

If that complex form of good which is called pleasure engage us, let it be analyzed into its constituent principles, of those allurements it draws from the heart and imagination, in order to heighten the low part of the indulgence; let the separate and comparative moment of each be distinctly ascertained and deduced from that gross part, and this remainder of the accumulated enjoyment will dwindle down into a poor, insipid, trivial thing. In proportion as the opinion of the good or pur chased abates, the admiration must decay, and the passions lose strength of course. One effectual way to lower the opinion, and consequently to weaken the habit founded upon it, is to prudently guide pieces of self-denial, or to abstain, to a certain pitch, from the pursuit or enjoyment of the favourite object; and that this may be the more easily accomplished, one must avoid those occasions, that company, those places, and the other circumstances, that inflamed one and endeared the other. And, as a counter-proof, let higher or even different enjoyments be brought in view, other passions played upon the former, different places frequent ed, other exercises tried, company kept with persons of a different or more correct way of thinking, both in natural and moral subjects.

As much depends on our setting out well in life, let By found of the youthful fancy, which is apt to be very florid and luxuriant, be early accustomed by instruction, example, and significant moral exercises, nay, by looks, gestures, and every other testimony of just approbation or blame, to annex ideas of merit, honour, and happiness, not to birth, dress, rank, beauty, fortune, power, popularity, and the like outward things, but to moral and truly virtuous qualities, and to those enjoyments which spring from a well-informed judgement and a regular conduct of the affections, especially those of the social and disinterested kind. Such dignified forms of purity and good, often fugitively, and, by moving pictures and examples warmly recommended to the imagination, enforced by the authority of conscience, and demonstrated by reason to be the surest means of enjoyment, and the only independent, unapproachable, and durable goods, will be the best counterbalance to meaner passions, and the firmest foundation and security to virtue.

It is of great importance to the forming a just taste, or pure and large conceptions of happiness, to study and understand what is human nature well, to remember what a complicated system it is, particularly to have deeply impressed on our mind that gradation of fancies, faculties, and powers of enjoyment formerly mentioned, and the subordination of goods resulting from these, which nature points out, and the experience of mankind confirms. Who when they think seriously, and are not under the immediate influence of some violent prejudice or passion, prefer not the pleasures of action, contemplation, friendship, and most exercises, and joys of the moral kind, as friendship, natural affections, and the like, to all sensual gratifications whatsoever? Where the different species of pleasure are blended into one complex form, let them be accurately distinguished, and be referred each to its proper faculty and sense, and examined apart what they have peculiar, what common with others, and what foreign and adventitious. Let wealth, greatness, luxury, love, fame, and the like, be tried by this test, and their true ally will be found out. Let it be further considered, whether the mind may not be easy and enjoy itself greatly, though it wants many of those elegancies and singularity in life which some poise on, or that load of wealth and power which others eagerly pursue, and under which they groan. Let the difficulty of attaining the precariousness of possessing, and the many abatements in enjoying overgrown wealth and envied greatness, of which the weary professors so frequently complain, as the hurry of business, the burden of company, of paying attendance to the forms, and giving it to the many, the cares of keeping, the tears of...
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of losing, and the desires of encreasing what they have, and the other troubles which accompany this pithful drudgery and pompous servitude; let these and the like circumstances be often considered, that are conducive to the removing or lessening the opinion of such goods, and the attendant passion of set of passions will decay of course.

Let the peculiar bent of our nature and character be observed, whether we are most inclined to form associations and relish objects of the sensible, intellectual, or moral kind. Let that which has the attendant be particularly watched; let it be directed to right objects, improved by proportioned exercises, and guarded by proper checks from an opposite quarter. Thus the sensible turn may be exalted by the intellectual, and a taste for the beauty of the fine arts, and all may be made subservient to convey and rivet sentiments highly moral and public-spirited. This inward survey must extend to the strength and weakness of one's nature, one's conditions, connections, habits, fortune, flatteries, acquaintances, and the other circumstances of one's life, from which every man will form the justest estimate of his own dispositions and character, and the rules for correcting and improving them. And in order to do this with more advantage, let those times of critical seasion be watched when the mind is best disposed towards a change; and let them be improved by vigorous resolutions, promises, or whatever else will engage the mind to persevere in virtue. Let the conduct, in fine, be often reviewed, and the causes of its corruption or improvement be carefully observed.

It will greatly conduct to refine the moral taste, and strengthen the virtuous temper, to accustomed the mind to the frequent exercise of moral sentiments and determinations, by reading history, poetry, particularly of the picturesque and dramatic kind, the study of the fine arts; by conversing with the most eminent for good sense and virtue; but, above all, by frequent and repeated acts of humanity, compassion, friendship, politeness, and hospitality. It is exercise that gives health and strength. He that reason most frequently, becomes the wise, and most enjoys the pleasures of wisdom. He who is most often affected by objects of compassion in poetry, history, or real life, will have his soul most open to pity, and its delightful pains and duties. So he also who prides most diligently the offices of kindliness and charity, will by it cultivate that disposition from whence all his pretensions to personal merit must arise, his present and his future happiness.

An useful and honourable employment in life will administer a thousand opportunities of this kind, and greatly strengthen a sense of virtue and good affections, which must be nourished by right training, as well as our understanding. For such an employment, by enlarging one's experience, giving an habit of attention and caution, or obliging one, from necessity or interest, to keep a guard over the passions, and study the outward deceits and appearances of virtue, will by degrees produce good habit, and at length influence the love of virtue and honesty for its own sake.

It is a great inducement to the exercice of benevolence to view human nature in a favourable light, to observe the characters and circumstances of mankind on the fairest sides, to put the best construction on their actions they will bear, and to consider them as the result of partial and misdirected virtue and vice, rather than just affections, or at worst, as the effect of a parradigm solely. This will flow, beyond all convention and disposition and is, by nature, essentially good, and of course, it will of its own accord, as a kind of natural experiment, be taught to us by experience, in proportion as it is engaged in the review of our actions, in peace and in prosperity, and in the contemplation of virtue and good affections, and of whatever is pleasing and beneficial, and in the exercise of the moral sentiments and passions, as they are apt to be excited by frequent and repeated acts of humanity, kindness, and friendship, and by every act of benevolence; and, as such, it will be observed, as it is in its different circumstances be often considered, that is often dissipated. 'Let the peculiar bent of our nature and character be observed, whether we are most inclined to form associations and relish objects of the sensible, intellectual, or moral kind. Let that which has the attendant be particularly watched; let it be directed to right objects, improved by proportioned exercises, and guarded by proper checks from an opposite quarter. Thus the sensible turn may be exalted by the intellectual, and a taste for the beauty of the fine arts, and all may be made subservient to convey and rivet sentiments highly moral and public-spirited. This inward survey must extend to the strength and weakness of one's nature, one's conditions, connections, habits, fortune, flatteries, acquaintances, and the other circumstances of one's life, from which every man will form the justest estimate of his own dispositions and character, and the rules for correcting and improving them. And in order to do this with more advantage, let those times of critical seasion be watched when the mind is best disposed towards a change; and let them be improved by vigorous resolutions, promises, or whatever else will engage the mind to persevere in virtue. Let the conduct, in fine, be often reviewed, and the causes of its corruption or improvement be carefully observed.

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tradition, that we not only approve, but can give a sufficient reason for what we do.

Let any man in a cool hour, when he is disengaged from busineses, and undisturbed by passion (as such cool hours will sometimes happen), sit down, and seriously reflect with himself what state or temper of mind he would choose to feel and indulge, in order to be easy and to enjoy himself. Would he choose, for such purpose, to be in a constant dizziness and hurry of thought; to be disturbed in the exercise of his reason; to have various and often interfering phantoms of good playing before his imagination, soliciting and distracting him by turns, now soothing him with amusing hopes, then torturing him with anxious fears; and to approve this minute what he shall condemn the next? Would he choose to have a strong and painful sense of every petty injury? quick apprehensions of every impending evil, inceflant and insatiable desires of power, wealth, honour, pleasure; an irreconcilable antipathy against all competitors and rivals; insolent and tyrannical dispositions to all below him; fawning, and at the same time envious, dispositions to all above him: with dark suspicions and jealousies of every mortal? Would he choose neither to love nor be beloved of any; to have no friend in whom to confide, or with whom to interchange his sentiments or designs; no favourite, on whom to bestow his kindness, or vent his passions; in fine, to be conscious of no merit with mankind, no esteem from any creature, no good affection to his Maker, no concern for, nor hopes of, his approbation: but, instead of all these, to hate, and know that he is hated, to condemn, and know that he is condemned by all: by the good, because he is so unlike: and by the bad, because he is so like themselves; to hate or to dread the very Being that made him: and, in short, to have his breast the seat of pride and passion, petulance and revenge, deep melancholy, cool malignity, and all the other furies that ever poffessed and tortured mankind?—Would our calm inquirer after happiness pitch on such a state, and such a temper of mind, as the most likely means to put him in possession of his desired ease and self-satisfaction?

Or would he rather choose a serene and easy flow of thought: a reason clear and composed; a judgment unbiassed by prejudice, and undistracted by passion; a sober and well-governed fancy, which presents the images of things true, and unmixt with delusive and unnatural charms, and therefore admitteth no improper or dangerous fuel to the passions, but leaves the mind free to choose or reject, as becomes a reasonable creature: a sweet and sedate temper, not easily ruffled by hopes or fears, prone neither to fupicion nor revenge, apt to view men and things in the fairest lights, and to bend gently to the humours of others rather than obstinately to contend with them? Would he choose such moderation and continence of mind, as neither to be ambitious of power, fond of honour, covetous of wealth, nor a slave to pleasure; a mind of course neither elated with success, nor dejected with disappointment: such a modest and noble spirit as supports power without insolence, wears honour without pride, ues wealth without profouion or profamity; and rejoves more in giving than in receiving; such fortitude and equanimity as rife above misfortunes, or turns them into blessings: such integrity and greatness of mind, as neither flatters the vices, nor nourishes over the follies of men; as equally spurns servitude and tyranny, and will neither engage in low designs, nor abet them in others? Would he choose, in fine, such mildness and benignity of heart as takes part in all the joys, and refuses none of the forrows, of others: finds well affected to all mankind; is conscious of meritting the esteem of all, and of being beloved by the belt; a mind which delights in doing good without any show, and yet arrogates nothing on that account: rejoices in loving and being beloved by its Maker, acts ever under his eye, reigns itself to his providence, and triumphs in his approbation?—Which of these dispositions would he choose, in order to be contented, serene, and happy?—The former temper is vice, the latter virtue. Where one prevails, there misery prevails, and by the generality is acknowledged to prevail. Where the other reigns, there happiness reigns, and by the confession of mankind it acknowledged to reign. The perfection of either temper is misery or happiness in perfection. Therefore, every approach to either extreme is an approach to misery or to happiness; i.e. every degree of vice or virtue is accompanied with a proportionable degree of misery or happiness.

The principal alleviations of a virtuous man's calamities are these:—That though some of them may have been the effect of his imprudence or weakness, yet few of them are sharpened by a sense of guilt, and none of them by a consciousness of wickedness, which is the keenest sting:—that they are common with him to the best of men;—that they seldom or never attack him quite unprepared, but rather guarded with a confidence of his own sincerity and virtue, with a faith and trust in providence, and a firm resignation to its perfect orders;—that they may be removed as means of correction, or materials to give scope and stability to his virtues;—and, to name no more, they are considerably lessened, and often sweetened to him, by the general sympathy of the wise and good.

His enjoyments are more numerous, or, if less numerous, yet more intense than those of the bad man; merits for he shares in the joys of others by re bound; and every increase of general or particular happiness is a real addition to his own. It is true, his friendly sympathy with others subjects him to some pains which the hard-hearted wretch does not feel: yet to give a leafe to it, is a kind of agreeable discharge. It is such a favor as he loves, to indulge; a sort of pleasing anguish that sweetly melts the mind, and terminates in a self-approving joy. Though the good man may want means to execute, or be disappointed in the success of his benevolent purposes; yet, as was formerly observed, he is still conscious of great affection, and that consciousness is an enjoyment of a more delightful favor than the greatest triumphs of successful vice. If the ambition, covetousness, or volup tuousness, are disappointed, their passions recoil upon them with a fury proportioned to their opinion of the value of what they pursue, and their hope of success; while they have nothing within to balance the disappointment, unless it is an ulefs fun of pride, which, however, frequently turns mere accidents into mortifying affronts, and excites grief into rage and frenzy. Whereas the meek, humble,
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214. From merit to sympathy.

As the good man is conscious of loving and wishing well to all mankind, he must be sensible of his deserving the esteem and good-will of all; and this suppos'd reciprocation of social feelings is, by the very frame of our nature, a source of so intense and exhilarating joy. By this sympathy of affections and interests, he feels himself intimately united with the human race; and, being sensibly above over the whole system, his heart receives and becomes responsive to every touch given to any part. So that, as an eminent philosopher finnily expresses it, he gathers contentment and delight from the pleased and happy states of those around him, from accounts and relations of such happiness, from the very countenances, gestures, voices, and sounds, even of creatures foreign to our kind, signs of joy and contentment he can any way discern.

Nor do those generous affections stop any other natural source of joy whatever, or deaden his sense of any innocent gratification. They rather keep the several joys and powers of enjoyment open and disengaged, intense and uncorrupted by riot or abuse; as is evident to any one who considers the dissipated, unfeeling state of men of pleasures, ambition, or interest, and compares it with the serene and gentle state of a mind at peace with itself, and friendly to all mankind, unruffled by any violent emotion, and sensible of every good natured and soothing joy.

It was easy, by going through the different fets of affections mentioned formerly*, to flow, that it is only by maintaining the proportion settled there, that the mind arrives at true repose and satisfaction. If fear exceeds that proportion, it sinks into melancholy and dejection. It engenders just bounds, it ferments into rage and revenge, or subsides into a sullen gloom, which embitters every good, and renders one exquisitely sensible to every ill. The private passions, the love of honour especially, whose impulces are more generous, as its effects are more diffusive, are instruments of private pleasur; but if they are disproportioned to our wants, or to the value of their several objects, or to the balance of other passions equally necessary and more amiable, they become instruments of intense pain and misery. For, being now delirious of that counterpoise which held them at a due pitch, they grow turbulent, peevish, and revengeful, the cause of constant restlessness and torment, sometimes flying out into a wild delirium, joy, at other times settling in a deep sullen grief. The concert between reason and passion is then broke; all is dissonance and distraction within. The mind is out of frame, and feels an agony proportioned to the violence of the reigning passion.

The cafe is much the same, or rather worse, when any of the particular kind affections are out of their natural order and proportion; as happens in the case of effeminacy, pily, exorbitant love, parental dotage, or any party-pasion, where the jilt regards to society are suspended. The more social and intermixed the passion is, it breaks out into the wilder exce'ss, and makes the more dreadful havoc both within and abroad; as is but too apparent in those cafes where a false species of religion, honour, zeal, or party rage, has seized on the natural enthusiasm of the mind, and worked it up to madness. It breaks through all ties natural and civil; disregards the most sacred and solemn obligations; involves every other affection whether public or private, and transforms the most gentle natures into the most savage and inhuman.

Whereas, the man who keeps the balance of internal happiness, even, is easy and serene in his motions; mild and yet in well-proportioned affectionate; uniform and confident with himself; is not liable to disagreeable collisions of interests and passions; gives always place to the most friendly and humane affections, and never to dispositions or acts of resentment, but on high occasions, when the security of the private, or welfare of the public system, or the great interest of mankind, necessarily require a noble indignation; and even then he observes a just measure in wrath; and last of all, he proportions every passion to the value of the object he affects, or to the importance of the end he pursues.

215. Do not interfere with other affections.

To sum up this part of the argument, the benevolent and good man has eminently the advantage of the line, and is not obliged to sacrifice end to end, as a man who keeps the balance of internal happiness, even, is easy and serene in his motions; mild and yet in well-proportioned affectionate; uniform and confident with himself; is not liable to disagreeable collisions of interests and passions; gives always place to the most friendly and humane affections, and never to dispositions or acts of resentment, but on high occasions, when the security of the private, or welfare of the public system, or the great interest of mankind, necessarily require a noble indignation; and even then he observes a just measure in wrath; and last of all, he proportions every passion to the value of the object he affects, or to the importance of the end he pursues.

216. The misery of excess in the private passions.

217. In the public affections.
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On one's fortune, interest, &c.

It may be some be thought odd to assert, that virtue is no enemy to a man's fortune in the present state of things. But if by fortune he meant a moderate or competent share of wealth, power, or credit, not overgrown degrees of them; what should hinder the virtuous man from obtaining that? He cannot cringe or fawn, it is true, but he can be civil and obliging as well as the knave; and surely his civility is more alluring, because it has more manliness and grace in it than the mean adulation of the other; he cannot cheat or undermine; but he may be cautious, provident, watchful of occasions, and equally prompt with the rogue in improving them; he turns to profitude himself as a pander to the passions, or as a tool to the vices, of mankind; but he may have as an understanding and as good capacities for promoting their real welfare, as for undermining their security.

The common course of bufiness, he has the fame chances with the knave of acquiring a fortune, and riling in the world. He may have equal abilities, equal industry, equal attention to bufness; and in other respects he has greatly the advantage of him. People love better to deal with him; they can trufm him more; they know he will not impose on them, nor take advantage of them, and can depend more on his word than on the oath or longest securities of others. Whereas what is commonly called running, which is the offspring of ignorance, and constant companion of knavery, is not only a mean-spirited, but a very short-sighted talent, and a fundamental obstacle in the road of bufness. It may procure indeed immediate and petty gains; but it is attended with dreadful abatements, which do more than overbalance them, both as it finks a man's credit when discovered, and cramps that largeness of mind which extends to the remotest as well as the nearest interrell, and takes in the most durable equally with the most transient gains. It is therefore easy to see how much a man's credit and reputation, and consequently his fucces, depend on his honesty and virtue.

With regard to security and peace with his neighbours, it may be thought, perhaps, that the man of a quiet forgiving temper, and a flowing benevolence and courtecy, is much exposed to injury and affronts from every proud or peevish mortal, who has the power or will to do mischief. If we suppose, indeed, the quietness and gentleness of nature accompanied with cowardice and pusillanimity, this may often be the case; but in reality the good man is bold as a lion, and so much the bolder for being the calmer. Such a person will hardly be a butt to mankind. The ill natured will be afraid to provoke him, and the good-natured will not incline to do it. Besides, true virtue, which is conducted by reason, and exerted gracefully and without parade, is a most influence and commanding thing; if it cannot disarm malice and resentment at once, it will wear them out by degrees, and subdue them at length. How many have, by favours and prudently yielding, triumphed over an enemy, who would have been inflamed into tenfold rage by the fiercest opposition! In fine, virtue is the most universally popular thing that can be.

To conclude; the good man may have some enemies; but he will have more friends; and, having given to many marks of private friendship or public virtue, he can hardly be delusive of a patron to protect, or a fanfuary to entertain him, or to protect or entertain his children when he is gone. Though he should have little else to leave them, he bequeaths them the fairest and generally the most unenvied, inheritance of a good name, which, like good seed sown in the field of futility, will often raise up involuntary friends, and yield a benevolent harvest of unexpected charities. But if the fragrance of the parent's virtue prove offensive to a perverse or envious age, or even draw persecution on the friend's orphans, there is one in heaven who will be more than a father to them, and recom pense their parent's virtues by showering down blessings on them.

Part III.

Motives to Virtue from the Being and Providence of God.

Besides the interesting motive mentioned in the preceding Chapter, there are two great motives to virtue, strictly connected with human life, and resulting from the very constitution of the human mind. The firft is the Being and Providence of God: the second is the Immortality of the Soul, with future rewards and punishments.

It appears from Chap. iv. of Part II., that man, by their immediate constitution of his nature, is designed to be a Religious Creature. He is intimately connected with the Deity, and necessarily dependent on him. From that connection and necessary dependence result various obligations and duties, without fulfilling which, some of his sublime powers and affections would be incomplete and abortive. If he be likewise an immortal creature, and if his present conduct shall affect his future happiness in another state as well as in the present, it is evident that we take only a partial view of the creature if we leave out this important property of his nature, and make a partial estimate of human life? if we strike out of the account, or overlook, that part of his duration which runs out into eternity.

It is evident from the above-mentioned Chapter, Piety, that 'to have a respect to the Deity in our temper and conduct, to venerate and love his character, to adore his goodness, to depend upon and rely on ourselves to his providence, to seek his approbation, and act under a sense of his authority, is a fundamental part of moral virtue, and the completion of the highest definition of our nature.'

But as piety is an essential part of virtue, so likewise it is a great support and enforcement to the practice of it. To contemplate and admire a Being of such transcendent dignity and perfection as God, must naturally and necessarily open and enlarge the mind, give a freedom and ampleness to its powers, and a grandeur and elevation to its aims. For, as an excellent divine observer, "the greatness of an object, and the excellency of the act of any agent about a transcendent object
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Motives to object, both mightily tend to the enlargement and improvement of his faculties. Little objects, mean company, mean cares, and mean buffets, cramp the mind, contract its views, and give it a creeping air and deportment. But when it flares above mortal cares and mortal pursuits into the regions of divinity, and converses with the greatest and best of beings, it spreads itself into a wider compass, takes higher flights in reason and goodness, becomes godlike in its air and manners. Virtue is, if one may say so, both the effect and cause of largeness of mind. It requires that one think freely, and act nobly. Now what can conduct more to freedom of thought and dignity of action, than to conceive worthily of God, to reverence and adore his unrivalled excellence, to imitate and transfigure that excellency into our own nature, to remember our relation to him, and that we are the images and representatives of his glory to the bulk of mankind? Indeed, from all actions that are base, unhandsome, unworthy our state and the relation we stand in to God will irradiate the mind with the light of wisdom, and enable it with the liberty and dominion of virtue.

The influence and efficacy of religion may be considered in another light. We all know that the presence of a friend, a neighbour, or any number of spectators, but especially an august assembly of them, uses to be a considerable check upon the conduct of one who is not lost to all sense of honour and fame, and contributes to restrain many irregular falls of passion. In the same manner as we imagine that the awe of some superior mind, who is flipp'd privy to our secret conduct, and armed with full power to reward or punish it, will impose a restraint on us in such actions as fall not under the control or animadversion of others. If we go still higher, and flipp our inmost thoughts and darkest designs, as well as our most secret actions, to lie open to the notice of the supreme and universal mind, who is both the spectator and judge of human actions, it is evident that the belief of so august a presence, and such awful inspection must carry a restraint and weight with it proportioned to the strength of that belief, and be an additional motive to the practice of many duties which would not have been performed without it.

It may be observed further, that to live under an habitual sense of the Divine and his great administration, is to be conversant with abysses, secrets, and secrets, in the highest sublunary, and to receive the delightful reflections and benign feelings which these excite while they irradiate upon him from every scene of nature and providence. How improving must such views be to the mind, in dilating and exalting it above those puny interests and competitions which agitate and in flame the bulk of mankind against each other!

Motives from the Immortality of the Soul.

The other motive mentioned was the immortality of the soul, with future rewards and punishments. The metaphorical proofs of the soul's immortality are commonly drawn from—its simple uncombined, and indivisible nature; from whence it is concluded, that it cannot be corrupted or extinguished by a dissolution or destruction of its parts—from its having a being within itself; whence it is inferred, that it can not discontinue and lose its motion—from the different properties of matter and mind, the connection and immensity of one, and the immense activity of the other; its prodigious flight of thought and imagination; its penetration, memory, foresight, and anticipations of futurity; from whence it is concluded, that a being of so divine a nature cannot be extinguished.

But as these metaphorical proofs depend on intricate reasonings concerning the nature, properties, and definitions of body and mind, with which we are not very well acquainted, they are not obvious to ordinary understandings, and are seldom so convincing as those of higher reach, as not to leave some doubts behind them. Therefore perhaps it is not so safe to rest the proof of such an important article on what many may call the fallacies of school-learning. Those proofs which are brought from analogy, from the moral character and providence of the human mind, the moral attributes of God, and the present course of things, and which therefore are called the moral arguments, are the plainest, and generally the most satisfying. We shall select only one or two from the rest.

In tracing the nature and definition of any being, we form the first judgment from his powers of action and the scope and limits of these, compared with his analogy, flat, or with that field in which they are exercised. If this being pusses through different states, or fields of action, and we find a succession of powers adapted to the different periods of his progress, we conclude that he was designed for those successive states, and reckon his nature progressive. If, besides the immediate act of powers which it him for action in his present state, we observe another act which appear superfluous if he were to be confined to it, and which point to another or higher one, we naturally conclude, that he is not designed to remain in his present state, but to advance to that for which these supernumerary powers are adapted. Thus we argue, that the insect, which has wings forming or formed, and all the apparatus proper for flight, is not designed always to creep on the ground, or to continue in the torpid state of adhering to a wall, but is designed in its season to take its flight in air. Without this farther definition, the admirable mechanism of wings and the other apparatus would be useless and absurd. The same kind of reasoning may be applied to man, while he lives only a sort of vegetative life in the womb. He is turned even there with a beautiful apparatus of organs, eyes, ears, and other delicate senses, which receive nourishment indeed, but are in a manner folded up, and have no proper exercise or use in their present confinement.

Let us flipp'some intelligent spectator, who never had any connection with man, nor the least acquaintance with human affairs, to see this odd phenomenon, a creature formed after such a manner, and placed in a situation apparently unsuitable to such various machinery: must he not be strangely puzzled about the use of this complicated structure, and reckon such a profusion of art and admirable workmanship fasten'd on the subject; or reason by way of anticipation, that a creature endowed with such various yet unexercised capacities, was designed for a more enlarged sphere.
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Sphere of action, in which those latent capacities shall have full play? The vast variety and yet beautiful symmetry and proportions of the several parts and organs with which the creature is endowed, and their apt cohesion with and dependence on the curios receptacle of their life and nourishment, would forbid his concluding the whole to be the birth of chance, or the bungling effort of an unskilful artist; at least would make him deny a while at to harass a sentence. But if, while he is in this state of uncertainty, we suppose him to see the babe, after a few successful struggles, throwing off his fetters, breaking loose from his little dark prison, and emerging into open day, then unfolding his recluse and dormant powers, breathing in air, gazing at light, admiring colours, sounds, and all the fair variety, of nature; immediately his doubts clear up, the propriety and excellency of the workmanship dawn upon him with full lustr, and the whole mystery of the first period is unravelled by the opening of this new scene. Though in this second period the creature lives chiefly a kind of animal-life, i.e. of sense and appetite, yet by various trials and observations he gains experience, and by the gradual evolution of the powers of imagination he ripens space for an higher life, for exerting the arts of design and imitation; and of those in which strength or dexterity are more requisite than acuteness or reach of judgment. In the succeeding sensitive or intellectual period, his understanding, which formerly crept in a lower, mounts into an higher sphere, canvases the natures, judges of the relations of things, forms schemes, deduces consequences from what is past, and from present as well as past collects future events. By this succession of states, and of correspondent culture, he grows up at length into a moral, a social, and a political creature. This is the last period at which we perceive him to arrive in this his mortal career. Each period is introductory to the next succeeding one; each life is a field of exercise and improvement for the next higher one; the life of the fetus for that of the infant, the life of the infant for that of the child, and all the lower for the higher and best. —But is this the last period of nature’s progression? Is this the acme of her plot, the summit of the drama, and dissolves the actor into eternal oblivion? Or does he appear to be invested with supernumerary powers, which have not full exercise and scope even in the last scene, and reach not that maturity or perfection of which they are capable; and therefore point to some higher scene where he is to fulfill another and more important character than he has yet sustained? If any such there are, may we not conclude by analogy, or in the same way of anticipation as before, that he is destined for that after part, and is to be produced upon a more august and solemn stage, where his sublimers powers shall have proportioned action, and his nature attain its completion?

If we attend to that curiocity, or prodigious thirst of knowledge, which is natural to the mind in every period of its progress, and consider with the endless round of business and care, and the various hardships to which the bulk of mankind are chained down, it is evident, that in this present state it is impossible to expeft the gratification of an appetite at once so insatiable and so noble. Our senses, the ordinary organs by which knowledge is let into the mind, are always imperfect, and often fallacious; the advantages of affiling or correcting them are perplexed by few; the difficulties of finding out truth amidst the various and contradictory opinions, interests, and passions of mankind, are many; and the wants of the creature, and of those with whom he is connected, numerous and urgent; so that it may be said of most men, that their intellectual organs are as much shut up and excluded from proper nourishment and exercise in that little circle to which they are confined, as the bodily organs are in the womb. Nay, those who to an altering genius have added all the affiliations of art, leisure, and the most liberal education, which narrow prospects can even they take of this unbounded scene of things from that little eminence on which they stand? and how eagerly do they still grasp at new discoveries, without any satisfaction or limit to their ambition?

But should it be said, that man is made for action and not for speculation, or frivolous searches after knowledge, we ask, For what kind of action? Is it only for bodily exercises, or for moral, political, and religious ones? Of all these he is capable; yet, by the unavoidable circumstances of his lot, he is tied down to the former, and has hardly any leisure to think of the latter, or if he has, wants the proper instruments of exercising them. The love of virtue of one’s friends and country, the generous sympathy with mankind, and zeal of doing good, which are all so natural to great and good minds, and some traces of which are found in the lowed, are seldom united with proportioned means or opportunities of exercising them; so that the moral spring, the noble energies and impulses of the mind, can hardly find proper scope even in the most fortunate condition; but are much depressed in some and almost entirely restrained in the generality, by the numerous clogs of an indigent, sickly, or embarassed life. Were such mighty powers, such godlike affections, planted in the human breast to be folded up in the narrow womb of our present existence, never to be produced into a more perfect life, nor to expiate in the ample career of immortality?

Unfatted desires of existence and happiness.

Powers in man which point to an after life.

Intellectual.

Does nature give the finishing touches to the letter and ignobler infinences of her skill, and raise every other creature to the maturity and perfection of his being; and shall he leave her principal workmanship unimproved? Does she carry the vegetative and animal life in man to their full vigour and highest delineation; and shall the suffer his intellectual, his moral, his divine life
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We must therefore conclude from this detail, that the present state, even at its best, is only the worm of man's being, in which the noblest principles of his nature are in a manner fettered, or included from a correspondent sphere of action; and therefore defined for a future and unbounded state, where they shall emancipate themselves, and exert the fulness of their strength. The most accomplished mortal, in this low and dark apartment of nature, is only the rudiments of what shall be when he takes his eternal flight, and puts on immortality. Without a reference to that state, now were a mere abortion, a rude uninfinished embryo, a monster in nature. But this being once supposed, he still maintains his rank of the master-piece of the creation; his latent powers are all suitable to the harmony and progression of nature; his noble aspirations, and the pains of his dilution, are his efforts towards a second birth, the pangs of his delivery into light, liberty, and perfection; and death, his discharge from gaol, his separation from his fellow-prisoners, and introduction into the assembly of those heroic spirits who are gone before him, and of their great eternal Parent. The fetters of his mortal coil being loosed, and his prison walls broke down, he will be bare and open on every side to the admission of truth and virtue, and their fair attendant happiness; every vital and in eternal spring will evince itself with a divine edibility in the free air of heaven. He will not then peep at the universe and its glorious Author through a dark grate or a grost medium, nor receive their reflections in his glance through the strait openings of sensible organs; but will be all eye, all ear, all ideal and divine feeling*. Let one part, however, of the analogy be attended to: That as in the womb we receive our original constitution, form, and the essential flamma of our being, which we carry along with us into the light, and which greatly affect the succeeding periods of our life; so our temper and condition in the future life will depend on the conduct we have observed, and the character we have formed, in the present life. We are here in miniature what we shall be at full length hereafter. The first rude sketch or outline of reason and virtue must be drawn at present, to be afterwards enlarged to the future and beauty of angels.

238 Immortality a guard, but an admirable incentive to virtue. For he who faithfully and ardently follows the light of knowledge, and pants after higher improvements in virtue, will be wonderfully animated and inflamed in that pursuit by a full conviction that the scene does not close with life—that his struggles, arising from the weakness of nature and the strength of habit, will be turned into triumphs—that his career in the tract of wisdom and goodness will be both fitter and smoother—and those generous arduous with which he goes towards heaven, i.e., the perfection and immortality of virtue, will find their adequate object and exercise in a sphere proportionably enlarged, incorruptible, immortal. On the other hand, what an inexpressible damp must it be to the good man to dread the total extirpation of that light and virtue, without which life, nay, immortality itself, were not worth a single wish?

Many writers draw their proofs of the immortality of the soul, and of a future state of rewards and punishments, from the unequal distribution of these here. It cannot be disbelieved that wicked men often escape the outward punishment due to their crimes, and do not feel the inward in that measure their demerit seems to require, partly from the callousness induced upon their nature by the habits of vice, and partly from the dissipation of their minds abroad by pleasure or business—and sometimes good men do not reap all the natural and genuine fruits of their virtue, through the many unforeseen or unavoidable calamities in which they are involved. To the smallest reflection, however, it is obvious, that the natural tendency of virtue is to produce happiness; that if it were universally practiced, it would, in fact, produce the greatest sum of happiness of which human nature is capable; and that this tendency is defeated only by numerous individuals, who, forsaking the laws of virtue, injure and oppress those who steadfastly adhere to them. But the natural tendency of virtue is the result of that constitution of things which was established by God at the creation of the world. This being the case, we must either conclude, that there will be a future state, in which all the moral obliquities of the present shall be made straight; or else admit, that the deigns of infinite wisdom, goodness, and power, can be finally defeated by the perverse conduct of human weaknesses. But this last supposition is so extravagantly absurd, that the reality of a future state, the only other possible alternative, may be pronounced to have the evidence of perfect demonstration.


Belief of Immortality, &c. a great support amid trials.
MORAL PHILOSOPHY.

Part III.

MORAL SCIENCE, that whereby we perceive what is good, virtuous, and beautiful, in actions, manners, and characters. See Moral Philosophy.

MORALITY. See Moral Philosophy.

MORANT (Philip), a learned and indefatigable antiquary and biographer, son of Stephen Morant, was born at St Saviour's in the Isle of Jersey, October 6, 1700; and, after finishing his education at Abingdon School, was entered December 16th, 1717 at Pembroke College, Oxford, where he took the degree of B.A. June 10th, 1721, and continued till midsummer 1722; when he was preferred to the office of preacher of the English church at Amsterdam, but never went to take possession. He took the degree of M.A. in 1724, and was preferred to the rectory of Shellow Boweis, April 20th, 1733; to the vicarage of Bromfield, January 17th, 1733-4; to the rectory of Chicksnall Smiley, September 19th, 1735; to that of St Mary's, Colchester, March 9th, 1737; to that of Wickham Bishop's, January 21st, 1742-3; and to that of Aldham, September 14th, 1745. All these benefices are in the county of Essex. In 1748 he published his History of Colchester, of which only 200 copies were printed. In 1751 he was elected F.S.A.; and in February 1768 he was appointed by the Lords sub-committees of the House of Peers to succeed Mr Blyde in preparing for the press a copy of the rolls of Parliament, a service to which he diligently attended till his death, which happened November 25th, 1770. Besides the above work, and many useful translations, abridgments, and compilations, &c., he wrote, all the Lives in the Biographia Britannica marked C; also the life of Stillingfleet, which has no mark at the end: The History of Effex, 1760, 1768, 2 vols folio: The life of King Edward the Confessor, and about 150 sermons. He prepared the rolls of Parliament as far as the 16th of Henry IV. The continuation of the task devolved upon Thomas Aítle, Esq.; who had married his only daughter.

MORANT-Point, the most easterly point or promontory of the island of Jamaica, in America. W. Lon. 75, 56. N. Lat. 17, 56.

MORASS, a marsh, fen, or low moist ground, which receives the waters from above without having any deficient to carry them off again. Somner derives the word from the Saxon mores, "lake;" Salmannas from mare, "a collection of waters;" others from the German maret, "a muddy place;" and others from mares, or mariset, à mariset, i.e. rushes. See Bog, Fen, and Draining.

In Scotland, Ireland, and the north of England, they have a peculiar kind of morasses called mosses or peat-mosses, whence the country people dig their peat or turf for firing. See Moss.

MORAT, or Morten, a rich trading, and consider.
siderable town of Switzerland, capital of a bailiwick of the same name, belonging to the cantons of Bern and Fribourg, with a castle where the bailiff resides. It is seated on the lake Morat, on the road from Avenches to Bern, 10 miles west of Bern and 10 miles north-east of Fribourg. The lake is about six miles long and two broad; the country about it being pleasant and well cultivated. The lakes of Morat and Neuchâtel are parallel to each other, but the latter is more elevated, discharging itself by means of the river Broye into the lake of Neuchâtel. According to M. de Luc, the former is 15 French feet above the level of Neuchâtel lake; and both these lakes, as well as that of Bienne, seem formerly to have extended considerably beyond their present limits, and from the position of the country appear to have been once united. Formerly the large fish named *flosurus glanis*, or the salm, frequented these lakes, but has not been caught in them for a long time past. The environs of this town and lake were carefully examined by Mr. Coxe during his residence in Switzerland, who made several excursions across the lake to a ridge of hills during his residence in Switzerland, who made several excursions across the lake to a ridge of hills, and was one of the first to examine the environs of Geneva as far as Bâle, and, on the other hand, by that stupendous chain of snowy Alps from the frontiers of Italy to the confines of Germany, and is lost at each extremity in the horizon. Morat is celebrated for the remains of a monument of this victory. It is a square building, filled with the bones of Burgundian soldiers, who were slain at the siege and in the battle; the number of which appears to have been very considerable. There are several inscriptions in the Latin and German languages commemorating the victory.

MORATA (Olympia Fulvia), an Italian lady, distinguished for her learning, was born at Ferrara, in 1526. Her father, after teaching the belles lettres in several cities of Italy, was made preceptor to the two young princes of Ferrara, the sons of Alphonso I. The uncommon abilities he discovered in his daughter determined him to give her a very extraordinary education. Meanwhile the princes of Ferrara, studying polite literature, it was judged expedient that she should have a companion in the same pursuits; and Morata being called, she was heard by the illustrious courtiers to declaim in Latin, to speak Greek, and to explain the paradoxes of Cicero. Her father dying, she was obliged to return home to take upon her the management of family-afairs, and the education of her brother and three sisters; both which she executed with the greatest diligence and success. In the mean time Andrew Grunthier, a young German, who had studied physic, and taken his doctor's degree at Ferrara, fell in love with her, and married her. She now went with her husband to Germany, taking her little brother with her, whom she instructed in the Latin and Greek tongues; and after staying a short time at Augsburg, went to Schweinfurt in Franconia, where her husband was born: but they had not been there long before that town was unhappily besieged and burnt; however, escaping the flames, they fled in the utmost distress to Hanlebur. This place they were also obliged to quit, and were reduced to the last extremities, when the elector palatine invited Grunthier to be professor of physic at Heidelberg, and he entered on his new office in 1554: but they no sooner began to taste the sweets of repose, than a difficulty, occasioned by the difficulties and hardships they had suffered, seized upon Morata, who died in 1555, in the 29th year of her age; and her husband and brother did not long survive her. She composed several works, great part of which were burnt with the town of Schweinfurt; the remainder, which consist of orations, dialogues, letters, and translations, were collected and published under the title of *Olympia Fulvia Morata, famina dolium, et plana divinæ, opera omnia que hœ- terus invento potuerunt*; quibus *Celli iuendi curiosis epístole et orationes accesserunt*, which has had several editions in octavo.

MORAVIA, a river of Turkey in Europe, which rises in Bulgaria, runs north through Servia by Niša, and falls into the Danube at Semendria, to the eastward of Belgrade.

MORAVIA, a marquise of Germany, derives the name of Mahern, as it is called by the Germans, and of Moraua, as it is called by the natives, from the river of that name which rises in the mountains of the county of Glatz, and passes through the middle of it. It is bounded to the south by Austria, to the north by Glatz and Silebia, to the west by Bohemia, and to the east by Sileia and Hungary; being about 120 miles in length and 100 in breadth. A great part of this country is over-run with woods and mountains, where the air is very cold, but much wholesome than in the low grounds which are full of bogs and lakes. The mountains, in general, are bare; but the more champaign parts tolerably fertile, yielding corn, with plenty of hemp and flax, good flaxen and pasture. Nor is it altogether destitute of wine, red and white, fruits and garden-stuff. Moravia also abounds in horst, black cattle, sheep, and goats. In the woods and about the lakes there is plenty of wild fowl, game, venison, bees, honey, hares, foxes, wolves, beavers, &c. In this country are likewise quarries of marble, baltard diamonds, amethysts, alum, iron, sulphur, falt-petre, and vitriol, with wholesome mineral-waters, and warm springs; but salt is imported. Its rivers, of which the March, Morawa, or Morau, are the chief, abound with trout, crayfish, barbels, eels, perch, and many other sorts of fish.

The language of the inhabitants is a dialect of the Scavonian, differing little from the Bohemian; but the nobility and citizens speak German and French.

Moravia was anciently inhabited by the Quadi, who were driven out by the Scavii. Its kings, who were once powerful and independent, afterwards became dependent on, and tributary to, the German emperors and kings. At last, in the year 908, the Moravian kingdom was parcelled out among the Germans, Poles, and...
MORAVIA.

and Hungarians. In 1086, that part of it properly called Moravia was declared a marquisate by the German king Henry IV. and united with Bohemia, to whole dukes and kings it hath ever since been subject. Though it is not very populous, it contains about 42 greater or walled towns, 47 smaller or open towns, and 158 market-towns, besides villages, &c. The states of the country consist of the clergy, lords, knights, and burghers; and the diets, when summoned by the regency, are held at Brunn. The marquisate is still governed by its own peculiar constitutions, under the direction of publics &c. &c. and the supreme jucicatory at Vienna. It is divided into six circles, each of which has its captain, and contributes to its sovereign about one-third of what is exacted of Bohemia. Tzowards the expenses of the military establishment of the whole Austrian hereditary countries, its year's quota is 1,800,000 florins. Seven regiments of foot, one of cuirassiers, and one of dragons, are usually quartered in it.

Christianity was planted in this country in the 6th century; and the inhabitants continued attached to the church of Rome till the 15th, when they espoused the doctrine of John Huss, and threw off popery; but after the defeat of the elector Palatine, whom they had chosen king, as well as the Bohemians, the emperor Ferdinand II. established popery; though there are still some Protestants in Moravia. The bishop of Olmutz, who stands immediately under the pope, is at the head of the ecclesiastics in this country. The supreme ecclesiastical jurisdiction, under the bishop, is vested in a consistory.

The commerce of this country is inconsiderable. Of what they have, Brunn enjoys the principal part. At Iglau and Trebits are manufactures of cloth, paper, gun-powder, &c. There are also some iron-works and glas-houses in the country.

The inhabitants of Moravia in general are open-hearted, not easy to be provoked or pacified, obedient to their masters and true to their promises; but credulous of old prophecies, and much addicted to drinking, though neither such sots or bigots as they are represented by some geographers. The boors, indeed, upon the river Hank, are said to be a thievish, unpolluted, brutal race. The sciences now begin to lift up their heads a little among the Moravians, the university of Olmutz having been put on a better footing; and a riding academy, with a learned society, have been lately established there.

MORAVIAN BROTHER. See HERHUTTERS, and UNITAS FRATRUM.

MORAW, or Morawa, a large river of Germany, which has its source on the confines of Bohemia and Silezia. It crosses all Moravia, where it waters Olmutz and Hradisch, and receiving the Taya from the confines of Lower Hungary and Upper Austria, separates these two countries as far as the Danube, into which it falls.

MORBID, among physicians, signifies "diseased or corrupt;" a term applied either to an unfound constitution, or to those parts or humours that are affected by a disease.

MORBUS COMITIALIS, a name given to the epilepsy; because if on any day when the people were assembl ed in comitia upon public business, any person suddenly seized with this disorder should fall down, the assembly was dissolved, and the business of the comitia, however important, was suspended. See COMITIA.

MORBUS REGIUS, the same with the JAUNDICE. See MEDICINE INDEX.

MORBUS, or DISCOURS, in botany. See VARIETAS.

MORDAUNT (Charles), earl of Peterborough, a celebrated commander both by sea and land, was the son of John Lord Mordaunt viscount Avalon, and was born about the year 1658. In 1675 he succeeded his father in his honours and estate. While young he served under the admirals Torrington and Narborough in the Mediterranean against the Algerines; and in 1680 embarked for Africa with the earl of Plymouth, and distinguished himself at Tangier when it was besieged by the Moors. In the reign of James II. he voted against the repeal of the test act; and distinguishing the measures of the court, obtained leave to go to Holland to accept the command of a Dutch squadron in the West Indies. He afterwards accompanied the prince of Orange into England; and upon his advancement to the throne, was sworn of the privy council, made one of the lords of the bedchamber to his majesty, also first commissioneer of the treasury, and advanced to the dignity of earl of Monmouth. But in November 1690 he was dismissed from his post in the treasury. On the death of his uncle Henry earl of Peterborough in 1697, he succeeded to that title; and, upon the accession of Queen Anne, was invested with the commissioneer of captain-general and governor of Jamaica. In 1705 he was sworn of the privy-council; and the same year declared general and commander in chief of the forces sent to Spain, and joint admiral of the fleet with Sir Cloudley Shovel, of which the year following he had the sole command. His taking Barcelonza with a handful of men, and afterwards relieving it when greatly distreessed by the enemy; his driving out of Spain the duke of Anjou, and the French army, which consisted of 25,000 men, though his own troops never amounted to 10,000; his gaining possession of Catalonia, the kingdoms of Valencia, Aragon, and the isle of Majorca, with part of Murcia and Catalonia, and thereby giving the earl of Galway an opportunity of advancing to Madrid without a blow; are astonishing instances of his bravery and conduct. For these important services his Lordship was declared general in Spain by Charles III. afterwards emperor of Germany; and on his return to England he received the thanks of the House of Lords. His Lordship was afterwards employed in several embassies to foreign courts, being knight of the garter, and made governor of Minorca. In the reign of George I. he was general of all the marine forces in Great Britain, in which post he was continued by King George II. He died in his paffage to Lisbon, where he was going for the recovery of his health, in 1735.—His Lordship was distinguished by his poiseing various shining qualities; for, to the greatest personal courage and resolution, he added all the arts and adresses of a general; a lively and penetrating genius; and a great extent of knowledge upon almost every subject of importance within the compass of
in the ^th year of Henry VIII, Sir Thomas More was made speaker of the house of commons; in which capacity he had the resolution to oppose the then powerful minister, Wolsey, in his demand of an appre-

![Image of a page from a book with text]

drative subsidy; notwithstanding which, it was not long before he was made chancellor of the duchy of Lancaster, and was treated by the king with singular familiarity. The king having once dined with Sir Thomas at Chelsea, walked with him near an hour in the garden, with his arm round his neck. After he was gone, Mr Roper, Sir Thomas's son-in-law, observed how happy he was to be so familiarly treated by the king: to which Sir Thomas replied, "I thank our lord, for Roper, I find his grace my very good lord indeed, and believe he doth as singularly favour me as any subject within this realm: howbeit, I must tell thee, I have no cause to be proud thereof; for if my head would win him a cull in France, it would not fail to go off." From this anecdote it appears, that Sir Thomas knew his grace to be a villain. In 1526 he was sent for to the Capital, with Cardinal Wolsey and others, on a joint embassy to France, and in 1529 with Bishop Tontal to Cambrai. The king, it seems, was so well satisfied with his services on these occasions, that in the following year, Wolsey being disgraced, he made him chancellor; which seems the more extraordinary, when we are told that Sir Thomas had repeatedly declared his disapprobation of the king's divorce, on which the great defectus fidei was so politically bent. Having executed the office of chancellor about three years, with equal wisdom and integrity, he resigned the seals in 1533, probably to avoid the danger of his refusing to confirm the king's divorce. He now retired to his house at Chelsea; dismissed many of his servants; sent his children with their respective families to their own houses (for hitherto he had, it seems, maintained all his children, with their families, in his own house, in the true style of an ancient patriarch); and spent his time in study and devotion: but the capricious tyrant would not suffer him to enjoy this tranquility. Though now reduced to a private station, and even to indigence, his opinion of the legality of the king's marriage with Anne Boleyn was deemed of so much importance, that various means were tried to procure his approbation: but all peroration proving ineffectual, he was, with some others, attainted in the house of lords of misprision of treason, for encouraging Elizabeth Barton, the nun of Kent, in her treasonable practices. His innocence in this affair appeared so clearly, that they were obliged to strike his name out of the bill. He was then accused of other crimes, but with the same effect; till, refusing to take the oath enjoined by the act of supremacy, he was committed to the Tower; and, after 15 months imprisonment, was tried at the bar of the King's-bench, for high treason, in denying the king's supremacy. The proof relied on the sole evidence of Rich the solicitor-general, whom Sir Thomas, in his defence sufficiently discredited; nevertheless the jury brought him in guilty, and he was condemned to suffer as a traitor. The merciful Harry, however indulged him with simple decollation; and he was accordingly beheaded on Tower-hill, on the 5th of July 1535. His body which was first interred in the Tower, was begged by his daughter Margaret, and...
More. and deposited at the chancel of the church at Chelsea, where a monument, with an inscription written by himself, had been some time before erected. This monument with the inscription is still to be seen in that church. The fame daughter, Margaret, also procured his head after it had remained 14 days upon Londonbridge, and placed it in a vault belonging to the Roper's family, under a chapel adjoining to St Dunstan's church in Canterbury. Sir Thomas More was a man of some learning, and an upright judge; a very pious religion, yet cheerful, and even affectedly witty (a). He wanted not sagacity, where religion was out of the question; but in that his faculties were so enveloped as to render him a weak and credulous enthusiast. He left one son and three daughters; of whom Margaret, the eldest, was very remarkable for her knowledge of the Greek and Latin languages. She married a Mr Roper of Well-hall in Kent, whose life of Sir Thomas More was published by Mr Hearne at Oxford in 1716. Mrs Roper died in 1544; and was buried in the vault of St Dunstan's in Canterbury, with her father's head in her arms.

Six Thomas was the author of various works, though his Utopia is the only performance that has survived in the eftem of the world; owing to the refi belonging chiefly of a polemic nature; his anfwer to Luther has only gained him the credit of having the blit knack of any man in Europe, at calling bad names in good Latin. His English works were collected and published by order of Queen Mary, in 1557; his Latin, at Basil, in 1563, and at Louvain in 1566.

More (Sir Antonio), an eminent painter, was born at Utrecht in 1519. He became a scholar of John Schorel, but seems to have studied the manner of Holbein, to which he approached nearer than to the freedom of design in the works of the great masters that he saw at Rome. Like Holbein he was a close imitator of nature, but did not arrive at his extreme delicacy of finishing; on the contrary, Antonio sometimes struck into a bold and masculine style, with a good knowledge of the chiaro furo. In 1542, he drew Philip II. and was recommended by cardinal Granvelle to Charles V., who sent him to Portugal, where he painted John III. the king, Catherine of Austria his queen, and the infant Mary first wife of Philip. For these three pictures he received 600 ducats, besides a gold chain of 1000 florins and other presents. He had 100 ducats for his common portraits. But still ampler rewards were bestowed on him when sent into England, to draw the picture of queen Mary, the intended bride of Philip. They gave him 1000 a. gold chain, and a pension of 1000 a. a quarter as painter to their majesties. He made various portraits of the queen; one was sent by cardinal Granvelle to the emperor, who ordered 200 florins to Antonio. He remained in England during the reign of Mary, and was much employed; but having neglected, as is frequent, to write the names on the portraits he drew, most of them have lost part of their value, by our ignorance of the persons represented. On the death of the queen, More followed Philip in to Spain, where he was indulged in so much familiarity, that one day the king flapping him pretty roughly on the shoulder, More returned the sport with his hand-flick; a strange liberty (Mr Walpole observes), to be taken with a Spanish monarch, and with such a monarch! A grandee interposed for his pardon, and he was ordered to retire to the Netherlands; but a messenger was dispatched to recall him before he had finished his journey. The painter, however, sensible of the danger he had escaped, modestly excused himself, and proceeded. At Utrecht he found the duke of Alva, and was employed by him to draw several of his mistresses, and was made receiver of the revenues of West Flanders; a pretenion with which they say he was so elated, that he burned his Cael and gave away his painting tools. More was a man of a lately and handsome presence; and often went to Brussels, where he lived magnificently. At what time or where he was knighted, is uncertain. He died at Antwerp in 1575, in the 50th year of his age. His portrait, painted by himself, is in the chamber of painters at Florence, with which the great duke, who bought it, so pleased, that he ordered a cartel with some Greek verses, written by Antonio Maria Salvini his Greek professor, to be affixed to the frame. Another picture of himself, and one of his wife, were in the collection of Sir Peter Lely. King Charles had five pictures painted by this master. Mr Walpole mentions a number of others that are in England. But More did not always confine himself to portraits. He painted several historic pieces, particularly one much esteemed of the resurrection of Christ with two angels, and another of Peter and Paul. A painter, who afterwards sold it to the prince of Condé, got a great deal of money by showing it at the foire St Germaine. He made a fine copy of Titian's Danae for the king; and left unfinished the Circumcision designed for the altar in the church of our Lady at Antwerp.

Morin (Henry), an eminent English divine and philosopher, in the 17th century, was educated at Eton school, and in Christ-college in Cambridge, of which he became a fellow, and spent his life in a retired way, publishing a great number of excellent works. He refused bishoprics both in Ireland and England. He was an open-hearted sincere Christian philosopher, who studied to establish men in the belief of providence against atheism. Mr Hobbes was used to say, that if his own philosophy was not true, there was none

(a) This last disposition, we are told, he could not refrain even at his execution. The day being come, he ascended the scaffold, which seemed so weak that it was ready to fall; whereupon, "I pray (said he) see me safe up, and for my coming down let me shift for myself." His prayers being ended, he turned to the executioner, and with a cheerful countenance said, "Pluck up thy spirits, man, and be not afraid to do thy office; my neck is very short, take heed therefore thou strike not awry for favoring thy honesty." Then laying his head upon the block, he bid him flay until he had put aside his beard, saying, "That had never committed any treason."
More (Alexander), was born at Calais in 1616. His father was a Scottishman, and principal of the college which the Calvinists had in that city. Alexander was sent to Geneva, where he was made professor of Greek and of Theology, and at the same time discharged the office of a pastor. His violent love of woman, and the irregularity of his conduct, excited a great number of enemies against him. Saumaise, informed of his disagreeable situation, invited him to Holland, where he was first appointed professor of Theology at Middleburgh, and afterwards professor of history at Amsterdam. The duties of these functions he discharged with great ability; and in 1655 he went to Italy, where he remained a considerable time. It was during his travels in Italy that he published his beautiful poem on the defeat of the Turkish fleet by the Venetians; and this work procured him the present of a golden chain from the republic. Having taken a dislike to Holland, he was translated to Charenton. There his sermons attracted a numerous audience, nor to a much for their eloquence as for the critical allusions and witcisms with which they were adorned. This kind of style succeeded with him, because it was natural; but in his imitators it appeared altogether ridiculous. The impertinency of his character brought him into new quarrels, especially with Daillé, who had greatly the better of him in the dispute.—This singular man died in Paris September 20th, 1670, aged 54, in the house of the duchess de Rohan. He was never married. His works are, 1. A Collection of Controversial Tracts. 2. Beautiful Orations and Poems, in Latin. 3. An answer to Milton, intituled, Alexandri, Mori fides publica. Milton has attacked him with great severity in his writings. Those sermons of his which are published, by no means justify the reputation which he had acquired for that kind of composition.

MOREA, formerly called the Peloponneseus, is a peninsula to the south of Greece, to which it is joined by the isthmus of Corinth. Its form resembles a mulberry-leaf, and its name is derived from the great number of mulberry-trees which grow there. It is about 80 miles in length, and 130 in breadth. The air is temperate, and the land fertile, except in the middle, where it is full of mountains, and is watered by a great number of rivers. It is divided into three provinces; Scania, Belvedera, and Brazzo-di-Mainia. It was taken from the Turks by the Venetians in 1687; but they lost it again in 1715. The magazines of the Morea resides at Modon. See GREECE and PELOPONNESUS.

MOREAU (James), an eminent French physician, born at Chalon-sur-Saone, was the disciple and friend of the famous Guy Patin. He drew upon himself the jealousy and hatred of the old physicians by the public theses he maintained, and afterwards vindicated in his writings. He died in a very advanced age in 1729. He wrote in French, 1. Consultations on the Rheumatism. 2. A chemical treatise on FEVERS. 3. A physical dissertation on the Dropisy; and other works which are esteemed.

MOREELSE (Paul), an eminent painter, was born at Utrecht in 1575, and studied painting under Michael Mirevelt. He was very successful, not only in portraits, but historical subjects and architecture, particularly after he had improved his taste by his studies in Italy. We have some excellent woodcuts in chiro-guro by this artist, who died in 1658.

MOREL, the name of several celebrated printers in the kings of France, who, like the Stephensons, were both men of great learning.

Frederic Morel, who was interpreter in the Greek and Latin tongues, as well as printer to the king, was heir to Vascofan, whose daughter he married. He was born in Champagne, and he died in an advanced age at Paris 1513. His sons and grandsons trode in his steps; they distinguished themselves in literature, and maintained also the reputation which he had acquired by printing. The edition of St Gregory of Nyssa, by his son Claude Morel, is held in great estimation by the learned.

Morel (Frederic), son of the preceding, and still more celebrated than his father, was professor and interpreter to the king, and printer in ordinary for the Hebrew, Greek, Latin, and French languages. He was so devoted to study, that when he was told his works would not finish till he had finished the sentence which he had begun, before it was finished, he was informed that he was actually dead; I am sorry for it (replied he coldly) she was an excellent woman. This printer acquired great reputation from the works which he published, which were very numerous and beautifully executed. From the manuscripts in the king’s library, he published several treatises of St Basil, Theodoret, St Cyrille; and he accompanied them with a translation. His edition of the works of Eumenius and Aretas, in 2 vols folio, is much esteemed. In short, after distinguishing himself by his knowledge in the languages, he died June 27, 1630, at the age of 78. His sons and grandsons followed the same profession.

Morel (William), regius professor of Greek, and director of the king’s printing house at Paris, died 1578. He compiled a Dictionnaire Gris-Latini-François, which was published in quarto in 1622, and some other works which indicate very extensive learning. His editions of the Greek authors are exceedingly beautiful. This scholar, who was of a different family from the preceding, had a brother named John, who died in prison (where he had been confined for heresy) at the age of 20, and whose body was dug out of the grave, and burnt Feb. 27, 1559. They were of the parish of Tilleul, in the county of Mortain, in Normandy.

Morel (Dom Robert), a benedictine monk of the society of Saint-Maur, was born at Chaise-Dieu in Auvergne, A. D. 1653. He was appointed keeper of the library of Saint-Germain des Pres in 1680. He was afterwards superior of different religious houses. In 1699 he disengaged himself from every care, and retired to Saint Denys, where he spent his time in composing works of practical religion. This learned monk, who enjoyed from nature a lively and fruitful imagination, excelled chiefly in subjects of piety, in a knowledge of the Christian character, and of the rules which regard the conduct of the Christian life. His conversations were sprightly and refined, his answers were prompt and ingenious, his temper was gentle, equable,
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equable, and full of gaiety mingling with differection. His florid appearance did not debase the beauty of his mind. All his words breathed charity, piety, uprightness, sincerity, and innocence of manners. Great simplicity and modesty, the limits of which he never transgressed, concealed his excellencies from the vulgar, but made him rank higher in the estimation of the wife and sensible part of mankind. Dom Morel died about B.D. 1731 aged 70. His principal works are,

1. Effusions de cœur pour chaque jour des Jours de l'Église; Paris, 1716, in 5 vols. 12mo. P. de Tournemine, a Jéftuit, esteemed this book (which abounds in piety and alluring thoughts and expressions) so much, that he perused it constantly; and when he was obliged to go to the country he always carried a volume of it along with him. He earnestly sought to be introduced to the author, and interested on his knees that he would grant him his benediction (Histoire littéraire de la congrégation de Saint Mort, p. 504).

2. Entretiens spirituels sur les Évangiles des Dimanches et des Mefliers de toute l'année, divirés pour tous les jours de l'Année, 1720, 4 vols 12mo.

3. Entretiens spirituels, pour favor de préparation à la Mort, 12mo, 1721.

4. Initiation de N. S. L. C. a new translation, with a pathetic prayer, or an effusion of the heart, at the conclusion of every chapter, in 12mo, 1723.


6. De l'Esplance Chrétiennes et de la Conscience en la miséricorde de Dieu, 12mo, 1728.

The greater part of Morel's works are devotions; and his observations are drawn chiefly from the scriptures, and from the practical writings of the fathers. This circumstance greatly raised the reputation of his works, and at the same time excited the envy and ill-will of his enemies. By them he was treated on his knees that he would grant him his beneficence; and when he was obliged to go to the country he always carried a volume of it along with him. He earnestly sought to be introduced to the author, and interested on his knees that he would grant him his benediction (Histoire littéraire de la congrégation de Saint Mort, p. 504).

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Morel (Andreas), a very eminent antiquary, born at Berne in Switzerland. Having a strong passion for the study of medals, he travelled through several countries, and made large collections: in 1683 he published at Paris, in 8vo, Specimen universae rei nummariae antiquae: and the great work of which this was the specimen was to be a complete collection of all ancient medals, of which he had at that time 20,000 exactly described. Soon after this essay appeared, Louis XIV. gave him a place in his cabinet of antiquities, in which capacity he brought himself into great danger by speaking too freely of M. Louvois on account of the neglect in paying his salary, or on some other private account, as he was committed to the Bastille, where he lay for three years; nor was he released until the death of Louvois, nor till the canton of Berne had interceded in his favour. He afterward accepted an invitation from the count of Schwartz at Arnsbadt, in Germany, with whom he lived in the capacity of an antiquary, and was furnished with every thing necessary for carrying on his grand work. In 1703 he died; and in 1734 came out at Amsterdam part of this collection, in 2 vols. folio, under the title of Tresorium Morellaum, sive familiarem Romanorum nummariae omnis, diligentissime describata etque conpilata, &c. Nunc primum editis & commentariis perpetuo illustravit Sigismundus Bruyerecampus. These volumes contain an explication of 3530 medals, engraved, with their reverses.

Morena, (anc. geog.), a distif or division of Mytilene, in the Hither Asia. A part of which was occupied by Cleon, formerly at the head of a band of robbers, but afterward pried of Jupiter Abreternus, and enriched with possessions, first by Antony, and then by Caesar.

Moresby, a harbour a little above Whithaven, in Cumberland; in and about which many remains of antiquity have been dug up, such as altars and stones, with inscriptions on them; and several caverns have been found called Pit's Holes. Here is supposed to have been a Roman fortification.

Moresque, Morees, or Murillo, a kind of painting, carving, &c. done after the manner of the Moors; consisting of several grotesque pieces and compartments promiscuously intermingled, not containing any perfect figure of a man, or other animal, but a wild resemblance of birds, beasts, trees, &c. These are also called arabesques, and are particularly used in embroideries, damask-work, &c.

Morrice-dances vaguely called Morrice-dances are those altogether in imitation of the Moors, as far and in Germany, with whom he lived in the capacity of an antiquary, and was furnished with every thing necessary for carrying on his grand work. In 1703 he died; and in 1734 came out at Amsterdam part of this collection, in 2 vols. folio, under the title of Tresorium Morellaum, sive familiarem Romanorum nummariae omnis, diligentissime describata et sequens conpilata, &c. Nunc primum editis & commentariis perpetuo illustravit Sigismundus Bruyerecampus. These volumes contain an explication of 3530 medals, engraved, with their reverses.

Morgagni. See Fata.

Morgagni (John Baptii), doctor of medicine, first professor of anatomy in the University of Padua, and member of several of the most eminent societies of learned men in Europe; was born in the year 1682, at Forli, a town in the distrito of La Romagna in Italy. His parents, who were in easy circumstances, allowed him to follow that course in life his genius dictated. He began his study at the place of his nativity; but soon after removed to Bologna, where he obtained the degree of Doctor of Medicine, when he had but just reached the 16th year of his age. Here his peculiar taste for anatomy found an able preceptor in Valfalva, who bestowed on him the utmost attention; and such was the progress he made under this excellent master, that at the age of 20 he himself taught anatomy with a high reputation. Soon, however, the fame of his prelections, and the number of his pupils excited the jealousy of the public professors, and gave rise to invidious persecutions. But his abilities and prudence gained him a complete triumph over his enemies; and all opposition to him was finally terminated from his being appointed by the Senate of Bologna to fill a medical chair, which soon became vacant. But the duties of this office, although important, neither occu-
MORGAGNA, the whole of his time, nor satisfied his anxious desire to afford instruction. He still continued to labour in secret on his favourite subject, and soon after communicated the fruits of these labours to the public in his Adversaria Anatomica, the first of which was published in the year 1706, the second and third in 1717, and the three others in 1719. The publication of this excellent work spread the fame of Morgagni far beyond the limits of the state of Bologna. Such was his reputation, that the wife republic of Venice had no hesitation in making him an offer of the second chair of the theory of medicine in the university of Padua, then vacant by the death of M. Molinetti; and, to ensure his acceptance, they doubled the emoluments of that appointment. While he was in this department he published his treatise, entitled Nova institutionum medicarum idea, which first appeared at Padua in the year 1712. From this work his former reputation suffered no diminution. And soon after he rose, by different steps, to be first professor of anatomy in that celebrated university. Although Morgagni was thus finally settled at Padua, yet he gave evident proofs of his gratitude and attachment to Bologna, which he considered as his native country with respect to the sciences. He exerted his utmost efforts in establishing the academy of Bologna, of which he was one of the first associates; and he enriched their publications with several valuable and curious papers. Soon after this, the Royal societies of London and Paris received him among their number. Not long after the publication of his Adversaria Anatomica, he began, much upon the same plan, his Epistola Anatomica, the first of which is dated at Padua in the beginning of April 1726. The works of Morgagni which have already been mentioned, are to be considered, in a great measure, as firstly anatomical: but he was not more eminent as an anatomist, than as a learned and successful physician. In the year 1760, when he was not far distant from the 80th year of his age, he published his large and valuable work De causis et findibus morborum per anatomen indagatis. This last and most important of all his productions will afford convincing evidence of his industry and abilities to late posterity. Besides these works, he published, at different periods of his life, several miscellaneous pieces, which were afterwards collected into one volume, and printed under his own eye at Padua, in the year 1765. It does not appear that he had in view any favourite publications; but he intended to have favoured the world with a complete edition of all his works, which would probably have been augmented with many new observations. In this he was engaged when, on the 5th of December 1771, after he had nearly arrived at the 90th year of his age, death put a period to his long and glorious career in the learned world.

MORINGS, or MORGAGNA, Fata. See Fata.

MORGES, a handsome and rich town of Switzerland, in the canton of Bern, and capital of a bailiwick, with a castle where the bailiff resides. It is a place of some trade, on account of a canal, from which they transport merchandise to the lake of Geneva, and thereby give occasion to its Musaeus sublanaris anatomia, which was his first production, and published in 1619. Upon his return to his native country, he contracted an attachment to the countess, and eventually married her.
MORIN (John), a very learned Frenchman, born at Blois, of Protestant parents, in 1591; but converted by cardinal du Perron to the catholic religion. He published, in 1626, some Exercitations upon the original of Patriarchs and Primates, and the ancient usage of ecclesiastical censores; dedicated to pope Urban VIII. In 1628 he undertook the edition of the Septuagint Bible, with Novius's version; and placed a preface before it, in which it treats of the authority of the Septuagint, and prefers the version in the edition made at Rome by order of Sixtus V. to the present Hebrew text, which he affirms has been corrupted by the Jews. About the same time he gave a French History of the deliverance of the church by the emperor Conftantine, and of the temporal greatnesfs conferred on the Roman church by the kings of France. He afterwards published Exercitations upon the Samaritan Pentateuch; and took the care of the Sama­ritan Pentateuch, for the Polyglot then preparing at Paris. He was greatly carefled at Rome; where after living nine years at the invitation of cardinal Barbarini, he was recalled by Cardinal Richelieu, and died at Paris in 1659. His works are very numerous; and some of them as much valued by Protestants as Papifts for the oriental learning they contain.

MORIN (Simon), a celebrated fanatic of the 17th century, was born at Richemont, near Aumale, and had been clerk to Mr Charron, general paymaster of the army. He was very ignorant and illiterate; and for the oriental learning they contain.

MORIN died at liberty as a visionary; and suffered to continue so till 1661, when Des Marets de St Sorin, who, though a fanatic and visionary himself, had conceived a violent aversion to him, discovered his whole scheme and had him taken up. The means Des Marets made use of for this discovery was by pretending to be one of his disciples; and he carried his treachery and dif­simulation so far, as to acknowledge him for "the Son of man riven again." This acknowledgment fo pleased Morin, that he conferred upon him, as a particular grace the office of being his harbinger, calling him a real 'John the Baptist restored.' Then Des Ma­rets impeached him, and became his acccuer; upon which Morin was brought to a trial, and condemned to be burnt alive. This sentence was executed on him at Paris, March 14th, 1663, in the form and man­ner following: After having made the amende honourable in his shirt with a cord about his neck and a torch in his hand, before the principal gate of the church of Notre Dame, he was carried to the place of exec­ution, and there tied to a stake; and after having been whipped by the hangman, and marked with a burning iron with fleurs de lis upon the right and left shoulders. Morin gave out that he would rife again the third day; which made many of the mob gather together at the place where he was burnt.—It is said, that when the pre­dent de Lamoignon asked him, whether it was written in any part of Scripture, that the great prophet or new Messiah should pass through the fire! he cited this text by way of answer: Lyne me examinatis, et non est inventa in me ini­quiitas; that is, "Thou hast tried me with fire, and no wickedness hath been found in me." Morin died with remarkable resolution; and it was then thought the judges had been too rigorous in their sentence, and that sending him to a mad-house would have been suf­ficient. They replied in defence of themselves, that Morin had owned many impious tenets; and that not in sudden flarts and fits of heat, but in cool blood, and with deliberate obstinacy. But then a question will arise, whether a fool, any more than a madman, ought to be capitally punished for any opinion or degree of stubborness?

MORIN (Peter), was born at Paris, A. D. 1531: he went into Italy, and was employed by the learned Paulus Manucius in his printing-house at Venice.—He afterwards taught Greek and cophography at Vic­encia whence he was called to Ferrara by the duke of that name. St Charles Borromeus, informed of his profound knowledge in ecclesiastical antiquities, of his disinterestedness, of his zeal and piety, offered him his friendship, and engaged him to go to Rome in 1575. The popes Gregory XIII. and Sixtus V. employed him in an edition of the Septuagint, 1587, and in one of the Vulgate, 1590, in folio. He also spent much of his time on an edition of the Bible translated from the Septuagint, and published at Rome, 1588, in folio; on an edition of the Decretals to the
MORIN (Stephen), minister of the Protestant reformed religion at Caen, the place of his birth, was admitted a member of the Academy of Belles Lettres in that city, notwithstanding an express law which excluded Protestants. His great learning gained him this mark of distinction. After the revocation of the edict of Nantes, he retired to Leyden in 1685, and from that to Amsterdam, where he was appointed professor of Oriental languages. He died in 1700, at the age of 75, after being long subject to infirmities both of body and mind. He published eight dissertations in Latin relating to subjects of antiquity, which are extremely curious. The Dordrecht edition of 1700, 8vo, is the best, and preferable to that published at Geneva in 1683, 4to. He wrote likewise the life of Samuel Bochart.

MORIN (Henry), son to the preceding, was born at Saint-Pierre-Sur-Dive, in Normandy, and became a Roman Catholic after he had been a Protestant minister. He is the author of several dissertations which are to be found in the Memoirs of the Academy of Inscriptions, of which he was a member. He died at Caen, on the 16th of July 1728, aged 60, as much esteemed as his father.

MORIN (Lewis), was born at Mans in 1635. He went on foot to Paris to study philosophy, and collected herbs during the whole journey. He afterwards studied physic, and lived in the manner of an anchorite, on bread and water, or at most a few fruits, being his whole subsistence. Paris was to him a hermitage; with this exception, that it furnished him with books, and with the conversation and acquaintance of the learned. He received the degree of doctor of medicine in 1662; and, after several years practice, he was expectant at the Hotel-Dieu. His reputation made Madame de Guise choose him for her first physician, and the Academy of Sciences for one of its members. He died A. D. 1715, aged 80. A long and vigorous life, with a gentle and easy death, were the rewards of his temperance. The exercises of religion and the duties of his station occupied his whole time. No part of it was spent in paying or receiving visits. "Those who come to see me (said he) do me honour; those who do not come, lay me under an obligation." "It was only an Anthony (said Fontenelle) who could visit this Paul." He left a library valued at 20,000 crowns, an herbal together with a cabinet of medals; and this seems to have been his whole fortune. His mental enjoyments had been much more expensive than those of the body. An index to Hippocrates, in Greek and Latin, much more copious and better finished than that of Pinus, was found among his papers.

MORIN (John), was born at Meung near Orleans in 1705, and in 1732 he was appointed professor of philosophy at Chartres. In 1750 the bishop of Chartres rewarded his long and diligent attention to classical learning by a canonry in the cathedral. At the age of 38, Morin published his Methamime Universel, one volume 12mo, which contains a great deal of information, but much more conjecture. His next work was a Treatise on Electricity, published in 1748. His third and last performance was an answer to the Abbé Nollet, who had attacked his opinions concerning electricity. His reputation was not limited to the province in which he lived: he was well known to the academies of sciences at Paris and Rouen, with whom he frequently corresponded. He continued his application to the sciences, and displayed the virtues of the priest and the philosopher to the last hour of his life. This valuable man died at Chartres, on the 28th of March 1764, at the age of 59.

MORINA, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking under the 48th order, Aggregate. The corolla is unequal; the calyx of the fruit is monophyllous and dentated; the calyx of the flower bifid; there is one seed under the calyx of the flower.

MORINORUM CASTELLUM (anc. geog.), simply Cadellum (Antoine); situated on an eminence, with a spring of water on its top, in the territory of the Morini. Now Mont Cadell, in Flanders.

MORINDA, in botany: A genus of the monogynia order, belonging to the pandentia class of plants; and in the natural method ranking under the 48th order, Aggregate. The flowers are aggregate and monopetalous; the stigmata bifid; the fruit plums aggregate, or in clusters.

MORISON (Robert), a physician and professor of botany at Oxford, was born at Aberdeen in 1620, and entered at the university there, and taught philosophy for some time in it; but having a strong inclination to botany, made great progress in it. The civil wars obliged him to leave his country; which, however, he did not do till he had first signalized his zeal for the interest of the king, and his courage, in a battle fought between the inhabitants of Aberdeen, and the Presbyterian troops on the bridge of Aberdeen, in which he received a dangerous wound on the head. As soon as he was cured of it, he went into France; and fixing at Paris, he applied assiduously to botany and anatomy. He was introduced to the duke of Orleans, who gave him the direction of the royal gardens at Blois. He exercised the office till the death of that prince, and afterwards went over to England in 1660. Charles II., to whom the duke of Orleans had presented him at Blois, sent for him to London, and gave him the title of his physician, and that of professor royal of botany, with a pension of 200 l. per annum. The Prodromus Botanicum, which he published in 1669, procured him so much reputation, that the university of Oxford invited him to the professorship of botany in 1669; which
Morisonia, which he accepted, and acquitted himself in it with great ability. He died at London in 1683, aged 63. He published a second and third part of his History of Plants, in 2 vols. folio; with this title, Plantarum Historia Oxoniensis Universa'ti. The first part of this excellent work has not been printed: and it is not known what has become of it.

MORISONIA, in botany: A genus of the polyandria order, belonging to the monadelphous class of plants and in the natural method ranking under the 24th order, putaminis. The calyx is simple and bidentiform; the corolla is tetrapetalous; there is one pistil; the berry is single, unilocular, polypermentous, and peduncellated.

MORLACHIA, a mountainous country of Dalmatia. The inhabitants are called Morlachi, or Morlabi; they inhabit the pleasant valleys of Koter, along the rivers Kerha, Cettina, Marenta, and among the inland mountains of Dalmatia. The inhabitants are by some said to be of Walachian extraction, as according to these authors is indicated even by their name; Morlachi being a contraction of Mauro-walachia, that is, Black Walachia: and the Walachians are said to be descendants of the ancient Roman colonies planted in these countries. This, however, is denied by the Abbé Fortis, who hath published a volume of travels into that country. He informs us, that the origin of the Morlachi is involved in the dark ages of barbarous ages, together with that of many other nations, remembering them so much in customs and language, that they may be taken for one people, differing in the vast tracks from the Adriatic sea to the frozen ocean. The emigrations of the various tribes of the Slav, who, under the names of Scythians, Gei, Goths, Hung, Slavini, Creuts, Avarri, and Vandals, invaded the Roman empire, and particularly the Illyrian provinces during the decline of that empire, must have strangely perplexed the genealogies of the nations which inhabited it, and which perhaps removed thither in the same manner as at more remote periods of time. The remainder of the Albiani, Asturiani, and other Illyrian people anciently settled in Dalmatia who probably could not reconcile themselves to a dependance on the Romans, might not in their own language, Vlazia; a national term, of which no veltige is found in the records of Dalmatia till the 13th century. It signifies powerful men, or men of authority; and the denomination of Mora Vlazia, corruptly Morlachi, as they are now called, may perhaps point out the original of the nation. This word may possibly signify the conquerors that came from the sea, Mor, in all the dialects of the Slavonian language, signifying the sea.

The Morlachi are so different from the inhabitants of the sea-coasts in dialect, dress, dispositions, and customs, that they seem clearly to be of a different original, or at least the colonies must have settled at such distant periods from each other, that they have had time to alter in a great measure their national character. There is also a remarkable diversity among the Morlachi themselves in several districts, probably on account of the different countries from whence they came.

With regard to the character of these people, we are informed that they are much injured by their maritime neighbours. The inhabitants of the sea-coast of Dalmatia tell many frightful stories of their avarice and cruelty: but these, in our author's opinion, are all either of an ancient date, or if any have happened in latter times, they ought rather to be ascribed to the corruption of a few individuals, than to the disposition of the nation in general; and though their tricks are frequent among them, he informs us, that a stranger may travel securely through their country, where he is faithfully escorted, and hospitably treated. The greatest danger is from the Haiducks or Banditti, of whom there are great numbers among the woods and caves of these dreadful mountains on the confines. Yet they are in no other country, or if they disturb the tranquility of others, and prove always faithful guides to travellers; the chief objects of their rapine being sheep and oxen, to supply themselves with food and shoes. Sometimes it happens, that in their extreme necessity the Haiducks go in parties to the shepherds' cottages, and rude demand something to eat; which they do not fail to take immediately by force if the least hesitation is made. It is a custom indeed they meet with a respectful, or with reluctance, as their relatiotn and fury are well known to be equal to the savage life they lead. Four Haiducks are not afraid to assault a caravan of 15 or 20 Turks, and generally plunder and put them to flight. The greatest part of the Haiducks keep upon it as a meritorious action to shed the blood of the Turks; to which cruelty they are easily led by their natural ferocity, inflamed by a mistaken zeal for religion, and the dicipulars of their fanatic priests.

As to the Morlachi themselves, they are represented as open and sincere to such a degree, that they would be taken for simpletons in any other country; and by means of this quality they have been so often duped by the Italians, that the faith of an Italian and the faith of a dog, are synonymous among the Morlachi. They are very hospitable to strangers, and their hospitality is equally conspicuous among the rich and poor. The rich prepares a roasted lamb or sheep, and the poor with equal cordiality offers what he has; nor is this generosity confined to strangers, but generally extends itself to all who are in want.
When a Morlack is on a journey, and comes to lodge at a friend's house, the eldest daughter of the family, or the new-married bride if there happens to be one, receives and kills him when he alights from his horse or at the door of the house: but a stranger is rarely favoured with these female civilities; on the contrary, the women, if they are young, hide themselves, and keep out of his way.

The Morlacchi in general have little notion of domestic economy, and readily consume in a week as much as would be sufficient for several months, whenever any occasion of mourning presents itself. A marriage, the holiday of the saint, protector of the family, the arrival of relations or friends, or any other joyful incident, consumes of course all that there is to eat and to drink in the house. Yet the Morlack is a great economisf in the use of his wearing-apparel; for rather than spoil his new cap, he takes it off let it rain ever so hard, and goes bareheaded in the storm. In the same manner he treats his shoes, if the road is dirty and they are not very old. Nothing but an absolute impossibility hinders a Morlack from being punctual; and if he cannot repay the money he borrowed at the appointed time, he carries a small present to his creditor, and requests a longer term. Thus it happens sometimes, that, from term to term, and present to present, he pays double what he owed, without reflecting on it.

Friendship, that among us is so subject to change on the slightest motives, is lasting among the Morlacchi. They have even made it a kind of religious point, and tie the sacred bond at the foot of the altar. The Scelvonian ritual contains a particular benediction for the solemn union of two male or two female friends in the presence of the congregation. The male friends thus united are called Pobratimi, and the female Pobratimini, which mean half-brothers and half-sisters. Friendships between those of different sexes are not at this day bound with so much solemnity, though perhaps in more ancient and innocent ages it was also the custom.

From these consecrated friendships among the Morlacchi and other nations of the same origin, it should seem that the facta brothers arose; a denomination frequent enough among the common people of Italy and in many parts of Europe. The difference between these and the Probratimini of Morlacchia confit not only in the want of the ritual ceremony, but in the design of unity itself. For, among the Morlacchi, the sole view is reciprocal service and advantage; but such a brotherhood among the Italians is generally commenced by bad men, to enable them the more to hurt and disturb society. The duties of the Pobratimini are, to ailton each other in every case of need or danger, to revenge mutual wrongs, and such like. The enthusiasm is often carried so far as to risk and even to lose their life for the Pobratimini, although these savage friends are not celebrated like Pyliades. If discord happens to arise between two friends, it is talked of over all the country as a scandalous novelty, and there has been some examples of it of late years, to the great affliction of the old Morlacchi, who attribute the depravation of their countrymen to their intercourse with the Italians. Wine and strong liquors, of which the nation is beginning to make daily

abuse, will of course produce the same bad effects as in the case of others.

But as the friendships of the Morlacchi are strong and sacred, so their quarrels are commonly unextinguishable. They pass from father to son; and the mothers fail not to put their children in mind of their duty to revenge their father if he has had the misfortune to be killed, and to show them often the bloody skirt and arms of the dead. And so deeply is revenge rooted in the minds of this nation, that all the millenaries in the world would not be able to eradicate it. A Morlack is naturally inclined to do good to his fellow-creatures, and is full of gratitude for the smallest benefit; but implacable if injured or insulted.

A Morlack who has killed another of a powerful family, is commonly obliged to save himself by flight, and to keep out of the way for several years. If during that time he has been fortunate enough to escape the search of his pursuers, and has got a small sum of money, he endeavours to obtain pardon and peace; and, that he may treat about the conditions in person, he asks and obtains a safe conduct, which is faithfully maintained, though only verbally granted. Then he finds mediators; and, on the appointed day, the relations of the two hostile families are assembled, and the criminal is introduced, dragging himself along on his hands and feet, the mulek, pilol, or cutlafs, with which he committed the murder, hung about his neck; and while he continues in that humble posture, one or more of the relations recites a panegyric on the dead, which sometimes rekindles the flames of revenge, and puts the poor prostrate in no small danger. It is the custom in some places for the offended party to threaten the criminal, holding all kinds of arms to his throat, and, after much intreaty, to consent at last to accept of his ransum. These pacifications cost dear in Albania; but the Morlacchia make up matters sometimes at a small expense; and every-where the business is concluded with a feast at the offender’s charge.

The Morlacks, whether they happen to be of the Roman or of the Greek church, have very singular ideas about religion; and the ignorance of their teachers daily augments the common people’s monstrous evil. They are as firmly persuaded of the reality of witches, fairies, enchantments, nocturnal apparitions, and fortillges, as if they had seen a thousand examples of them. Nor do they make the least doubt about the existence of vampires; and attribute to them, as in Transylvania, the fucking of blood of infants. Therefore, when a man dies suspected of becoming a vampire, or voodloe, as they call it, they cut his hams, and prick his whole body with pins; pretending, that after this operation he cannot walk about. There are even instances of Morlacchi, who, imagining that they may possibly thirst for children blood after death, intreat their heirs, and sometimes oblige them to promise, to treat them as vampires when they die.

The boldest Haiduk would fly trembling from the appearance of a spectre, ghost, phantam, or such like goblins as the heated imaginations of credulous and preposterous people never fail to see. Nor are they ashamed, when ridiculed for this terror; but answer, much in the words of Pindar; “Fear that proceeds from
The women, as may be half and old, and some of them by frequently hearing themselves plays itself without any
not to foment, and tell a thousand little scandalous
they think they cure the
(');
indeed! but a proof of the innocent manners of
the
soul, but not very dirty; those of the Greeks are equally poor, and shamefully called
ground in the church yard, to hear the
generally
must, but a proof of the innocent manners of

A most perfect discord reigns in Morlachia, as it
generally does in other parts, between the Latin and
Greek communities, which their respective priests fail not to foment, and tell a thousand little scandalous sto-
ries of each other. The churches of the Latins are poor, but not very dirty; those of the Greeks are equally poor, and shamefully ill kept. Our author has seen the curate of a Morlack village sitting on the

The compoee of this

The dress of the unmarried

even the Turks near the borders, provide themselfs

to the horns of their oxen. The compoee of this

The alcoran; yet when saluted, in the

The girls ufe a

The Morlack women keep themselves somewhat neat till they get a

Indeed it cannot be said that even the young women have a grateful odour, as they are ufed to anoint their

increafes their income, as well as

The drefs of the unmarried

cures or to prevent
diseases; and they alfo tie them for the fame purpofe tally to a lowthfom.e dirtinefs,

In times of feafing and merriment, besides the kifes, some other little liberties are taken with the hands, which we would not reckon decent, but are not minded among them; and when they are told it, they anfwer, It is only toy-
ing, and means nothing. From this toying, however, their amours ofte take their beginning, and frequently

many traces of them remain in the places farked: di-

from our settlements. Pure cordiality of senti-

is not there restrained by other regards, and dis-
plays itself without any distinction of circumfances. A

They are not a little. increafes their income, as well as

in every method to maintain the credit of deed it cannot be

Although this particular is carried to an abuse as well as that of public

and correct the bodies of their offending flock with the cudgel. Perhaps this

The virtues attributed to these zapiz are much of the

The women in that country being generally

But the custom is

The girls ufe a scarlet cap, to

The principal merit of these caps, which conftrute the
good taste as well as vanity of the Morlack young

they have alfo any thing elfe but a handkerchief, either

The Morlachiv have also

to carry them tied to their caps, to cure or to prevent
diseases; and they alfo tie them for the fame purpofe to the horns of their eex. The compoee of this

The trefles of the unmarried women is the moft com-

Italy have little lefs, to certain copper and silver coins which they commonly hang a veil falling

In times of feafing and merriment, besides the kifes, some other little liberties are taken with the hands, which we would not reckon decent, but are not minded among them; and when they are told it, they anfwer, It is only toy-
ing, and means nothing. From this toying, however, their amours often take their beginning, and frequently

As may be

The women, as may be

The women, as may be

The women, as may be

The women, as may be
in others, tremulous plumes of glass; and in others, artificial-flowers, which they purchase in the sea-port towns; and in the variety of these capricious and barbarous ornaments, sometimes a fancy not ineluctable is displayed. Their holiday-shirts are embroidered with red silk, and sometimes with gold, which they work themselves while they attend their flocks; and it is surprising to see how nicely this work is executed.

Both old and young women wear about their necks large strings of glass-beads, of various size and colour; and many rings of brass, tin, or silver, on their fingers. Their bracelets are of leather covered with wrought tin or silver; and they embroder their stomachers, or adorn them with beads or shells. But the use of stays is unknown, nor do they put whale-bone or iron in the stomacher. A broad woollen girdle surrounds their petticoat, which is commonly decked with shells, and of blue colour, and therefore called modrin6. Their gown, as well as petticoat, is of a kind of serge; and both reach near to the ankle; the gown is bordered with scarlet, and called fadak. Their robe of the same material is without sleeves over a linen petticoat or shift.

The girls always wear red stockings; and their shoes are like those of the men, called opanke. The sole is of undressed ox-hide, and the upper part of sheep-skin thongs knotted, which they call aputa; and these they fall on above the ankles, something like the ancient cotothurns.

The unmarried women, even of the richest females, are not permitted to wear any other sort of shoes; though after marriage they may, if they will, lay aside the opanke, and use the Turkish slippers. The girls keep their hair tressed under their caps, but when married they let it fall dishevelled on the breast; sometimes they tie it under the chin; and always have medals, beads, or bored coins, in the Turkish or American mode twisted amongst it. An unmarried woman, who falls under the imputation of want of chastity, runs the risk of having her red cap torn off her head publicly in church by the curate, and her hair cut by some relation, in token of infamy. Hence, if any of them happen to have fallen into an illicit amour, they commonly of their own accord lay aside the badge of virginity, and remove into another part of the country.

Nothing is more common among the Morlachi than marriages concluded between the old people of the respective families, especially when the parties live at a great distance and neither see nor know each other: and the ordinary motive of these alliances is the ambition of being related to a numerous and powerful family, famous for having produced valiant men. The father of the future bridegroom, or some other near relation of mature age, goes to ask the young woman, or rather a young woman of such a family, not having commonly any determinate choice. Upon this all the girls of the house are shown to him, and he chooses which pleases him best, though generally respecting the right of seniority. A denial in such cases is very rare; nor does the father of the maid inquire much into the circumstances of the family that asks her. Sometimes a daughter of the master is given in marriage to the servant or tenant, as was usual in patriarchal times; so little are the women regarded in this country. On these occasions, however, the Mor. Marachi girls enjoy a privilege which ours would also with to have, as in justice they certainly ought. For he who acts by proxy, having obtained his fair, is obliged to go and bring the bridegroom; and if, on seeing each other, the young people are reciprocally content, the marriage is concluded, but not otherwise. In some parts it is the custom for the bride to go to see the house and family of the proposed husband, before she gives a definitive answer; and if the place or persons are disagreeable to her, she is at liberty to annul the contract. But if she is contented, she returns to her father’s house, escorted by the bridegroom and nearest relations. There the marriage day is appointed: on which the bridegroom comes to the bride’s house, attended by all his friends, of greatest note, who on this occasion are called fowas, and are all armed, and on horseback, in their holiday-cloaths with a peacock’s feather in their cap, which is the distinctive ornament used by those who are invited to wadings. The company goes armed, to repulse any attack or ambush that might be intended to disturb the feast; for in old times these encounters were not unfrequent according to the records of many national heroic songs.

The bride is conducted to a church veiled, and surrounded by the svent on horseback: and the sacred ceremony is performed amidst the noise of muskets, pistols, barbaric shouts and acclamations, which continue till she returns to her father’s house, or to that of her husband, if not far off. Each of the svent has his particular inspection, as well during the cavalcade as at the marriage-feast, which begins immediately on their return from church. The parvaux precedes all the rest, singing such songs as he thinks suitable to the occasion. The bariafras brands a lance with a tife banner fastened to it, and an apple stuck on the point; there are two bariafras, and sometimes four at the more noble marriages. The firi-svent is the principal personage of the brigade; and the most respectable relation is commonly invested with this dignity. The flacheo’s duty is to receive and obey the orders of the firi-svent. The two divers, who ought to be the bridegroom’s brothers when he has any, are appointed to serve the bride. The knum corresponds to our sponsors; and the komorgia, or sekfa, is deputed to receive and guard the dowry. A crowd carries the mace, and attends to the order of the march, as master of the ceremonies; he goes singing aloud, Brereri, Davari, Dobrofriechi, Hari, Pio; names of ancient prophetical deities. Bukla is the cup-bearer of the company, as well on the march as at table; and all these offices are doubled, and sometimes tripled; in proportion to the number of the company.

The first day’s entertainment is sometimes made at the bride’s house, but generally at the bridegroom’s, whether the svent set immediately after the nuptial benediction: and at the same time three or four men run on foot to tell the good news; the first who gets to the house has a kind of towel, embroidered at the ends, as a premium. The domachi, or head of the house, comes out to meet his daughter-in-law; and a child is handed to her, before the alights, to care for it; and if there happens to be none in the house, the child is borrowed from one of the neighbours. When the

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alights,
then the mother-in-law, or in her place fame other female relation, presents a corn-feed, full of different kinds of grain, nuts, almonds, and other small fruit, which the bride scatters upon the svati, by handfuls, behind her back. The bride does not sit at the great table the first day, but has one apart for herself, the two dervi, and the flatheo. The bridegroom sits at table with the svati; but in all that day, consecrated to the matrimonial union, he must neither uncloset nor cut any thing whatever. The knum carves his meat, and eats his bread. It is the domachin's business to give the toasts, and the farr-svati is the first who pledges him. Generally the bukkara, a very large wooden cup, goes round, first to the faint protector of the family; next to the prosperity of the holy faith; and sometimes to a name the most sublime and venerable. The most extravagant abundance reigns at these feasts; and each of the svati contributes, by sending a share of provisions. The dinner begins with fruit and cheeses; and the soup comes last, just contrary to our custom. All sorts of domestic fowls, kid, lamb, and sometimes venison, are heaped in prodigal quantities upon their tables; but very rarely a Morlaccho eats veal, and perhaps never, unless he has been persuaded to do it out of his own country. This abhorrence to calves flesh is very ancient among the Morlacchi. St. Jerome, against Jovinian, talks notice of it; and Tomaso Marnavich, a Bofian writer, who lived in the beginning of the last age, says, that the Dalmatians, uncorrupted by the vice of strangers, abstained from eating calves flesh as an unclean food, even to his days. The women relations, if they are invited, never dine at table with the men, it being an established custom for them to dine by themselves. After dinner, they pass the rest of the day in dancing, singing ancient songs, and in games of dexterity, or of wit and fancy; and in the evening, at a convenient hour after supper, the three ritual healths having first gone round, the knum accompanies the bridegroom to the matrimonial apartment, which commonly is the cellor or the stabel, whither the bride is also conducted by the dervi and the flatheo; but the three laft are obliged to retire, and the knum remains alone with the new-married couple. If there happens to be any bed prepared better than straw, he leads them to it: and having untied the bride's girdle, he caueth them both to undress each other reciprocally. It is not long since the knum was obliged to undress the bride entirely; but that custom is now out of use; and, instead of it, he has the privilege of kissing her as often as he pleases, where he meets her; which privilege may possibly be agreeable for the first months, but must soon become very disgusting. When they are both undressed, the knum retires, and stands liftening at the door, if there be a door. It is his business to announce the consummation of the marriage, which he does by discharging a pistol, which is answered by many of the company. The next day the bride, without her veil and virginal cap, dines at table with the svati, and is forced to hear the coarse equivocal jeers of her indelicate and sometimes intoxicated company.

These nuptial-feasts, called sdrawje by the ancient Usuri, are by our Morlacchi called sdrawvize, from whence our Italian word sdrawvize is undoubtedly derived. They continue three, six, eight, or more days, according to the ability or prodigal disposition of the family where they are held. The new-married wife gets no inconsiderable profit in these days of joy; and it usually amounts to much more than all the portion the brings with her, which often consists of nothing but her own clothes and perhaps a cow; nay, it happens sometimes that the parents, instead of giving money with the daughter, get something from the bridegroom by way of price. The bride carries water every morning to wash the hands of her guests as long as the feasting lasts; and each of them throws a small piece of money into the basin after performing that function, which is a very rare one among them, excepting on such occasions. The brides are also permitted to raise other little contributions among the svati, by hiding their shoes, caps, knives, or some other necessaries of their equipment, which they are obliged to ransom by a piece of money, according as the company rates it. And, besides all these voluntary or extorted contributions already mentioned, each guest must give some present to the new married wife at taking leave the last day of the sdrawvize: and then the also distributes some trifles in return, which commonly consist in shirts, caps, handkerchiefs, and such like.

The nuptial-rites are almost precisely the same thro' all the vast country inhabited by the Morlacchi; and those in use among the peasants and common people of the sea-coast of Dalmatia, Istria, and the islands, differ but little from them. Yet among these particular varieties, there is one of the island Zlarine, near Sebenico, remarkable enough; for there the farr-svati (who may naturally be supposed drunk at that hour) must at one blow with his naked broad sword, strike the bride's crown of flowers off her head, when she is ready to go to bed. And in the island of Pago, in the village of Novoglia (probably the Gifia of ancient Geographers) there is a custom more comical, and less dangerous, but equally savage and brutal. After the marriage contract is settled, and the bridegroom comes to conduct his bride to church, her father or mother, in delivering her over to him, makes an exaggerated enumeration of her ill qualities: "Know, since thou wilt have her, that she is good for nothing, ill-natured, obstinate, &c." On which the bridegroom, affecting an angry look, turns to the young woman, with an "Ah! since it is so, I will teach you to behave better:" and at the same time regales her with a blow or a kick, or some piece of similar galantry, which is by no means figurative. And it seems in general, that the Morlacchi women, and perhaps the greatest part of the Dalmatians, the inhabitants of the cities excepted, do not dislike a beating either from their husbands or lovers.

In the neighbourhood of Derniff, the women are obliged, during the first year after marriage, to kiss all their national acquaintances who come to the house; but after the first year they are dispensed from that compliment: and indeed they become so intolerably nattily that they are no longer fit to practice it. Perhaps the mortifying manner in which they are treated by their husbands and relations is, at the same time, both
Morlacchi, both the cause and effect of their shameful neglect of their persons. When a Morlack husband mentions his wife, he always premisses, by your leave, or begging your pardon. And when the husband has a bed-fell, the wife must sleep on the floor near it. Our author often lodged in Morlack houses, and observed that the female sex is universally treated with contempt; it is true, that the women are by no means amiable in that country; they even deform and spoil the gifts of nature.

The pregnancy and births of those women would be thought very extraordinary among us, where the ladies suffer so much, notwithstanding all the care and circumstanced used before and after labour. On the contrary, a Morlack woman neither changes her food nor interrupts her daily fatigue on account of her pregnancy; and is frequently delivered in the fields, or on the road, by herself; and takes the infant, washes it in the first water she finds, carries it home and returns the day after to her usual labour, or to feed her flock.

The little creatures, thus carelessly treated in their tenderest moments, are afterwards wraught in miserable rags, where they remain three or four months, under the same ungentle management; and when that term is elapsed, they are set at liberty, and left to crawl about the cottage and before the door, till they learn to walk upright by themselves; and at the same time acquire that singular degree of strength and health with which the Morlacchi are endowed, and are able, without the least incoherence, to expede their naked breasts to the severest frost and snow. The infants are allowed to suck their mother's milk while she has any, or till she is with child again; and if that is elapsed, they are set at liberty, and left to crawl all the relations and friends send presents of eatables to the woman in childbed, or rather to the woman delivered; and the family makes a supper of all those presents together. The women do not enter the church till 40 days after child-birth.

The Morlacchi pass their youth in the woods, at the forest of Boigny, subject to the Porte, where no women run about, without breeches, in a of the Morlackian women is somewhat extraordinary; for it is very certain, that they can give the teat to their children over their shoulders, or under their arms. They let the boys run about, without breeches, in a shirt that reaches only to the knee, till the age of 13 or 14, following the custom of Boffina, subject to the Porte, where no haraz or capitation-tax is paid for the boys till they wear breeches, they being considered before that time as children not capable of labouring, or of earning their bread. On the occasion of births, and especially of the first, all the relations and friends send presents of eatables to the woman in childbed, or rather to the woman delivered; and the family makes a supper of all those presents together. The women do not enter the church till 40 days after child-birth.

The Morlacchi pass their youth in the woods, where they remain three or four months, under the same ungentle management; and when that term is elapsed, they are set at liberty, and left to crawl about the cottage and before the door, till they learn to walk upright by themselves; and at the same time acquire that singular degree of strength and health with which the Morlacchi are endowed, and are able, without the least inconvenience, to expede their naked breasts to the severest frost and snow. The infants are allowed to suck their mother's milk while she has any, or till she is with child again; and if that is elapsed, they are set at liberty, and left to crawl all the relations and friends send presents of eatables to the woman in childbed, or rather to the woman delivered; and the family makes a supper of all those presents together. The women do not enter the church till 40 days after child-birth.

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Morne-garon, a very remarkable volcanic mountain on the island of St. Vincent's in the West Indies. It was visited by Mr. James Anderson surgeon in the year 1784, who is the only person that ever ascended to the top of it, and from whose account, in the Philosophical Transactions, Vol. LXXV. the following is taken.

The mountain in question is situated on the north-west part of the island, and is the highest in it. It is constantly reported to have emitted volcanic eruptions; and the ravines at the bottom seem to corroborate the traditions of the inhabitants in this respect. The structure of it, when viewed at a distance, appears different from that of any other mountain in the island, or that Mr. Anderson had seen in the West Indies. He could perceive it divided into many different ridges, separated by deep chasms, and its summit appeared quite distinct of every vegetable production. Several ravines, that run from the bottom a great way up the mountain, were found quite distinct of water, and pieces of pumice-stone, charcoal, and several earths and minerals of a particular quality, found in them, plainly indicated some very great singularity in this mountain. Some very old men also informed our author, that they had heard it related by the captain of a ship, that between this island and St. Lucia he saw flames and smoke rising from the top of the mountain, and next morning his decks were covered with ashes and small stones.

Mr. Anderson's curiosity was so much excited by these circumstances, that he formed a resolution of going up to the top; but was informed that this was impossible, nor could he find either white man, Caribbee, or negro, who would undertake to show him the way. Having observed the huts as well as he could, with a view to discover the most proper place for attempting an ascent, he found several dry ravines that seemingly ran a great way up, though he could not be certain that they were not interred by rocks or precipices lying across. Having examined the mountain with a good glass, he thought he perceived two ridges by which there was a possibility of getting up; and though they appeared to be covered for a great way with wood, he hoped by a little cutting to open a way through it.

On the 26th of February 1784, our author began his journey, having been furnished by a Mr. Maloune, who lives within a mile of the foot of the mountain, with two stout negroes, and having another boy who waited on himself. They arrived at the bottom of the
the mountain a little before seven in the morning, having each a good cutlass to cut through the woods, or to defend themselves in case of an attack from the Caribbees or runaway negroes. Before they could get at either of the ridges, however, they had a rock to climb upwards of 50 feet high. Having scrambled up this with great difficulty, they found themselves in the bottom of a deep and narrow ravine, which having afforded a little way, they arrived at the habitation of Mr. Gafco the Frenchman. Mr. Anderfon expresses his surprise, that a young and healthy man, and a good mechanic, should extricate himself from the world among woods and precipices, where he was besides in continual danger of being swept away with his whole habitation by the torrents occasioned by the rains. He found him, however, an intelligent man, and was hospitably entertained by him.

"The difficulty (says Mr. Anderfon) in going thro' woods in the West Indies, where there are no roads or paths, is far beyond any thing an European can conceive. Besides tall trees and thick underwood, there are hundreds of different climbing plants twisted together like ropes, and running together in all directions to a great extent; and even to the tops of the highest trees. They cannot be broken by pushing on; and many of them are not to be cut without difficulty. Besides these, a species of grass, the *johannes lirifpermat*, with ferrated leaves, cuts and tears the hands and face terribly."

By reason of these obstructions, it was upwards of two hours before they got upon the ridge; but here they found their passage more difficult than before. They were now surrounded by a thick forest, rendered more impracticable by the large piles of trees blown down by the hurricanes; which obliged them in many places to creep on their hands and feet to get below them, while in others it was necessary to climb to a considerable height to get over them; at the same time that by the trunks being frequently rotten, they often tumbled headlong from a great height, and could not extricate themselves without great difficulty.

The fatigue of cutting their way through the woods soon became intolerable to the negroes; so that about four in the afternoon he could not prevail on them to go any farther. Mr. Anderfon therefore perceiving it was impossible to get to the summit that night, and his water being totally expended, returned to Mr. Gafco's, where he spent the night, determining to try another route next morning. The hospital Frenchman entertained him in the best manner he could; but though he parted with his own hammock to him, and slept on a board himself, Mr. Anderfon found it impossible to shut his eyes the whole night by reason of the cold. "His hut (says he) was built of *sagami* or large reeds, between each of which a dog might creep through, and the top was covered with dry grass. It is situated in the bottom of a deep gully, where the sun does not shine till nine in the morning; nor after four in the afternoon. It is surrounded by thick wood; and during the night the whole of the mountain is covered with thick clouds, from which it frequently rains, and which makes the night air exceedingly cold."

Early next morning Mr. Anderfon set out in company with the negro boy, who continued very faithful to him during the whole of the journey. He now determined to take his course up the ravine, and proceeded for about a mile and a half without any considerable obstruction. It now, however, began to narrow still; there were numbers of rocks and precipices to climb over, with many bushes and vines which could scarcely be got through. At last the ravine terminated at the bottom of a very high precipice. It was impossible to know the extent of this, as the top was covered with thick wood; but from the bottom upward, as far as he could see, was loose sand with ferns and tufts of grass, which as soon as he took hold of them came up by the roots. Though the ascent was plainly at the risk of his life, Mr. Anderfon relented to attempt it; and therefore telling the boy to keep at some distance behind, lest he should tumble and drive him down, he began to ascend, digging holes with his cutlass to put his feet in, and taking hold of the tufts of grass as lightly as possible. Notwithstanding all his care, however, he frequently slipped down a considerable way; but as it was only loose sand, he could easily push his cutlass into it up to the handle, and thus by taking hold of it recover himself again. At last he got up to some wild plantains, which continued all the way to the place where the trees began to grow. Here he rested for some time, waiting for the boy, who got up with much less difficulty than he had done. On getting up to the top of the precipice, he found himself on a very narrow ridge, covered with wood, and bounded by two ravines, the bottoms of which he could not see, the deficit to them appearing to be nearly perpendicular, though all the way covered with thick wood. Proceeding onwards, they found the ridge exceedingly narrow, in many places not fix feet broad; with a tremendous gulf on each side, into which they were every moment in danger of falling; so that Mr. Anderfon was obliged to lie down on his belly with great caution, in order to see through the bushes how the ridge tended.

Here a sulphurous smell of rather one like gunpowder, began to be perceived; which, Mr. Anderfon knew, must proceed from the top of the mountain, as the wind then blew that way; and as it plainly grew stronger as he advanced, he was in hopes that the top could not be very far distant. Perceiving a rising before him, he imagined, that, by getting upon it, he might have a view of the top of the mountain; but when this was done, he could only see a peak on the north-west side of the mountain, to which, by appearance, he judged himself very little nearer than when at the bottom.

The woods now became very difficult, great quantities of fallen trees lying buried among the grass; and being rotten, he was frequently buried very deep among them when he thought himself walking upon firm ground. About noon he was alarmed with a rushing among the bushes, and something like a human voice behind him; but as he was preparing to defend himself against Caribbees or runaway negroes, he was agreeably surprized with the sight of those who had formerly left him, with three others, sent by Mr. Maloune with plenty of provisioins. Encouraged by this afflailence, after refreshing themselves, they renewed their labours with fresh vigour, and Mr. Anderfon thought himself sure of reaching the top before night.
In a little time he had a fair view of the ravine on the left, which was of prodigious depth, and ran from near the top of the mountain to the sea. Its bottom seemed to be a rock nearly resembling lava in colour, and it seemed as if there had been vast torrents of sulphureous matter running upon it for some time. He now regretted much that he knew not of this ravine before he commenced his excursion, as, by palling a headland in a caros, and getting into it, he might have gained the summit without all those delays and difficulties he had encountered.

About four in the afternoon he had no prospect of the top of the mountain, but imagined that if he could get into the ravine before night, he might easily reach it next morning. After cutting through wild plantains for a great way, however, he found himself at funlet on the brink of a precipice, over which he all the fountains of nature; and are piled up very regular. Great

Mr Anderfon directed his course towards a high peak that overlooked a large excavation where the ridges met, and which he supposed to be the crater of the volcano. In his way, he found the last wood composed of a most beautiful species of trees. After that he entered into a thick long grafs intermixed with fern, which branched and ran in every direction. Thro' this they were obliged to cut their way with almost as much difficulty as they had done through the woods, and before they continued very near to the top of the mountain. The fatigue of this work soon reduced them to such a situation, that they were scarce able to stand; and they were obliged to quench their thirst, which was excessive, by chewing the leaves of the begonia obliqua, there being no water to be had in the place. Two of the negroes returned, and the rest refused to proceed any farther; so that Mr Anderfon himself was obliged to abandon the enterprise, and they all began to descend about half an hour after twelve; and as there was now a clear path all the way down, they arrived at Mr Gaffo's by funlet; and notwithstanding his extreme weariness, Mr Anderfon continued his journey to Mr Maloune's, where he arrived between fix and seven at night.

Our traveller having refreshed himself to the 4th of March, in order to sustain the fatigue of his journey, he set out about four that morning in company with a Mr Frafer, who had resolved to accompany him. They met with little difficulty till they came to the place whence they had formerly returned. Here, however, they were obliged for a quarter of a mile to cut their way through the grafs and ferns already mentioned; which being done, they met with no further obstruction. When they came within a quarter of a mile of the top, they found the climate suddenly altered, the air very cold, and the vegetable productions changed, the whole summit of the mountain being barren. On the confines of the grasy and barren regions, however, he found some beautiful plants; and he observes, that this is the only place in the West Indies where he ever found moss; but here it grows in such plenty, that he frequently funk in it up to the knees. About noon they reached the summit, and were instantly surprized with the fight of a moss extraordinary cavity. It is situated in the very centre of the mountain, at the place where all the ridges meet. Its diameter is something more than a mile, and its circumference to appearance a perfect circle. Its depth from the surrounding margin is above a quarter of a mile, and it narrows a little, but very regularly, to the bottom. Its sides are very smooth, and for the most part covered with short moss, except towards the south, where there are a number of small holes and rents. This is the only place where it is possible to go down to the bottom; and the descent is very dangerous on account of the numberless small cliffs. On the west side is a section of a red rock like granite, cut very smooth, and having the same declivity with the other parts. All the rest of the surrounding sides seem to be composed of sand, which has undergone the action of an intense fire. It has a crust quite smooth, and about an inch thick, almost as hard as rock; on breaking thro' which we met with nothing but loose sand. In the centre stands a burning mountain about a mile in circumference, of a conic form, "but quite level." Out of the middle of the summit rises a small eminence eight or ten feet high, and perfectly conical; from the apex of which a column of smoke constantly issue. It is composed of large masses of red granite-like rock, of various shapes and sizes, which appear to have been split into their present form by some terrible convulsion of nature; and are piled up very regular. Great quantities of smoke issue from most parts of the mountain, especially on the north side which appears to be burning from top to bottom; and the heat is so intense, that it is impossible to ascend it. It is even very dangerous to go round the base, as large masses of rock are constantly splitting with the heat and tumbling down. At the bottom, on the north side, is a very large rock split in two. Each of these halves, which are rent in all directions, are separated to a considerable distance from each other, and the crevices have glossy efflorescences tuffing like vitriol. There are also beautiful crystallizations of sulphur; and on all parts of the mountain are great quantities of sulphur, also alum, vitriol, &c.

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From the external appearance of this mountain, Mr Anderfon conjectures that it had but lately begun to burn; as on several parts of it he saw small shrubs and
and grass which looked as if they had been but lately scorched and burnt. There were also several holes on the south from which smoke issued, that appeared to have broken out but lately, the adjacent bushes being but lately burnt. On two opposite sides, the cleft and west, of the burning mountain, are two lakes of water, about a fome's throw in breadth. They appear to be deep in the middle, and have a bottom of a kind of clay. The water is a chalky, and has a pleasant taste. These lakes probably derive their existence in a great measure, if not totally, from the rain-water running down the sides of the crater. On the north side Mr Anderson observed the traces of great torrents, that to appearance had conveyed vast quantities of water to these lakes; and by the stones at the bottom he could perceive that absorption or evaporation, or both, went on very fast. The greater part of the bottom of the crater is very level; and on the south side are some shrubs and small trees. Some pieces of pumice-stone were met with, and many stones about the size of a man's fist, rough, and blue upon one side, are scattered all over the mountain.

The motion of the clouds, on the top of this mountain was very singular. Though there were several parts higher than the crater, yet the clouds seemed always to be attracted by the latter. After entering on its east or windward side, they funk a considerable way into it; then mounting the opposite side, and whirling round the north-west side, they ran along a ridge which tended nearly north-east, and afterwards sunk into a deep ravine dividing this ridge from another on the north-west corner of the mountain, and the highest on it, lying in a direction nearly north and south. They keep in this ridge to the south end, and then whirl off in their natural direction.

From the situation of these islands to one another, and to the continent of South America, Mr Anderson conjectures, that there are submarine communications between the volcanoes in each of them, and from them to the high mountains of South America. He observes, that the crater in this island lies nearly in a line with Soufriere in Martinico; and probably from thence to a place of the same kind in Dominique, and from thence to the other islands; there being something of the kind in each, Barbadoes and Tobago excepted.

MOROC, or MAROC, a beautiful bird of Abyssinia described by Mr Bruce, who thinks its name is derived from mar “honey,” though he says that he never heard it was further concerned in the honey than destroying bees. It seems to pursue those insects out of enmity or diversion as well as for food, leaving great numbers dead on the ground, besides those which it devours for food. In consequence of this property, the moroc is never found any where but where the honey is very plentiful, tho’ the Abyssinians never take any notice of the ravages they commit among their flocks of bees.

The moroc resembles the cuckoo in size and shape, but differs in other respects. Its mouth is very wide, the opening reaching almost to his eyes; the inside of the mouth and throat yellow, the tongue sharp pointed, and capable of being drawn almost half its length out of the mouth beyond the point of its beak, and is very flexible. The head and neck are brown, without any mixture of other colours; there are like eyes a number of very small and feafock visible hairs at the root of the beak. The eyebrows are black; the beak pointed, and very little crooked; the pupil of the eye black, and surrounded with an iris of a dull and dusky red: The fore-part of the neck is light yellow, darker on each side than in the middle, where it is partly white; the yellow on each side reaches near the shoulder, or round part of the wing; and from this the whole breast and belly is of a dirty white to the under part of the tail; and from this the feathers begin to be tip’ed with white, as are all those that cover the outside of the wing. The wing has eight feathers of the largest size and fix of the second; the tail consists of twelve feathers, the longest three being in the middle: they are placed closely together; and the tail is of an equal breadth from top to bottom, the feathers being also tip’d with white. The thighs are covered with feathers of the same colour as those of the belly, reaching more than half way down the legs, which are black, as well as the feet, and marked distinctly with scales. There are two toes before and behind, each of which has a sharp and crooked claw. It makes a sharp snapping noise when it catches the bees, evidently from closing its beak; but Mr Bruce never could discover that it had any song.

This seems to be the creature mentioned by Dr Sparman under the name of cuculus indicator, which (he says) has the singular property of discovering the nests of wild bees, and leading travellers by a certain cry to the place where the treasure is deposited. According to Sparman’s account, it makes known these discoveries by the same cry to foxes as well as to the human species; but Jerome Lobo, who mentions the Abyssinian bird, does not take notice of the foxes, though he mentions its singing melodiously when it arrives at the place where the honey is deposited.

Both these accounts are fev’erely criticized by Mr Bruce, “I cannot (says he), for my own part, conceive, in a country where there are so many thousand lives, that there was any use for giving to a bird a peculiar instinct or faculty of discovering honey, when, at the same time, nature had deprived him of the power of availins himself of any advantage from the discovery: for man feems in this cafe to be made for the service of the moroc, which is very different from the common and ordinary course of things; man certainly needs him not, for on every tree, and on every hillock, he may see plenty of honey at his own deliberate disposal. I cannot then but think, with all submissioin to these natural philosophers, that the whole of this is an improbable fiction; nor did I ever hear a single perfon in Abyssinia fuggelt, that either this or any other bird had such a property. Sparman says it was not known to any inhabitant of the Cape, any more than that of the moroc was in Abyssinia; it was a secret of nature, hid from all but these two great men; and I most willingly leave it among the catalogue of their particular discoveries.”

MORNING, the beginning of the day, or the time of the sun-rising. The astronomers reckon morning, many from the time of midnight to that of mid-day. Thus an eclipse is said to begin at 11 o’clock in the morning, &c.

MORNING STAR is the planet Venus, when a little to
Nothing can be conceived more unjust and despotic than the government of Morocco, and nothing more degenerated than the character of the people. The emperor is allowed to have not only an uncontrollable power over the lives and fortunes of his subjects, but in a great measure over their consciences, such as they are; in as much as he is the only person who, as the successor of the prophet, has a right to interpret the Koran; and appoints all the judges under him, of whom the whole government of Morocco and Fez are the chief, whose business it is to explain and dispense the laws relating to their religion; and who, being his creatures and instruments, dare not fler otherwise than he directs. Whenever therefore the laws are enacted by him, and proclaimed by his governors in all the provinces, as is commonly done, that none may plead ignorance, they are everywhere received with an implicit and religious submission. On the other hand, the subjects are bred up with a notion, that those who die in the execution of his command are entitled to an immediate admittance into paradise, and those who have the honour to die by his hand to a fill greater degree of happiness in it. After this we need not wonder at finding so much cruelty, oppression, and tyranny on the one side, and so much submission, paffiveness, and misery on the other.

This latter, however, extends no farther than the Moors; for as to the mountaineers, the subjection and tribute they pay to those tyrants was always involuntary, and altogether forced; and as for the negroes, their zeal and attachment is owing merely to the great the black sway and power which they have gained in the government, on various accounts. They were first introduced, or rather their importation increased, by the policy of Muley Ismael, a late emperor, at a period when there was a great decrease of population in the empire, occasioned in some degree by the enormous cruelties exercised by its former sovereigns, who have been known not unfrequently, through a slight dispute, to abandon a whole town or province to the sword. In the character of Muley Ismael, were found the most singular incon sistencies; for it is certain, that although a tyrant of the same class, yet in other respects, as if to repair the mischief which he committed, he left nothing undone for the encouragement of population. He introduced, as above mentioned, large colonies of negroes from Guinea; built towns for them, many of which are still remaining; assigned them portions of land, and encouraged their increase by every possible means. He soon initiated them in the Mahometan faith; and had his plan been followed, the country by this time would have been populous, and probably flourishing. As the negroes are of a more lively, active, and enterprising disposition than the Moors, they might soon have been taught the arts of agriculture and their singular ingenuity might have been directed to other useful purposes. It is true, Muley Ismael, when he adopted this plan, had more objects in view than that of merely peopling his dominions. He saw plainly that his own subjects were of too capricious a disposition to form soldiers calculated for his tyrannical purposes. They had uniformly manifested an inclination to change their sovereigns, though more from the love of variety than to reform the government, or restrain the abuses of tyranny. In short, whatever revolution,
Defterism of the emperors.

A most flagrant species of defterism, which renders the emperors still more formidable to their subjects, is their making themselves their sole heirs, and, in virtue of that, seizing upon all their effects, and making only such provision for their families as they think proper; and often, on some frivolous pretence, leaving them destitute of any, according to the liking or dislike they bear to the deceased; so that, upon the whole, they are the only makers, judges, and interpreters, and in many instances likewise the executioners, of their own laws, which have no other limits than their own arbitrary will. To preserve, however, some show or shadow of justice, they allow their subjects a kind of superiority in spirituals, and a sort of liberty to the nearest subject to summon them before his tribunal. But the danger which such an attempt would bring upon a plaintiff, perhaps no less than death and seduction, it is of itself sufficient to deter any man from it; especially considering the little probability there is that the judges of it would run the risk of declaring themselves against a monarch whose creatures they are, and on whom their lives and fortunes do absolutely depend. The titles which the emperors of Morocco assume, are those of Messiah, mighty, and noble emperor of Africa, king of Fez and Morocco, Tafilalt, Sfax, Dachra, and all the Berber, and is territories in Africa; grand sheyf (or, as others write, Xarif), that is, successor, or vicegerent, of the great prophet Mohammed, &c.

The judges or magistrates that are immediately under the emperor are either spiritual or temporal, or rather ecclesiastical and military. The muftis and the kadi are judges of all religious and civil affairs; and the bailiffs, governors, alcaides, and other military officers, of those that concern the state or the army; all of them the most obsequious creatures and slaves of their prince, and no less the rapacious tyrants of his subjects, and from whom neither justice nor favour can be obtained but by mere dint of money and extortionate bribery, from the highest to the lowest. Neither can it indeed be otherwise in such an arbitrary government, where the highest posts must not only be bought of the prince at a most extravagant price, and kept only by the exorbitant a tribute, which is yearly paid to him, but where no one is sure to continue longer than he can bribe some of the courtiers to intimate to the monarch that he pays to the utmost of his power, and much beyond what was expected from him. Add to this, that these bailiffs, governors, &c., are obliged to keep their agents and spies in constant pay at court, to prevent their being supplanted by higher bidders, flanders, or other underminers. In short, power and weakness, rank and meanness, opulence and indigence, are here equally dependent, equally uncertain. There are instances of the Sultan elevating at once a common soldier to the rank of a bailiff, or making him a confidential friend; the following day he would perhaps imprison him, or reduce him again to the station of a private soldier. It is surprising that more men under these circumstances should be ambitious of rank, or desirous of riches. Yet such is the disposition of these people, that they have an unbounded thirst for rank and power with all their uncertainties; and what is more extraordinary, when they have obtained a high station, they seldom fail to afford their sovereign a plea for ill treating them, by abusing in some way or other their trust.

From what has been said, it may be reasonably Royal re-concluded that the revenue arising to the emperor from the last mentioned source, that of bribery, extortion, and confiscation, must be very confiderable, though there is no possibility to make any other conjecture of its real amount than that it must be an immense one. Another considerable branch is the piratical trade, which brings the greater income into his treasury, as he is now at any expense either for fitting of corsairs vessels out, or maintaining their men; and yet has the tenth of all the cargo and of all the captives; besides which, he appropriates to himself all the rest of them, by paying the captors 50 crowns per head, by which means heengroves all the slaves to his own service and advantage. This article is indeed a very
The climate of Morocco is in general sufficiently temperate, healthy, and not so hot as its situation might lead us to suppose. The chain of mountains which form Atlas, on the eastern side, defends it from the cold winds, that would freeze up the earth were they frequent. The summit of these mountains is always covered with snow; and their abundant descending streams form verdure through the neighbourhood, make the winter more cold, and temper the heat of summer. The sea on the west side, which extends along the coast from north to south, also refreshes the land with regular breezes, that seldom vary according to their seasons. At a distance from the sea, within land, the heat is so great that the rivulets become dry in summer; but as in hot countries dews are plentiful, the nights are always cool. The rains are tolerably regular in winter: and are even abundant, though the atmosphere is not loaded with clouds as in northern latitudes. Those rains which fall by intervals are favourable to the earth, and increase its fecundity. In January the country is covered with verdure, and enamelled with flowers. Barley is cut in March, but the wheat harvest is in June. All fruits are early in this climate; and in forward years the vintage is over in the beginning of September. Though in general there is more uniformity and less variation in hot than in northern climates, the first are nevertheless exposed to the intertemperance of weather; too heavy rains often impede the harvest; and drought has still greater inconveniences, for it injures the propagation of locusts. These fatal insects, which have so often laid desolate hot countries, sometimes commit the most dreadful ravages in the empire of Morocco. They come from the south, spread themselves over the lands, and increase to infinity when the rains of spring are not sufficiently heavy to destroy the eggs they deposit on the earth. The large locusts, which are near three inches long, are not the most destructive; as they fly, they yield to the current of wind, which hurries them into the sea, or into sandy deserts, where they perish with hunger or fatigue. The young locusts, that cannot fly, are the most ruinous; they creep over the country in such multitudes, that they leave not a blade of grass behind; and the noise of their feeding announces their approach at some distance. The devastations of locusts increase the price of provisions, and often occasion famines: but the Moors find a kind of compensation in making food of these insects; prodigious quantities of which are brought to market salted and dried like red herrings. They have an oily and rancid taste, which habit only can render agreeable; they are eaten here, however, with pleasure. The winters in Morocco are not severe, nor is there an absolute need of fire. In the coldest weather the thermometer seldom sinks to more than five degrees below the freezing point. The longest days in Morocco are not more than 14 hours, and the shortest consequently not less than ten.

The soil of Morocco is exceedingly fertile. It is soil, and most fit for the inland provinces. On the western coast it is in general light and flaky, and is better adapted to the vine and olive than the culture of wheat. They annually burn, before the September rains, the stubble, which is left rather long; and this and the dung of cattle, every day turned to pasture, form the sole manure the land receives. The soil requires but little labour, and the ploughing is so light that the furrows are scarcely six inches deep; for which reason, in some provinces, wooden ploughshares are used for cheapness. The empire of Morocco might supply itself with all necessaries, as well from the abundance and nature of its products, as from the few natural or artificial wants of the Moors occasioned by climate or education. Its wealth consists in the fruitfulness of its soil: its corn, fruits, flocks, flax, flax, gums, and wax, would not only supply its necessaries, but yield a superfluous, which might become...
become an object of immense trade and barter with other nations. Such numerous exports might return an inexhaustible treasure, were its government fixed and secure, and its subjects enjoy the fruits of their labour and their property in safety. The increase of corn in Morocco is often as sixty to one, and thirty is held to be but an indifferent harvest. The exportation of this corn is burdened by the laws, and by the prejudices of an intolerant religion, which permits them not to sell their superabundance to infidels. The property of land is besides entirely precarious; so that each individual grows little more than sufficient for his own wants. Hence it happens, when the harvest falls from the ravages of locusts or the intermixture of feasons, these people are exposed to misery, such as Europeans have no conception of, who enjoy a stable administration, which obviates and provides for all their wants.

The Moors, naturally indolent, take little care of the culture of their fruits. Oranges, lemons, and thick-skinned fruits, the trees of which require little nurture, grow in the open fields; and there are very large plantations of them found, which they take the trouble to water in order to increase their product. Their vines, which yield excellent grapes, are planted as far as the 33d degree, as in the southern provinces of France, and are equally vigorous. But at Morocco, where they yield a large and delicious grape, they are supported by vine- poles five and fix feet above the ground; and as they are obliged to be watered, the little wine made there is seldom preferred. Figs are very good in some parts of the empire, but toward the south they are scarcely ripe before they are full of worms; the heats and night dews may, perhaps, contribute to this speedy decay. Melons, for the same reason, are rarely eatable; they have but a moment of maturity; which passes so rapidly that it is with difficulty seized. Water-melons are every where rare, and in some provinces are excellent. Apricots, apples, and pears, are in tolerable plenty in the neighbourhood of Fez and Mequinez, where water is less scarce and the climate more temperate. But in the plain, which extends along the western coast, these delicate fruits are very indifferent, have less juice or taint, and the peaches there do not ripen. The tree called the prickly pear, or the Barbary fig, is plentifully found in the empire of Morocco; and is planted round vineyards and gardens, because its thick and thorny leaves, which are wonderfully prolific, form impenetrable hedges. From these leaves a fruit is produced, covered with a thorny skin, that must be taken off with care. This fruit is mild, and full of very hard, small, kernels. The olive is every where found along the coast, but particularly to the south. The trees are planted in rows, which form alleys the more agreeable because the trees are large, round, and high in proportion. They take care to water them, the better to preserve the fruit. Oil of olives might here be plentifully extracted, were taxation fixed and moderate; but such has been the variation it has undergone, that the culture of olives is so neglected as scarcely to produce oil sufficient for internal consumption. In 1768 and 1769 there were near 40,000 quintals of oil exported from Modogore and Santa-Cruz to Marseilles, and ten years after it cost 15 d. per pound. Thus do the vices of government expose nations to dearth and famine who live in the very bosom of abundance.

From the province of Daqueta to the south of the empire, there are forests of the arga tree, which is thorny, irregular in its form, and produces a species of almond exceedingly hard, with a skin as corrodive as that of walnuts. Its fruit consists of two almonds, rough and bitter, from which an oil is produced very excellent for frying. In order to use this oil, it must be purified by fire, and set in a flame which must be suffered to die away of itself; the most greasy and corrosive particles are consumed, and its acrid qualities are thus wholly destroyed. When the Moors gather these fruits, they bring their goats under the trees; and as the fruit falls the animals carefully nibble off the skins. In the same province also is found the tree which produces gum sandarac; also that which yields the transparent gum; but the latter is most productive, and affords the best gum the farther we proceed southward, where the heat and night dews may perhaps render the vegetable secretion more pure and copious.

In the province of Suz, between the 25th and 30th degrees, the inhabitants have an almond harvest, which varies little because of the mildness of the climate; but the fruit is small for which reason they take little care of the trees, and they degenerate with time. The palm tree is common on the southern provinces of Morocco; but dates ripen there with difficulty, and few are good except in the province of Suz and towards Tafilet. On the coast of Salle and Mamora there are forests of oak, which produce acorns near two inches long. They taste like chestnuts, and are eat raw and roasted. This fruit is called Bellote, and is sent to Cadiz where the Spanish ladies hold it in great estimation. The empire of Morocco also produces much wax; but since it has been subjected by the emperor to the payment of additional duties, the country people have very much neglected the care of their hives. Salt abounds in the empire, and in some places on the coast requires only the trouble of gathering. Independent of the salt-pits formed by the evaporation of the soft water, there are pits and lakes in the country whence great quantities are obtained. It is carried even as far as Tombut, whence it palls to the interior parts of Africa.

The Moors cultivate their lands only in proportion to their wants; hence two-thirds of the empire at least lie waste. Here the drew, that is, the fan or wild palm tree, grows in abundance; and from which those people, when necessity renders them industrious, find great advantage. The shepherds, mule-drivers, camel-drivers, and travellers, gather the leaves, of which they make mats, fringes, baskets, hats, boaris or large wallets to carry corn, twine, ropes, girdles, and covers for the pack-faddles. This plant, which also they heat their ovens, produces a mild and refined fruit that ripens in September and October. It is in form like the raisin, contains a kernel, and is astringent and very proper to temper and counteract the effects of the watery and laxative fruits, of which these people in summer make an immoderate use.

Unacquainted with the sources of wealth of which Mines their ancestors were polifhed, the Moors pretend there are gold and silver mines in the empire, which the em-
Morocco

...pers will not permit to be worked, left their subjects should thus find means to take off their yoke. It is not improbable but that the mountains of Atlas may contain unexplored riches; but there is no good proof that they have ever yielded gold and silver. There are known iron mines in the south; but the working of them has been found so expensive, that the natives would rather use imported iron, notwithstanding the heavy duty it pays, by which its price is doubled. There are copper mines in the neighbourhood of Santa Cruz, which are not only sufficient for the small consumption of the empire, where copper is little used, but are also an object of exportation, and would become much more so were the duties less immediate.

Neither the elephant nor the rhinoceros is to be found either in this or the other states of Barbary; but their deserts abound with lions, tigers, leopards, hyenas, and monstrous serpents. The Barbary horses were formerly very valuable, and thought equal to the Arabian. Though their breed is now said to be decayed, yet some very fine ones are occasionally imported into England. Camels and dromedaries, asses, mules, and kumrians (a most serviceable creature, begotten by an ass upon a cow), are their beasts of burden. Their cows are but small, and barren of milk. Their sheep yield but indifferent fleeces, but are very large, as are their goats. Bears, porcupines, foxes, apes, hares, rabbits, ferrets, weasels, moles, cameoles, and all kinds of reptiles, are found here. Pardises and quails, eagles, hawks, and all kinds of wild-fowl, are frequent on the coast.

As to mountains, the chief are that chain which goes under the name of Mount Atlas, and runs the whole length of Barbary from east to west, passing through Morocco, and abutting upon that ocean which separates the eastern from the western continent, and is from this mountain called the Atlantic Ocean. See Atlas. The principal rivers, besides the Malva or Mulvia above-mentioned, which rises in the deserts, and running from south to north divides Morocco from the kingdom of Algiers, are the Susa, Omminrhilh, Ralbata, Larache, Darodti, Sebron, Gourion, and Tenisf, which rise in Mount Atlas, and fall into the Atlantic Ocean. The chief capes are Cape Threeforks on the Mediterranean, Cape Sparrel at the entrance of the straits, Cape Cantin, Cape None, and Cape Rajador, on the Atlantic Ocean. Of the bays the most considerable are, the bay of Te-tuan in the Mediterranean, and the bay of Tangier in the straits of Gibraltar.

The traffic of the empire by land is either with Arabia or Negroiland: to Mecca they send caravans, consisting of several thousand camels, horses, and mules, twice every year, partly for traffic, and partly on a religious account; for numbers of pilgrims take that opportunity of paying their devotions to their great prophet. The goods they carry to the east are woolen manufactures, leather, indigo, cochineal, and other feathers; and they bring back from thence, filk, mufkins, and drugs. By their caravans to Negroiland, they send salt, filk, and woollen manufactures, and bring back gold and ivory in return, but chiefly negroes.

The caravans always go strong enough to defend themselves against the wild Arabs in the deserts of Africa and Asia; though, notwithstanding all their vigilance, some of the fragellers and baggers often fall into their hands: they are also forced to load one half of their camels with water, to prevent their perishing with drought and thirst in those inhospitable deserts. And there is still a more dangerous enemy, and that is the sand itself: when the winds rise, the caravan is perfectly blinded with dust; and there have been instances both in Africa and Asia, where whole caravans, and even armies, have been buried alive in the sands. There is no doubt also, but both men and cattle are sometimes surprized by wild beasts, as well as robbers, in those vast deserts; the hot winds also, blowing over a long tract of burning sand, are equal almost to the heat of an oven, and destroy abundance of merchants and pilgrims. If it was not for devotion, and in expectation of very great gains, no man would undertake a journey in these deserts; great are the hazards and fatigues they must of necessity undergo; but those that go to Mecca affure themselves of paradise if they die, and have uncommon honours paid them at home if they survive. People crowd to be taken into the eastern caravans; and the gold that is found in the south makes them no less eager to undertake that journey.

The natives have hardly any trading vessels, but Foreign commerce ships, bring them whatever they want from abroad; as linen and woollen cloth, stuffs, iron wrought and unwrought, arms, gunpowder, lead, and the like: for they take in return, copper, wax, hides, Moroccan leather, wool (which is very fine), gums, soap, dates, almonds, and other fruits. The duties paid by the English in the ports of Morocco are but half those paid by other Europeans. It is a general observation, that no nation is fond of trading with these states, not only on account of their despotic government, but the villainy of their individuals, both natives and Jews, many of whom take all opportunities of cheating, and when detected are seldom punished.

The land-forces of the emperor of Morocco consist principally of the black troops already mentioned, and some few white; amounting altogether to an army of about 36,000 men upon the establishment, two thirds of which are cavalry. This establishment, however, upon occasion admits of a considerable increase, as every man is supposed to be a soldier, and when called upon is obliged to act in that capacity. About 6000 of the standing forces form the emperor's body guard, forces, and are always kept near his person; the remainder are quartered in the different towns of the empire, and are under the charge of the bahaws of the provinces. They are all clothed by the emperor, and receive a trifling pay; but their chief dependence is on plunder, which they have frequent opportunities of acquiring. The soldiers have no distinction in drees from the other Moroccos; and are only marked by their accoutrements, which consist of a cloth, a very long musket, a small red leat her box to hold their balls, which is fixed in front by means of a belt, and a powder-horn slung over their shoulders. The army is under the direction of a commander in chief, four principal bahaws, and alcaides who command distinct divisions.

The black troops are naturally of a very fiery disposition,
Religion and

With respect to religion, the inhabitants of Morocco are Mohammedans, of the sect of Ali; and have a mufti or high-priest, who is also the supreme civil magistrate, and the last resort in all causes ecclesiastical and civil. They have a great veneration for their hermits, and for idiots and madmen; as well as for those who by their tricks have got the reputation of wizards; all of whom they look upon as inspired persons, and not only honour as saints while they live, but build tombs and chapels over them when dead; which places are not only religiously visited by their devotees far and near, but are esteemed inviolable sanctuaries for all sorts of criminals except in cases of treason.

Notwithstanding the natives are zealous Mohammedans, they allow foreigners the free and open profession of their religion, and their very laws, have their priests and chapels in the capital city; though it must be owned that the Christian slaves are here treated with the utmost cruelty. Here, as in all other Moslem countries, the alacrity and their comments upon it are their only written laws; and though in some instances their cadis and other civil magistrates are controlled by the arbitrary determinations of their princes, bakhaws, generals, and military officers, yet the latter have generally a very great deference and regard for their laws. Murder, theft, and adultery, are commonly punished with death; and their punishments for other crimes, particularly those against the state, are very cruel; as impaling, dragging the prisoner through the streets at a mule's heels till all his flesh is torn off; throwing him from a high tower upon iron hooks; hanging him upon hooks till he die; crucifying him against a wall; and, indeed, the punishment and condemnation of criminals is in a manner arbitrary. The emperor, or his bakhaws, frequently turn executioners; shoot the offender, or cut him to pieces with their own hands, or command others to do it in their presence.

The inhabitants of the empire of Morocco, known by the name of Moors, are a mixture of Arabian and African nations formed into tribes; with the origin of whom we are but imperfectly acquainted. These tribes, each stranger to the other, and ever divided by traditional hatred or prejudice, seldom mingle. It seems probable that most of the calls who occupy the provinces of Morocco have been repulsed from the eastern to the western Africa, during those different revolutions by which this part of the world has been agitated; that they have followed the standard of their chiefs, whose names they have preferred; and that by these they, as well as the countries they inhabit, are distinguished. At present their tribes are called cabils or califs, from the Arabic word kalsin; and they are so numerous, that it is impossible to have a knowledge of them all. In the northern provinces are enumerated Beni-Garir, Beni-Guermid, Beni-Mansor, Beni-Oriegane, Beni-Chelid, Beni-Juseph, Beni-Zarnoul, Beni-Radim, Beni-Gabara, Beni-Busriet, Beni-Gualid, Beni-Yedra, Beni-Gueaghal, Beni-Guaffle, Beni-Guasmad, &c. Towards the east are, Beni-Sayad, Beni-Toumint, Beni-Ijffait, Beni-Buahale, Beni-Tied, Beni-Soffian, Beni-Belid, Beni-Zequar, &c., and to the south, those of Beni-Fosfara, Beni-Aros, Beni-Hassen, Beni-Mager, Beni-Basil, Beni-Seba, with an infinite number of others. The people...
The Brebes and the Shells having a language common to themselves, and unknown to the Moors, both must have had the same origin, notwithstanding the difference there is in their mode of life. The Shells live on the frontiers of the empire toward the south; their population is by no means so great as that of the Brebes, nor are they so ferocious; they do not marry with other tribes; and though they practice many superstitious rites, they are faithful observers of their religion.

The Moors of the plains may be distinguished into those who lead a pastoral life, and those who inhabit the cities.

The former live in tents; and that they may allow the Moors their ground a year's rent, they annually change the place of their encampments, and go in search of fresh pasture; but they cannot take this step without acquainting their governor. Like the ancient Arabs, they are entirely devoted to a pastoral life: their encampments, which they call doubars, are composed of several tents, and form a crescent; or they are ranged in two parallel lines, and their flocks, when they return from pasture, occupy the centre. The entrance of the douhar is sometimes flutt with faggots of thorns; and the only guard is a number of dogs, that bark ineffectually at the approach of a stranger. Each douhar has a chief, subordinate to an officer of the highest rank, who has under his administration a number of camps; and several of these subordinate divisions are united under the government of a pacha, who has often 1000 douhars in his department.

The tents of the Moors, viewed in front, are of a conical figure; they are from 8 to 10 feet high, and from 20 to 25 feet long; like those of high antiquity, they resemble a boat reversed. They are made of cloth composed of goats' and camels' hair, and the leaves of the wild palm, by which they are rendered imperious to water; but at a distance their black colour gives them a very disagreeable look.

The Moors, when encamped, live in the greatest simplicity, and exhibit a faithful picture of the islaam simple way of life. The nature of their education, the temperature of the climate, and the rigour of the government, diminish the wants of the people, who find in their plains, in the milk and wool of their flocks, every thing necessary for food and clothing. Polygamy is allowed among them; a luxury so far from being injurious to a people who have few wants, that is a great convenience in the economy of those societies, because the women are entrusted with the whole care of the domestic management. In their half-clad tents, they are employed in milking the cows for daily use; and when the milk abounds, in making butter, in picking their corn, their barley, and pulse, and grinding their meal, which they do daily in a mill composed of two stones about 18 inches in diameter, the uppermost having a handle, and turning on an axis fixed in the under one; they make bread likewise every day, which they bake between two earthen plates, and often upon the ground after it has been heated by fire. Their ordinary food is the coucoufofo; which is a pate made with their meal in the form of small grains like Italian paife. This coucoufofo is drest in the vapour of boiling foup, in a hollow delf perforated with many small holes in the bottom.
Morocco.  

...and the dish is enclosed in a bottle where meat is boiled; the couscous, which is in the hollow dish, grows gradually soft by the vapour of the broth, with which it is from time to time moistened. This simple food is very nourishing, and even agreeable when one has got the better of the prejudices which every nation entertains for its own customs. The common people eat it with milk or butter indifferently; but those of higher rank, such as the governors of provinces and lieutenants, who live in the centre of the encampments, add to it some succulent broth, made with a mixture of mutton, poultry, pigeons, or hedgehogs, and then pour on it a sufficient quantity of fresh butter. These officers receive strangers in their tents with the same cordiality that Jacob and Laban showed to their guests. Upon their arrival a sheep is killed and immediately roasted; if they are not provided with a spit, they instinctively make one of wood; and this mutton roasted at a brisk fire, and served up in a wooden dish, has a very delicate colour and taste.

The women in their tents likewise prepare the wool, spin it, and weave it into cloth on looms suspended the whole length of the tent. Each piece is about five ells long and one and a half broad; it is neither dressed nor dyed, and it has no selvedges. They wash it when it is dirty; and as it is the only habit of the Moors, they wear it night and day. It is called Haick, and is the true model of the ancient draperies.

The Moors of the plain wear nothing but their woolen stuff; they have neither skirts nor drawers. Linen among these people is a luxury known only to those of the court or the city. The whole wardrobe of a country Moor in easy circumstances consists in a haick for winter, another for summer, a red haick, a hood, and a pair of slippers. The common people both in the country and in towns wear a kind of tunick of woollen cloth, white, grey, or striped, which reaches to the middle of the leg; with great sleeves and a hood; it resembles the habit of the Carthufians.

The women's dresses in the country is likewise confined to a haick, which covers the neck and the shoulders, and is fastened with a silver clasp. The ornaments they are fond of are ear-rings, which are either in the form of rings or crescents, made of silver, bracelets, and rings for the small of the leg; they wear these trinkets at their ordinary occupations; it is said they are unacquainted with the use of depilatories in other parts of the body, having the head and the ends of their fingers, with an herb called beenna, which gives them a deep farron colour; a custom that must be very ancient among the people of Asia. Abu Bcece dyed his eye-brows and beard with the same colour, and many of his sycophants imitated him. The custom may have originally been a religious ceremony, which the women have turned into an ornament; but it is more probable that the custom of painting the beard and hair, and that of having the head and using depilatories in other parts of the body, has been at first employed from motives of cleanliness in warm countries.

The marriage ceremonies of the Moors that live in tents pretty much resemble those of the same people that live in the cities. In the douhars they are generally most brilliant and gay; the strangers that pass along are invited, and made to contribute to the feast; but this is done more from politeness than from any mercenary motive.

The tribes of the plain generally avoid mixing with marriage with one another; the prejudices that divide these people are commonly perpetuated; or, if they are partially healed, they never fail to revive upon trifling occasions, such as a strayed camel, or the preference of a pasture or a well. Marriages have sometimes taken place among them, that, so far from cementing their differences, have occasioned the most tragical scenes. Husbands have been known to murder their wives, and women their husbands, to revenge national quarrels.

Parents are not incumbered with their children, however numerous they may be, for they are very early employed in domestic affairs; they tend the flocks, they gather wood, and they afflict in ploughing and reaping. In the evening, when they return from the field, all the children of the douhar assemble in a common tent, where the Imam, who himself can hardly spell, makes them read a few sentences from the Koran written on boards, and instructs them in their religion by the light of a fire made of straw, of bulrushes, and cow-dung dried in the sun. As the heat is very great...
great in the inland parts of the country, children of both sexes go quite naked till the age of nine or ten.

The douhars dispersed over the plains are always in the neighbourhood of some rivulet or spring, and they are a kind of inns for the reception of travellers. There is generally a tent erected for their use, if they have not brought one along with them. They are accommodated with poultry, milk, and eggs, and with whatever is necessary for their horses. Instead of wood for fuel, they have the cow-dung, which, when mixed with charcoal, makes a very brisk fire. The sorts that abound in the vegetables of warm countries give this arrangement a confidence which it has not perhaps in northern regions. A guard is always set on the tents of travellers, especially if they are Europeans, because the opinion of their wealth might tempt the avidity of the Moors, who are naturally inclined to thieving.

With respect to the roads, a very judicious policy is established; which is adapted to the character of the Moors, and to their manner of life. The douhars are responsible for robberies committed in their neighbourhood and in sight of their tents; they are not only obliged to make restitution, but it gives the sovereign a pretence for exacting a contribution proportioned to the abilities of the douhar. In order to temper the rigour of this law, they are made responsible only for such robberies as are committed during the day; those that happen after sun-set are not imputed to them, as they could neither see nor prevent them; on this account, people here travel only from sun rising to sun setting.

To facilitate the exchange of necessaries, there is in the fields every day except Friday, which is a day of prayer, a public market in the different quarters of each province. The Moors of the neighbourhood assemble to sell and buy cattle, corn, pulle, dried fruits, carpets, haikhs, and in short all the productions of the country. This market which is called 

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Markets.

To facilitate the exchange of necessaries, there is in the fields every day except Friday, which is a day of prayer, a public market in the different quarters of each province. The Moors of the neighbourhood assemble to sell and buy cattle, corn, pulp, dried fruits, carpets, haikhs, and in short all the productions of the country. This market which is called 

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Of the

Moors who dwell in cities.

The Moors who inhabit the cities differ from the others only in having a little more urbanity and a more easy deportment. Though they have the same origin with those of the plains, they affect to decline all intercourse with them. Some writers, without any foundation, have given the name of Arabs to the inhabitants of the towns, and that of Arabs to those of the plains. But the greater part of the cities of this empire are more ancient than the invasion of the Arabs, who themselves lived in tents.

The houses in most of the towns in this empire appear at a little distance like vaulted tombs in a churchyard; and the entrance into the cell of them has but a mean appearance. The rooms are generally on the ground floor, and whitened on the outside. As the roofs are quite flat, they serve as verandas, where the Moorish women commonly sit for the benefit of the air; and in some places it is possible to get nearly over the whole town without having occasion to descend into the street.

As the better apartments are all backwards, a stable, or perhaps something worse, is the place to which visitors are first introduced. Upon entering the house, the stranger is either detained in this place or in the street till all the women are dispatched out of the way; he is then allowed to enter a square court into which four narrow and long rooms open by means of large folding doors, which as they have no windows, serve likewise to introduce light into the apartments. The court has generally in its centre a fountain; and if it is the house of a Moor of property, it is floored with blue and white chequered tiling. The doors are usually painted with various colours in a chequered form, and the upper parts of them are frequently ornamented with very curious carved work. None of the chambers have fire-places, and their vistuals are always dressed in the court-yard in an earthen stove heated with charcoal. When the visitor enters the room where he is received by the master of the house, he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he finds him sitting cross-legged and barefooted on a carpet, with a piece of carpeting, is in general the only furniture he

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Their houses and furniture.

Like the latter, they have a haik, and a hood more or less fine, and have also a hood of coarse European cloth of dark blue for the winter. What farther distinguishes them from the country Moors is, that they wear a shirt and linen drawers, and an upper garment of cotton in summer, and of cloth in winter, which they call a caftian. The white or blue hood, the pur-
The women have yellow slippers, and a custom of wearing a kind of flossing of fine cloth somewhat large, which is tied below the knee and at the ankle, over which it falls in folds. This flossing is let's calculated to show what we call a handsome leg, than to make it appear thick; for to be fat is one of the rules of beauty among the Moorish women. To obtain this quality, they take infinite pains, feed when they become thin on a diet somewhat like forced-meat balls, a certain quantity of which is given them daily; and, in fine, the fame care is taken among the Moors to fatten young women as is in Europe to fatten fowls. The reason of a custom like this may be found in the nature of the climate and the quality of the aliment, which make the people naturally meagre. Our gender waiters and fine turned ankles would be imperfections in this part of Africa, and perhaps over all that quarter of the globe; so great is the contrast of taste, and so various the prejudices of nations.

The Moors present their wives with jewels of gold, silver, or pearl, but very few wear precious stones; this is a luxury of which they have little knowledge. They have rings in silver or gold; also ear-rings in the form of a crescent, five inches in circumference, and as thick as the end of the little finger. They first pierce their ears, and introduce a small roll of paper, which they daily increase in thickness, till at length they insert the kernel of the date, which is equal in size to the ear-ring. They wear bracelets in gold and solid silver, and silver rings at the bottom of their legs, some of them considerably heavy. The use of white paint is unknown among the Moorish women, and that of red but little. It is much more common to the negroes which form the tribes coming from the south, who have preferred their customs; for the Moors do not change modes which they have once adopted.

The Negroes, who constitute a large proportion of the emperor's subjects, and the occasion of whose introduction to this empire has been already mentioned, are better formed than the Moors; and as they are more lively, daring, and active, they are entrust with an important share in the executive part of government. They constitute the most considerable part of the emperor's army, and are generally appointed to the command of provinces and towns. This circumstance, naturally, creates a jealousy between the emperor and the Moors, the latter considering the negroes usurpers of a power which they have no right to assume. Besides those negroes which form the emperor's army, there are a great many others in the country, who either are or have been slaves to private Moors: every Moor of consequence, indeed, has his proportion of them in his service. To the disgrace of Europe, the Moors treat their slaves with humanity, em-
Jews.

Among the inhabitants of Morocco there is another class, of whom we must not omit to make mention. These are the Renegados, or foreigners who have renounced their religion for the faith of Mahomet. Of these there are a great number who have been originally Jews: they are held in little estimation by the Moors; and would be held in abhorrence by the Jews, if they durst freely express their aversion. The families of these apostates are called Tournadis: not having at any time married with the Moors, they still preserve their ancient characteristics, and are known almost at sight to be the progeny of those who formerly embraced the Mahometan religion. The Christian renegados are but few; and generally are fugitive peculators of Spain, or men fallen from power, who because of their misconduct, or in despair, quit one unfortunate situation for another much more deplorable.

The Jews were formerly very numerous in this empire. After being proscribed in Spain and Portugal, multitudes of them passed over to Morocco, and spread themselves throughout the towns and over the country. By the relations they themselves give, and by the extent of the places assigned them to dwell in, it would appear there were more than 30,000 families, of whom at present there is scarcely a residue of one-twelfth; the remainder either having changed their religion, funk under their sufferings, or fled from the vexations they endured, and the arbitrary taxes and tolls imposed upon them. The Jews poifeß neither lands nor gardens, nor can they enjoy their fruits in tranquillity; they must wear only black; and are obliged, when they pass near mosques or through streets in which there are sanctuaries, to walk barefoot. The lowest among the Moors imagines he has a right to ill-treat a Jew: nor dares the latter defend himself, because the koran and the judge are always in favour of the Mahometans.

Notwithstanding this state of oppression, the Jews have many advantages over the Moors; they better understand the spirit of trade; they act as agents and brokers, and profit by their own cunning and the ignorance of the Moors. In their commercial bargains many of them buy up the commodities of the country to sell again. Some have European correspondents; and others are mechanics, such as goldsmiths, tailors, gunsmiths, millers, and masons. More industrious, artful, and better informed than the Moors, the Jews are employed by the emperor in receiving the customes, coining the money, and in all affairs and intercourse which the monarch has with the European merchants, as well as in all his negotiations with the various European governments.

The Moors, who derive their language and religion from the Arabs, seem not in any manner to have participated of their knowledge. United and confounded as those of Morocco have been with the Moors of Spain, the latter of whom cultivated the arts and sciences, gave birth to Averroes, and many other great men, the Moors of this empire have preserved no traces of the genius of their ancestors. They have no conception of the speculative sciences. Education conficts merely in learning to read and write; and as the revenues of the learned are derived from these talents, the priests and talbes among them are the sole depositaries of this much knowledge; the children of the Moors are taught in their schools to read and repeat some sixty lessons, selected from the Koran, which for the sake of economy are written upon small boards. These lessons being once learned, the scholar is supposed to have obtained sufficient knowledge to leave school; on this occasion he rides on horseback through the city, followed by his comrades, who sing his praises: this to him is a day of triumph; to the scholars an incitement to emulation, a festival for the master, and a day of expense for the parents: for in all countries, wherever there are festivals and processions, there also are eating and drinking. At Fez there is some small degree more of instruction to be obtained in the schools; and the Moors who are a little wealthy send their children thither to have them instructed in the Arabic language, and in the religion and laws of their country. Here some of them also acquire a little taste for poetry.

The Moors who formerly inhabited Spain gave great application to physic and astronomy; and they have left manuscripts behind them which still remain monuments of their genius. The modern Moors are infinitely degenerate; they have not the least inclination to the study of science; they know the properties of some simples; but as they do not proceed upon principle, and are ignorant of the causes and effects of diseases, they generally make a wrong application of their remedies. Their most usual physicians are their talbes, their fakirs, and their fainis, in whom they place a superstitious confidence. Astronomy is entirely or almost unknown to the Moors; for though they likewise wander from place to place, there are few if any among them who have a knowledge of the motion of the heavens, or who are capable from principle to direct their own course by observing the course of the stars. They are therefore necessarily wholly unable to calculate the eclipses, which they always interpret to portend evil.

Superstitious people, indeed, have every where supposed eclipses were sent to prejudice some calamity.

The Moors being unable to reason on the causes of such an appearance, imagine the fun or the moon are in the power of a dragon that swallows them; and they offer up prayers that these luminaries may be delivered from an enemy so cruel and voracious.

Notwithstanding the Moors have occupied themselves little in the study of astronomy they have been eager after astrology. This imaginary science, which made so rapid a progress at Rome in despite of the edicts of the emperors, may be conceived to make still greater advances among a people wholly stupid and ignorant, and ever agitated by the dread of present evils, or the hope of a more happy futurity. Magic, the companion of astrology, has here also found its followers, and is particularly studied by the talbes in the southern parts, who successfully use it in imposing upon the Moors.
Moroccan credulity with strange dreams and ambiguous forebodings and prophecies.

In short, arts and sciences seem to be almost unknown in Morocco; or if at all cultivated, it is only by the Jews, who indeed are the only industrious and ingenious people in the country. The Moors in general may be considered as excelling in the pastoral state, following only a few mechanical trades, and leaving every thing that requires invention to the Jews, who have likewise the principal management of their commercial and pecuniary matters; and even those few of the Moors who are merchants, are obliged to have Jewish agents, for the purpose of transacting their business.

The Moroish manufactures are—The hijab, which, as was before observed, is a long garment composed of white wool and cotton, or cotton and silk woven together, and is used by the Moors for the purpose of covering their under dress when they go abroad, which they do by totally wrapping themselves in it in a careless but easy manner; silk handkerchiefs of a particular kind, prepared only at Fez; kilts chequered with cotton; carpeting, little inferior to that of Turkey; beautiful matting, made of the palmetto or wild palm tree; paper of a coarse kind; cordovan, commonly called Morocco leather; gunpowder of an inferior nature; and long-barrelled muskets, made of iron. The Moors are unacquainted with the mode of casting cannon; and therefore those few which are now in the country are obtained from Europeans.

The manufacture of glafs is likewise unknown to them; as indeed they make great use of earthen ware, and have few or no windows to their houses, this commodity may be of less importance to them than many others. They make bucker, by putting the milk into a goat-skin, with its outward coat turned inwards, and shaking it till the butter collects on the sides, when it is taken out for use. From this operation it produces always full of hair, and has an insipid flavour. Their cheese consists merely of curds hardened and dried, and has uniformly a disagreeable taste. The bread in general of the principal towns, particularly at Tangier and Saltee, is remarkably good, but in many other places it is coarse, black, and heavy.

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Their looms, forges, ploughs, carpenters tools, &c. are much upon the same construction with the unimproved instruments of the same kind which are used at this time in some parts of Europe, only filled more clumsily finished. In their work, they attend more to strength than neatness or convenience; and, like all
The whole of this ceremony they repeat three times.

Their sabbath is on their Friday, and commences from six o'clock the preceding evening. On this day they use a blue flag instead of the white one. As it has been prophesied that they are to be conquered by the Christians on the sabbath-day, the gates of all the towns and of the emperor's palaces are shut when at divine service on that day, in order to avoid being surprized during that period. Their tables are not distinguished by any particular dress.

The Moors have three solemn devotional periods in the course of the year. The first, which is named Ayd de CADHER, is held in commemoration of the birth of Mahomet. It continues seven days; during which period, every person who can afford the expense kills a sheep as a sacrifice, and divides it among his friends.

The second is the Ramadan. This is held at the season when Mahomet disappeared in his flight from Mecca to Medina. Every man is obliged at that period to fast (that is, to abstain from animal-food from sun-rise to sun-set each day) for 30 days; at the expiration of which time a feast takes place, and continues a week. The third is named Lambard, and is a day fast apart by Mahomet for every person to compute the value of his property, in order for the payment of zakat, that is one-tenth of their income to the poor, and other pious uses. Although this feast only lasts a single day, yet it is celebrated with far greater magnificence than either of the others.

The Moors compute time by lunar months, and count the days of the week by the first, second, third, &c. beginning from our Sunday. They use a common creed for writing, and begin their manuscripts from right to left.

The Moors of the empire of Morocco, as well as those to the northern limits of Africa, speak Arabic; but this language is corrupted in proportion as we retire farther from Africa, where it first took birth; the intermixture which has happened among the African nations, and the frequent transflagurations of the Moors, during a succession of ages, have occasioned them to lose the purity of the Arabic language; its pronunciation has been vitiated, the use of many words lost, and other foreign words have been introduced without thereby rendering it more copious: the pronunciation of the Africans, however, is fitter to the ear and less guttural than that of the Egyptians. The language, when written, is in effect much the same at Morocco as at Cairo, except that there are letters and expressions among the Moors which differ from those of the Oriental Arabs, who, however, understand the Moors in conversation, notwithstanding their vitiated manner of pronouncing. They mutually read each other's writings with some difficulty.

There is a very sensible difference among the Moors between the Arabic of the learned and the courtiers, and that spoken by the people in general; and this difference is felt still more in the provinces of the south or of the east, and among the Moors who live in the deserts, where the Arabic is yet farther disfigured by a mixture of foreign tribes.

The Brebes and the Shells, who appear to have had the same origin, for they have preferred the same disfigured, speak a language which the Moors do not understand, and which seems to have no analogy with that of the latter. It has been conjectured to be the Punic, or the Numidian; but these people write it in Arabic characters. The Brebes count the days of the week like the Moors, and both of them employ Arabic words. The Shells enumerate the days after the same method, but in their own language.

Both the Brebes and the Shells denote the months of the year in the same manner as do the Moors and Arabs, and date from the same era; that is to say, from the year of the Hegira.

The Koran and books of prayer of the Brebes and Shells are in Arabic; as likewise are their acts and title-deeds, which are written by their talbes or learned men.

The Moors are naturally of a grave and penfive disposition, fervid in professions of friendship, but very infinacere in their attachments. They have no curiosity, no ambition of knowledge; an indolent habit, united to the want of mental cultivation, renders them perhaps even more callous than other unenlightened people to every delicate sensibility; and they require more than ordinary excitement to render them female of pleasure or of pain. This languor of temper is, however, unaccompanied with the smallest spark of courage or fortitude. When in adversity, they manifest the most abject submission to their superiors; and in prosperity their tyranny and pride is insupportable. They frequently smile, but seldom are heard to laugh loud. The most infallible mark of internal tranquility and enjoyment is when they amuse themselves with strolling or playing with their beard. When roused by resentment, their disputes rarely proceed further than violently to abuse each other in the most opprobrious language. They never fight or box with their fists like our peasantry; but when a quarrel proceeds to great extremities, they collar each other, and sometimes terminate a dispute by affai nination.

Personal cleanliness has been considered as one of the most oftho circumstances which serve to mark and determine the civilization of a people. It was in vain that Mahomet enjoined the frequency of ablution as a religious duty to the Moors. Their dress, which should be white, is but seldom washed; and their whole appearance evinces that they perform this branch of their religious ceremonies in a slovenly manner. With this degree of negligence as to their persons, we may be justly surprised to find united a most scrupulous nicety in their inhabitants and apartments. They enter their chambers barefooted, and cannot bear the slightest degree of contamination near the place where they are seated. This delicacy again is much confined to the infides of their hovels. The streets receive the whole of their rubbish and filth; and by these means the ground is soiled in most parts of the city of Morocco, that the new buildings always stand considerably higher than the old.

When a Moor receives his guests, he never rises from his seat, but rises hands, inquires after their health, and directs them to sit down, either on a carpet or a cushion placed on the floor for that purpose. Whatever be the time of day, tea is then brought in on a tea-board with short feet. This is the highest

41 Language of the Moors.

42 Their temper and disposition.

43 Morocco.
compliment that can be offered by a Moor; for tea is a very expensive and scarce article in Barbary, and is only drunk by the rich and luxurious. Their manner of preparing it is by pouring some green tea, a small quantity of tansy, the same portion of mint, and a large proportion of sugar (for the Moors drink their tea very sweet) into the tea-pot at the same time, and filling it up with boiling water. When these articles are infused a proper time, the fluid for china, the smaller the more genteel, without any the meats, it is handed round to the company. From the great esteem in which this beverage is held by the Moors, it is generally drunk by very small and slow sips, that its flavour may be the longer enjoyed; and as they usually drink a considerable quantity when ever it is introduced, this entertainment is seldom finished in less time than two hours.

The other luxuries of the Moors are fruift, of which they are uncommonly fond, and smoking tobacco, for which the greater part use wooden pipes about four feet in length, with an earthen bowl; but the princes or emperor generally have the bowls made of solid gold. Instead of the indulgence of opium, which, from the heavy duty imposed upon that article by the emperor, is too expensive to be used by the Moors, they substitute the achicha, a species of flax. This they powder and infuse in water in small quantities.

The Moors affect, that it produces agreeable ideas; but own that when it is taken to excess it most powerfully intoxicates. In order to produce this effect, they likewise mix with their tobacco an herb named in this country khash, which by smoking, occasions all the exhilarating effects of the achicha. The use of spirits as well as wine is strictly forbidden by the Koran; there are, however, very few among the Moors who do not joyfully embrace every private opportunity of drinking both to excess.

With respect to the hours for eating, the people of this country are remarkably regular. Very soon after day-break they take their breakfast, which is generally a soup of flour and water boiled thin, and which is finding in it yellow tinge. The male part of the family eat in one apartment and the female in another. The children are not permitted to eat with their parents, but take their meals afterwards with the servants; indeed in most other respects they are treated exactly as servants or slaves by their parents. The mess is put into an earthen bowl, and brought in upon a round wooden tray. It is placed in the centre of the guests, who sit crook-legged either on a mat or on the floor, and who form a circle for the purpose. Having previously washed themselves, a ceremony always performed before and after meals, each person with his spoon attacks vigorously the bowl, while they diversify the entertainment by eating with it fruit or bread. At 12 o'clock they dine, performing the same ceremonies as at breakfast. For dinner, from the emperor down to the peasant, their dish is universally cowfordo, the mode of preparing which has been already described. The dish is brought in upon a round tray and placed upon the floor, round which the family sit as at breakfast, and with their fingers commit a violent assault on its contents: they are at the same time, however, attended by a slave or domestic, who presents them with water and a towel occasionally to wash their hands. From the want of the simple and convenient invention of knives and forks, it is not uncommon in this country to see three or four people pulling to pieces the same piece of meat, and afterwards with their fingers stirring up the plate or cowfordo, of which they often take a whole handful at once into their mouth. At fun-set they set upon the same dish; and indeed supper is their principal meal.

Such is the general mode of living among the principal people in towns. There are considerable multitudes, however, who do not fare so well, but are obliged to content themselves with a little bread and fruit instead of animal food, and to sleep in the open streets. This kind of existence seems ill calculated to endure even in an active state; far more severe must it therefore be to those who exercise the laborious employment of couriers in this country, who travel on foot a journey of 300 or 400 miles at the rate of between 30 or 40 miles a-day, without taking any other nourishment than a little bread, a few figs, and water, and who have no better shelter at night than a tree. It is wonderful with what alacrity and perseverance these people perform the most fatiguing journeys at all seasons of the year. There is a regular company of them in every town, who are ready to be dispatched at a moment's warning to any part of the country their employers may have occasion to send them. They constitute in this empire the only mode of conveyance for all public and private dispatches; and as they are well known in the place to which they belong, they are very punctual in delivering every thing that is put into their hands. From their steady pace in travelling, at the rate of about four miles an hour, and from their being able to pass over parts which from the mountainous state of the country, and from the want of good roads, perons on horseback would find inaccessible, they are indeed by far the most expeditious messengers that could be employed.

As none but the very vulgar go on foot in this country, for the purpose of visiting, mules are considered as more genteel than horses; and the greatest pride of a Moor is to have such as walk remarkably fast, and to keep his footmen, of which the number is proportionable to the rank and consequence of the master, on a continued run.

As the Moors are not fond of admitting men into their houses except upon particular occasions, if the weather is fine they place a mat, and sometimes a carpet, on the ground before their door, seat themselves upon it crook-legged, and receive their friends, who form a circle, sitting in the same manner, with their attendance on the outside of the group. Upon these occasions they either drink tea or smoke and converse. The streets are sometimes crowded with parties of this kind; some engaged in playing at an inferior kind of chess or drafts, at which they are very expert; but the majority in conversation. The people of this country, indeed, are so decidedly averse to standing up, or walking about, that if only two or three
Their amusements.

The Moors have in general but few amusements; the fedentary life they lead in cities is little variegated except by the care they take of their gardens, which are rather kept for profit than pleasure. Most of these gardens are planted with the orange, the lemon tree, and the cedar, in rows, and in such great quantities, that the appearance is rather that of a forest than that of a garden. The Moors sometimes, though rarely, have music in their retreats: a state of slavery but ill agrees with the love of pleasure: the people of Fes alone, either from a difference in education, or because their organs and sensibility are more delicate, make music a part of their amusements. There are not in Morocco, as in Turkey, public coffee-houses, where people meet to inquire the news of the day; but instead of these, the Moors go to the barbers shops, which in all countries seem to be the rendezvous of Newsmongers. These shops are surrounded by benches; on which the customer, the inquisitive, and the idle, seat themselves; and when there are no more places vacant, they crouch on the ground like monkeys.

Showmen and dancers come often into the towns; round whom the people assemble and partake of the amusement for a very trifle. There are also a kind of wandering historians: the vulgar, who cannot read, and who every where are eager to hear extraordinary relations, are the more affiduous in attending these narrators, as want of more extensive information prevents the tale-teller remaining above a week in a place.

A common diversion in the towns where there are fadors, as well as in the country, is what the Moors call the game of gun-powder; a kind of military exercise that is the more pleasing to these people, inasmuch as, by the nature of their government, they all are, or are liable to become, fadors, therefore all have arms and horses. By expostions of powder, too, they manifest their felicity on their holidays. Their game of gun-powder consists in two bodies of horse, each at a distance from the other, galloping in successive parties of four and four, and firing their pieces charged with powder. Their chief art is in galloping up to the opposite detachment, suddenly stopping, firing their muskets, facing about, charging and returning to the attack; all which maneuvers are imitated by their opponents. The Moors take great pleasure in this amusement, which is only an imitation of their military evolutions.

The common topics for conversation among the Moors, are the occurrences of the place, religion, their women, but above all their horses. This last topic, horses, indeed, appears to occupy by far the greatest portion of their attention. These animals are seldom kept in stables in Morocco. They are watered and fed only once a-day, the former at one o'clock at noon, and the latter at sunset; and the mode which they use to clean them is by washing them all over in a river two or three times a week, and suffered them to dry themselves.

Notwithstanding the attachment which the Moors manifest to their horses, they most certainly use them with great cruelty. Their highest pleasure, and one of their first accomplishments, is, by means of long and sharp spurs, to make the horse go full speed, and then to flop him instantaneously; and in this they certainly manifest uncommon dexterity. The iron-work of their bridles is so constructed, that by its preffure on the horse's tongue and lower jaw, with the least exertion of the rider, it fills his mouth full of blood; and if not used with the utmost caution, throws him inevitably on his back. The bridle has only a single rein, which is so very long, that it serves the purpose of both whip and bridle. The Moorish saddle is in some degree similar to the Spanish, but the pummel is still higher and more peaked. Their stirrups, in which they ride very short, are so formed as to cover the whole of the foot. They either plate or gild them, according to the dignity, opulence or fancy of the possessor. Their saddles which are covered with red woollen cloth, or if belonging to a person of consequence, with red fatin or damask, are fastened with a strong girth round the body in the European style, and another round the shoulders. The Moors frequently amuse themselves by riding with the utmost apparent violence against a wall; and a stranger would conceive it impossible for them to avoid being dashed to pieces, when just as the horse's head touches the wall, they stop him with the utmost accuracy.

Like all other barbarous nations, the Moors are particularly fond of music, and some few have a taste for music poetry. Their fobs air for want of that variety which is introduced when the science has attained a degree of perfection, have a very melancholy fameness; but some of their quick tunes are beautiful and simple, and partake in some degree of the characteristic melody of the Scotch airs. The poetry of their fongs, the constant subject of which is love, though there are few nations perhaps who are less sensible of that passion, has certainly less merit than the music.

Their instruments are a kind of hautboy, which differs from ours only in having no keys; the mandoline, which they have learnt to play upon from their neighbours the Spaniards; another instrument, bearing some resemblance to a violin, and played upon in a similar manner, but with only two strings; the large drum, the common pipe, and the tabor. These, united, and accompanied with a certain number of voices, upon many occasions form a band, though solo music is more common in this unfocial country. Upon all days of rejoicing, this kind of music, repeated volleys of musketry, either by men on horseback or on foot and
The Moors marry very young, many of their females not being more than 12 years of age at their nuptials. As Mahometans, it is well known that their religion admits of polygamy to the extent of four wives, and as many concubines as they please: but if we except the very opulent, the people seldom avail themselves of this indulgence, since it entails on them a vast additional expense in house-keeping, and in providing for a large family. In contracting marriage, the parents of both parties are the only agents: and the intended bride and bridegroom never see each other till the ceremony is performed. The marriage ceremonies are made before the cadi, and then the friends of the bride produce her portion, or if not the husband agrees to settle a certain sum upon her in case he should die, or divorce her on account of barrenness, or any other cause. The children of the wives have all an equal claim to the effects of the father and mother, but those of the concubines can each only claim half a share.

When the marriage is finally agreed upon, the bride is kept at home eight days, to receive her female friends, who pay congratulatory visits every day. At the same time a tablet attends upon her, to converse with her relative to the solemn engagement on which she is about to enter; on these occasions he commonly accompanies his admonitions with singing a pious hymn which is adapted to the solemnity. The bridegroom, on the other hand, receives visits from his male friends in the morning, and in the evening rides through the town accompanied by them, some playing on hautboys and drums, while others are employed in firing volleys of musketry. In all their festivals, the discharge of musketry indeed forms a principal part of the entertainment. Contrary to the European mode, which particularly arms at firing with exactness, the Moors discharge their pieces as irregularly as possible, so as to have a continual succession of reports for a few minutes.

The evening is put into a square or octagonal cage about 12 feet in circumference, which is covered with fine white linen and sometimes with gauzes and silks of various colours. In this vehicle, which is placed on a mule, she is paraded round the streets, accompanied by her relations and friends: some carrying lighted torches, others playing on the hautboys, and a third party is again firing volleys of musketry. In this manner she is carried to the house of her intended husband, who returns about the same time from performing similar ceremonies. On her arrival she is placed in an apartment by herself, and her husband is introduced to her alone for the first time, who finds her sitting on a silk or velvet cushion, supposing her to be a person of consequence, with a small table before her, upon which are two wax candles lighted. Her shift, or more properly shirt, hangs down like a train behind her, and over it is a silk or velvet robe with close sleeves, which at the breast and wrists is embroidered with gold; this dres reaches something lower than the calf of the leg. Round her head is tied a black silk scarf, which hangs behind as low as the ground. Thus attired, the bride sits with her hands over her eyes, when her husband appears and receives her as his wife without any further ceremony; for the agreement made by the friends before the cadi, is the only specie contract which is thought necessary.

If the husband should have any reason to suspect that his wife has not been strictly virtuous, he is at liberty to divorce her and take another. For some time after marriage, the family and the friends are engaged in much feasting, and a variety of amusements, which last a longer or shorter time according to the circumstances of the parties. It is usually customary for the man to remain at home eight days and the woman eight months after they are first married; and the woman is at liberty to divorce herself from her husband, if she can prove that he does not provide her with a proper subsistence. If he curbs her, the law obliges him to pay her, for the first offence eight ducats; for the second, a rich dress of silk greater value; and the third time she may leave him entirely. He is then at liberty to marry again in two months.

Women suffer but little inconvenience in this country from child-bearing; they are frequently up the next day, and go through all the duties of the house with the infant upon their backs. In celebrating the rite of circumcision, the child is dressed very sumptuously; and carried on a mule, or, if the parents are in poor circumstances, on an ass, accompanied with flags flying and musicians playing on hautboys and beating drums. In this manner they proceed to the mosque, where the ceremony is performed. Children are as soon as they can be made in the least degree useful, are put to the various kinds of labour adapted to their age and strength. Others, whose parents are in better circumstances, are sometimes sent to school; and those who are intended for the church, usually continue their studies till they have nearly learnt the Koran by rote. In that cafe, they are enrolled among the talbes, or learned men of the law; and upon leaving school are paraded round the streets on a horse, accompanied by music, and a large concourse of people.

When any person dies, a certain number of women are hired for the purpose of lamentation; in the funeral performance of which, nothing can be more grand than the crying to the ear, or more unpleasing, than their frightful moans, or rather howlings; at the same time, these mercenary mourners beat their heads and tear their cheeks with their nails. The bodies are usually buried a few hours after death. Previous to interment, the corpse is washed very clean, and sewed up in a thong, with the right hand under the head, which is pointed towards Mecca, it is carried on a bier, supported upon men's shoulders, to the burying place, which is always, with great propriety, on the outside of the town, for they never bury their dead in the mosques, or within the bounds of an inhabited place. The bier is accompanied by numbers of people, two a breast, who walk very fast, calling upon God and Mahomet, and singing hymns adapted to the occasion. The grave is made very wide at the bottom and narrow at the top, and the body is deposited without any other ceremony than singing and praying in the same manner as on their way to the grave. They have no tombs in this country, but long and plain stones; and it is frequently customary for the female friends...
friends of the departed to weep over their graves for several days after their funeral.

It has often been thought surprising, that the Christian powers should suffer their marine to be infalut by those barbarians, who take the ships of all nations with whom they are not at peace, or rather who do not pay them a subsidy either in money or commodities. This forbearance has been accounted for no other than by supposing, first, that a breach with them might provoke the Forte, who pretends to be their lord paramount; secondly, that no Christian power would be fond of seeing Algiers, and the rest of that coast, in possession of another; and, thirdly, that nothing could be got by a bombardment of any of their towns, as the inhabitants would instantly carry their effects to their deserts and mountains, so that the benefit resulting from the conquest must be tedious and uncertain.

The first reason is so obvious as to require no answer; in regard to the second and third suppositions, it may be observed, that there is no necessity for taking possession of those towns without the necessity of any European power whatever. The object ought to be, not to conquer, but to render impotent, those piratical states; not to profit by plundering them, but to quash their piracies, and prevent them from being longer the nuisances and pests of the Mediterranean. Than which according to the best informed travellers, there can be nothing more easy. Hardly any force of armament would be necessary for the purpose; would the Europeans merely leave them to their own resources, and with-hold those supplies with which they have been in use to furnish them, contrary as well to good policy as to the interests of humanity. M. Lempriere, speaking of the emperor of Morocco (1790) observes, that "nothing but gross neglect or inexecutable ignorance could induce the European princes in general to remain in a kind of tributary state to a prince who had neither an army nor a fleet which deferred the name, and a people whose disposition is least united to enter into any thing than perhaps any other. What had they to fear from him? His whole fleet consisted only of a few small frigates and row-boats, ill managed and worse manned, the whole of which might have been destroyed in one day by two or three well appointed European frigates. The entrances of those ports where he laid up his shipping, if we except Tangier and Larache, are so continually hoisting up with sand, that in a short time they will only admit fishing-boats, or the very smallest craft. The towns are none of them regularly fortified except Mogodore, and that hardly produces half a dozen of men who understand the least of working the guns. And yet this contemptible power gives laws to all the coasts of Portugal and Spain, and may be said in some measure to command the entrance of the Mediterranean."

It may be said, he was too trifling a power to notice; if so, why lavish immense presents for the purpose of keeping him in temper? Tho' those who imagined they secured his friendship by these means, were much mistaken; on the contrary, they only added fuel to that flame of avarice which was not to be extinguished. If he was one day presented with a frigate, he asked for two the next; and the more his requests were indulged, the more his inordinate desires were increased. It is well known to those who have been conversant with the Moors, that to secure their friendship, you must first assert your own superiority; and then if you make them a trifling present, its value, is trebled in their estimation. The same disposition would have been found in the late emperor as in the common Moor. So far from courting an alliance, it would rather have been good policy at once to quarrel with him; the loss of a few towns, and particularly Mogodore, to which he was much attached, from its being raised under his own auspices, would soon have reduced him to good humour and submission."

Another intelligent traveller, M. Briffon, observes, how extraordinary it is, that a prince so little to be dreaded as the emperor of Morocco should oblige the different powers of Europe to fend ambassadors to him, and that he should even dictate laws to them. There is not a single foreigner who dares to send a representative to his court without making him at the same time considerable presents; and what envoy would present himself without having his hands full? How happens it that the consuls have not by common consent, represented to their respective sovereigns, that the emperor of Morocco becomes every day more and more powerful by the supplies which they themselves furnish him? Twenty years ago this prince was absolutely destitute of resources. He had neither materials nor any place for casting cannons; and he was equally in want of wood for building ships, of ropes, of nails, and even of workmen. It is France and other European powers that affit him, albeit the emperor of Morocco would be of little consideration. His superb batteries of brass cannons, 24, 36, and 48 pounders, were furnished by Holland, Spain, England, and France. England has done more than other nations, by sending him those beautiful cannons which were taken on the floating batteries. Mogodore is built in an advantageous situation, its batteries are well disposed, and there are cannon at each embrasure; but they are there only in a manner for show, as they have no carriages, and are supported only by brick-work. There are no workmen in the country capable of mounting them on carriages, nor is there wood proper for making them. Did a few vessels only wait for the falling of those small frigates, which are almost all unfit for sea except only two, nothing would be easier than to prevent them from returning, and to block up the ports of Mogodore, Rabat, and Sallee. What would become of his commerce, and above all his marine, if the Christian princes cease to affit him, contrary to the interests of humanity? Would England and Spain unite only for a moment, Tangiers, his most beautiful port, would soon be so far ruined, that it could not afford shelter to his subjects, who, deftitute of ships, would soon be obliged to give over their piracies. If the consuls of different nations have never made these observations, and in and if they have never pointed out the means of curtailing the insolence of the emperor of Morocco, it is because they are at the head of the commerce which those different powers carry on in that part of the world. I can positively affirm, that these representatives, instead of furnishing their courts with the means of diminishing the power of the emperor, never cease to add to his strength, and to incite him to make new
Morocco. [355]  

Morocco, a city of the kingdom of Morocco in Barbary, lying about 120 miles to the north of Tarudant, 90 to the east of Mogodore, and 350 to the south of Tangier. It is situated in a beautiful valley, formed by a chain of mountains on the northern side, and those of the Atlas, from which it is distant about 20 miles to the south and east. The country which immediately surrounds it is a fertile plain, beautifully diversified with clumps of palm trees and shrubs, and watered by small and numerous streams which descend from Mount Atlas. The emperor's out-gardens, which are situated at a distance of about five miles to the south of the city, and are large plantations of elvies walled in, add considerably to the beauty of the upper town.

Morocco, though one of the capitals of the empire (for there are three, Morocco, Mequinez, and Fez), has nothing to recommend it but its great extent and the royal palace. It is encompassed by remarkably strong walls built of tabby, the circumference of which is about eight miles. On these walls there are no guns mounted; but they are flanked with square towers, and surrounded by a wide and deep ditch. The city has a number of entrances, consisting of large double porches of tabby in the Gothic style, the gates of which are regularly shut every night at certain hours. As polygamy is allowed by the Mahometan religion, and is supposed in some degree to affect population, it would be difficult to form any computation near the truth with respect to the number of inhabitants which this city may contain. The mosques, which are the only public buildings, except the palace, worth noticing at Morocco, are more numerous than magnificent; one of them is ornamented with a very high and square tower, built of cut stone, which is visible at a considerable distance from the city. The streets are very narrow, dirty and irregular, and many of the houses are uninhabited and falling to ruin. Those which are decent and respectable in their appearance are built of tabby, and enclosed in gardens. That of the effendi or prime minister (according to Mr Lempriere, from whose Travels this account is transcribed), was among the best in Morocco. This house, which consisted of two stories, had elegant apartments both above and below, furnished in a style far superior to any thing our author ever saw in that country. The court, into which the lower apartments opened, was very neatly paved with glazed blue and white tiling, and had in its centre a beautiful fountain. The upper apartments were connected together by a broad gallery, the balusters of which were painted of different colours. The hot and cold baths were very large, and had every convenience which art could afford. Into the garden, which was laid out in a tolerably neat style, opened a room adjoining to the house, which had a broad arched entrance but no door, beautifully ornamented with chequered tiling; and at both ends of the apartment the walls were entirely covered with looking-glasses. The flooring of all the rooms was covered with beautiful carpeting, the walls ornamented with large and valuable looking glasses, inteminated with watches and clocks in glass cases. The ceiling was carved woodwork, painted of different colours; and the whole was in a superior style of Moorish grandeur. This and a few others are the only decent habitations in Morocco. The generality of them serve only to impress the traveller with the idea of a miserable and defecfent city.

The Elcaniferia is a particular part of the town where trifles and other valuable articles are exposed to sale. It consists of a number of small shops, formed in the walls of the houses, about a yard from the ground, of such an height within as just to admit a man to it in one of them crooks-legged. The goods and drawers are so arranged round him, that when he serves his customers, who are standing all the time out in the street, he can reach down any article he wants without being under the necessity of moving. These shops, which are found in all the other towns of the empire, are sufficient to afford a striking example of the indolence of the Moors. There are three daily markets in different parts of the town of Morocco where provisions are sold, and two weekly fairs or markets for the disposal of cattle. The city is supplied with water by means of wooden pipes connected with the neighbouring streams, which empty themselves into reservoirs placed for the purpose in the suburbs, and some few in the centre of the town.

The castle is a large and ruinous building, the outer walls of which enclose a space of ground about three miles in circumference. It has a mosque on the top of which are three large balls, formed, as the Moors allege, of solid gold. The castle is almost a town itself; it contains a number of inhabitants; who in some department or other are in the service of the emperor, and all under the direction of a particular alcaide, who is quite independent of the governor of the town. On the outside of the castle, between the Moorish town and the Jewdry are several small distinct pavilions, inclosed in gardens of orange trees, which are intended as occasional places of refuge for such of the emperor's sons or brothers as happen to be at Morocco. As they are covered with coloured tiling, they have at a small distance rather a neat appearance; but upon approaching or entering them, that effect in a great measure ceases.

The Jews, who are at this place pretty numerous, have a separate town to themselves, walled in, and under the charge of an alcaide, appointed by the emperor. It has two large gates, which are regularly shut every evening about nine o'clock; after which time no person whatever is permitted to enter or go out of the Jewdry till they are opened again in the following morning. The Jews have a market of their own; and when they enter the Moorish town, castle, or palace, they are always compelled to be bare footed.

The palace, is an ancient building, surrounded by a square wall, the height of which nearly excludes from the view of the spectator the other buildings. Its principal gates are contructed with Gothic arches.
Morocco is composed of cut stone, which conduct to several open and spacious courts; through these it is necessary to pass before we reach any of the buildings. These open courts were used by the late emperor for the purposes of transacting public business and exercising his troops. The habitable part consists of several irregular square pavilions, built of tabby, and whitened over; some of which communicate with each other, others are distinct, and most of them receive their names from the different towns of the empire. The principal pavilion is named by the Moors the douhar, and is more properly the palace and spacious courts; through these it is possible to reach any of the buildings. The other pavilions are merely for the purposes of pleasure or business, and are quite distinct from the douhar. The Mogador pavilion, named from the late emperor’s partiality to that town, has by far the fairest claim to grandeur and magnificence. This apartment was the work of Sidi Mahomet, and is lofty and square. It is built of cut stone, hand-finished, and ornamented with windows, and covered with varnished tiles of various colours; and its simplicity and irregularity of the other buildings produce a most striking effect. In the inside, besides several other apartments, we find in the pavilion a spacious room floored with blue and white chequered tiling, its ceiling covered with curiously carved and painted wood, and its fluted walls variously ornamented with looking-glasses and tassels, regularly distributed in glass-panels. To this pavilion the late emperor manifested an absolute preference, frequently retiring to it both for the purposes of business and of recreation. The apartments of the emperor have in general a much smaller complement of furniture than those of the Moors in the inferior walks of life. Handsome carpeting, a matress on the ground covered with fine linen, a couch, and a couple of European bedsteads, are the principal articles they contain. The gardens within the walls of the palace, of which he has several, are very neat; they contain orange and olive trees, variously disposed and arranged, and intersected with fountains of water, fountains, and fountains. Those on the outside are nothing more than large tracts of ground, irregularly planted with olives; having four square walks, and surrounded by walls.

Morocco or Marruecos, the skin of a goat, or some other animal resembling it, dressed in sheep or gall, and coloured of any colour at pleasure; much used in bookbinding, &c. The name is ordinarily derived from the kingdom of Morocco, whence it is supposed the manner of preparing these skins was first borrowed. There are Morocco skins brought from the Levant, Barbary, Spain, Flinders, and France; red, black, yellow, blue, &c. For the manner of preparing them, see Leather.

Morocchus, in natural history, an indurated clay called by us French chalk; serving taylors and others to mark with. The ancients esteemed it as an astringent, preferring it in the cholic, haemorrhages, and other fluxes.

Moron, a town of Spain, in Andalusia, seat in a pleasant fertile plain, and in the neighbourhood is a mine of precious stones. It is 30 miles south-east of Seville. W. Long. 5° 20', N. Lat. 37° 0'.

Morpeth, a handsome town of Northumberland, 14 miles from Newcastle, 286 miles from London, is an ancient borough by prescription, with a bridge over the Wanbeck. It had once an abbey and a castle, now in ruins, situated about a quarter of a mile south of the town and river Wanbeck, on an eminence which overlooks them both. The marketplace is conveniently situated near the centre of the town; and an elegant town-house was built by the Carlisle family in 1714, in which the quarter-sections are held for the county. It is built of hewn-stone, with a piazza. The church being a quarter of a mile distant from the town, a tower containing a good ring of bells stands near the market-place. Near the bridge is the county gaol, a modern structure. Here are a free grammar-school, a chapel near the river on the site of a chantry that was granted for the support of the foundation of the school, which was part of the old structure, and an hospital for infirm people. In 1215, the townsmen themselves burnt their town, out of pure hatred to king John, that he might find no shelter there. Here is a good market on Saturday for corn, cattle, and all necessary provisions; and there is another on Wednesday, the greatest in England except Smithfield, for live cattle. This is a poit town and a thoroughfare, with many good inns, and plenty of fish; and here are several mills.—The earl of Carlisle’s steward holds a court here twice a-year, one of them the Monday after Michaelmas, when four persons are chosen by the free burgesses, who are about 107, and preferred to the steward, who names two of them to the bailiffs, who, with seven aldermen, are its governors for the year ensuing. Its fairs are on Wednesday, Thursday, and Friday before Whitsunday, and the Wednesday before July 22. It sends two members to parliament.

Morpheus, in fabulous history, the god of sleep, or, according to others, one of the ministers of Somaus. He caused sleepers, and represented the forms of dreams. Ovid styles him the kindlest of the deities; and he is usually described in a recumbent posture, and crowned with poppies.

Morreri (Lewis), author of the Historical Dictionary, was born at Bargemont in Provence, 1643. He learned rhetoric and philosophy at Aix, and divinity at Lyons. At 18 years of age he wrote a small piece, intitled Le Pays d’Amour, and a collection of the finest French poems intitled Deux plaisirs de la Poésie. He learned Spanish and Italian; and translated out of Spanish into French the book intitled La Perfection Chrétienne de Rodriguez. He then refined the Saints Lives to the purity of the French tongue. Being ordained priest, he preached at Lyons, and undertook, when he was but 30 years of age, a new Historical Dictionary, printed at Lyons in one vol. folio, 1673. But his continual labour impaired his health; so that he died in 1680, aged 37. His second volume was published after his death; and four more volumes have since been added. He left some other works behind him.

Morrhina was, were a fort of cups or veses made use of by the ancients for drinking out of, and others.
other purposes. Authors are not agreed as to the substance of which they were made. Some say it was a stone; some assert that it was a fluid congealed by being buried under ground. All that we know concerning it is, that it was known by the name of Murba, and that Heliogabalus’s chamber pot was made of it. The word is sometimes written myrrha.

MORRISE-DANCES. See MORRIS-dances.

MORIS, DEATH, one of the infernal deities, born of Night without a father. She was worshipped by the ancients with great solemnity. She was not represented as an actually existing power, but as an imaginary being. Euripides introduces her in one of his tragedies on the stage. The moderns represent her as a skeleton armed with a scythe and a scymnetar.

MORSE, in zoology. See TRICHECUS.

MORTALITY, a term frequently used to signify a contagious disease, which destroys great numbers of either men or beasts.

Bills of Mortality, are accounts or registers specifying the numbers born, married, and buried in any parish, town or district. In general they contain only these numbers; and, even when thus limited, are of great use, by showing the degrees of healthiness and prolificness, and the progress of population in the places where they are kept. It is therefore much to be wished, that such accounts had been always correctly kept in every kingdom, and regularly published at the end of every year. We should then have had under our inspection the comparative strength of every kingdom, as far as it depends on the number of inhabitants, and its increase or decrease at different periods. But such accounts are rendered more useful, when they include the ages of the dead, and the distempers of which they have died. In this case they convey some of the most important instructions, by furnishing us with the means of ascertaining the law which governs the waste of human life, the values of annuities dependent on the continuance of any lives, or any survivorships between them, and the favourableness or unfavourableness of different situations to the duration of human life. There are but few registers of this kind; nor has this subject, though so interfering to mankind, ever engaged much attention till lately. The first bills containing the ages of the dead were those for the town of Breslaw in Silesia. It is well known what use has been made of these by Dr Halley, and after him by De Moivre. A table of the probabilities of the duration of human life at every age, deduced from them by Dr Halley, has been published in the Philosophical Transactions, (see the Abridgement, vol. iii. p. 609.) and is the first table of this sort that has ever been published. Since the publication of this table, similar bills have been established in a few towns of Great Britain, particularly in London, in the year 1728, and at Northampton in 1735.

Two improvements of these registers have been proposed: the first is, that the sexes of all that die in every period of life should be specified in them, under the denomination of boys, married men, widowers, and bachelor’s; and of girls, married women, widows, and virgins. The second is, that they should specify the numbers of both sexes dying of every distemper in every month, and at every age. See the end of the 4th essay in Dr Price’s Treatise on Reversionary Payments. Mortality.

Registers of mortality thus improved, when compared with records of the seafarers, and with the circumstances that discriminate different situations, might contribute greatly to the increase of medical knowledge; and they would afford the necessary data for determining the difference between the duration of human life among males and females; for such a difference is certainly much in favour of females, as will appear from the following facts.

At Northampton, though more males are born than females, and nearly the same number die; yet the number of living females appeared, by an account taken in 1746, to be greater than the number of males, in the proportion of 230 to 1770, or 39 to 30. At Berlin it appeared, from an accurate account which was taken of the inhabitants in 1747, that the number of female citizens exceeded the number of male citizens in the proportion of 459 to 391. And yet out of this smaller number of males, more had died for 20 years preceding 1751, in the proportion of 19 to 17.

At Edinburgh, in 1743, the number of females, was to the number of males as 4 to 3. (See Maitland’s History of Edinburgh, p. 220.) But the females that died annually from 1749 to 1758, were to the males in no higher proportion than 35 to 32.

He that will take the pains to examine the accounts in Phil. Trans. abr. vol. vii. part iv. p. 46, &c. will find, that though in the towns there enumerated, the proportion of males and females born is no higher than 19 to 18, yet the proportion of boys and girls that die is 8 to 7; and that, in particular, the still-born and chrysom males are to the still-born and chrysom females as 3 to 2.

In 39 parishes of the district of Vaucluse in Switzerland, the number of males that died during ten years before 1766 was 8170; of females 8167; of whom the numbers that died under one year of age were 1817 males and 1305 females; and under ten years of age, 3099 males and 2598 females. In the beginning of life, therefore, and before any emigrations can take place, the rate of mortality among males appears to be greater than among females. And this is rendered yet more certain by the following accounts. At Vevey, in the district of Vaucluse just mentioned, there died in the course of 20 years, ended at 1764, in the first month after birth, of males 135 to 89 females; and in the first year 225 to 162. To the same effect it appears from a table given by Suflimie, in his Gottliche Ordnung, vol. ii. p. 317, that in Berlin 223 males die in the first month, and but 168 females; and in the first year, 489 to 395; and also, from a table of Struycks, that in Holland 396 males die in the first year to 306 females.

The authorities for the facts here mentioned, and much more on this subject, may be found in the 4th essay in Dr Price’s Treatise on Reversionary Payments, and in the supplement at the end of that treatise.

We shall here only add the following table, taken from a memoir of Mr Wargentin’s, published in the collection of the Memoirs of the Royal Academy of Sciences at Stockholm, printed at Paris in 1772.
Mortality.

In all Sweden for nine years, ending in 1763, the proportion of females to males that died out of a given number living, was

<table>
<thead>
<tr>
<th>Age of One Year</th>
<th>1000 to 1099</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under the age of one year</td>
<td>-</td>
</tr>
<tr>
<td>From 1 to 3 years of age</td>
<td>1000 1022</td>
</tr>
<tr>
<td>3</td>
<td>1042</td>
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<tr>
<td>5</td>
<td>1074</td>
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<td>1280</td>
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<td>15</td>
<td>1097</td>
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<tr>
<td>20</td>
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<tr>
<td>25</td>
<td>1161</td>
</tr>
<tr>
<td>30</td>
<td>993</td>
</tr>
<tr>
<td>35</td>
<td>1159</td>
</tr>
<tr>
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<td>1340</td>
</tr>
<tr>
<td>45</td>
<td>1339</td>
</tr>
<tr>
<td>50</td>
<td>1292</td>
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<td>1125</td>
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<td>60</td>
<td>1090</td>
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<td>65</td>
<td>1022</td>
</tr>
<tr>
<td>70</td>
<td>880</td>
</tr>
<tr>
<td>75</td>
<td>1046</td>
</tr>
<tr>
<td>80</td>
<td>1046</td>
</tr>
<tr>
<td>Above 90</td>
<td>1046</td>
</tr>
</tbody>
</table>

Registars of mortality on the improved plan before mentioned, were established in 1772 at Chelfter, and also in 1773 at Warrington in Lancashire; and they are so comprehensive and correct, that there is reason to expect they will afford much instruction on the subject of human mortality, and the value of lives.

But the country most distinguished in this respect is Sweden: for in that kingdom exact accounts are taken of the births, marriages, and burials, and of the numbers of both sexes that die at all ages in every town and district; and also at the end of every period of five years, of the numbers living at every age: and at Stockholm a society is established, whose business it is to superintend and regulate the enumerations, and to collect from the different parts of the kingdom the registers, in order to digest them into tables of observations. These regulations were begun in Sweden in 1755; and tables, containing the result of them from 1755 to 1763, have been published in Mr Wargentin's memoir just referred to; and the most material parts of them may be found in an essay by Dr Price on the Difference between the Duration of Human Life in Towns and in Country Parishes, printed in the 65th volume of the Philos. Tran.

Part II.

In the fourth essay in Dr Price's Treatise on Reversionary Payments and Life-Annuities, the following account is given of the principles on which tables of observation are formed from registers of mortality; and of the proper method of forming them, so as to render them just representations of the number of inhabitants, and the probabilities of the duration of human life in a town or country.

In every place which just supports itself in the number of its inhabitants, without any recruits from other places; or where, for a course of years, there has been no increase or decrease; the number of persons dying every year at any particular age, and above it, must be equal to the number of the living at that age. The number, for example, dying every year at all ages from the beginning to the utmost extremity of life, must, in such a situation, be just equal to the whole number born every year. And for the same reason, the number dying every year at one year of age and upwards, at two years of age and upwards, at three and upwards, and so on, must be equal to the numbers that attain to those ages every year; or, which is the same, to the numbers of the living at those ages. It is obvious, that unless this happens, the number of inhabitants cannot remain the same. If the former number is greater than the latter, the inhabitants must decrease; if less, they must increase.

From this observation it follows, that in a town or country where there is no increase or decrease, bills of mortality which give the ages at which all die, will show the exact number of inhabitants, and also the exact law according to which human life wavers in that town or country.

In order to find the number of inhabitants, the mean numbers dying annually at every particular age and upwards must be taken as given by the bills, and placed under one another in the order of the second column of the following tables. These numbers, it has appeared, are the numbers of the living at 1, 2, 3, &c. years of age; and consequently the sum diminished by half the number born annually will be the whole number of inhabitants.

This subtraction is necessary for the following reason: In a table formed in the manner here directed, it is supposed that the numbers in the second column are all living together at the beginning of every year. Thus the number in the second column opposite to 0 in the first column, the table supposes to be all just born together on the first day of the year. The number, likewise, opposite to 1, it supposes to attain to one year of age just at the same time that the former number is born. And the like is true of every number in the second column. During the course of the year, as many will die at all ages as were born at the beginning of the year; and consequently, there will be an excess of the number alive at the beginning of the year above the number alive at the end of the year, equal to the whole number of the annual births; and the true number constantly alive together, is the arithmetical mean between these two numbers; or agreeably to the rule here given, the sum of the numbers in the second column of the table leaffened by half the number of annual births.

In such a series of numbers, the excess of each number above that which immediately follows it, will be the number dying every year out of the particular number alive at the beginning of the year; and these excesses set down regularly as in the third column of the table to which we have referred, will show the different rates at which human life wavers through all its different periods, and the different probabilities of life at all particular ages.

It must be remembered, that what has been now said goes on the supposition, that the place whose bills of mortality are given, supports itself, by procreation only, in the number of its inhabitants. In towns this very seldom happens on account of the luxury and debauchery which generally prevail in them. They are, therefore, commonly kept up by a constant accession of strangers, who remove to them from country parishes and villages. In these circumstances, in order to find the true number of inhabitants, and probabilities
Mortality. Probabilities of life, from bills of mortality containing an account of the ages at which all die, it is necessary that the proportion of the annual births to the annual settlers should be known, and also the period of life at which the latter remove. Both these particulars may be discovered in the following method.

If for a course of years there has been no sensible increase or decrease in a place, the number of annual settlers will be equal to the excess of the annual burials above the annual births. If there is an increase, it will be greater than this excess. If there is a decrease, it will be less.

The period of life at which these settlers remove, will appear in the bills by an increase in the number of deaths at that period and beyond it. Thus in the London bills the number of deaths between 20 and 30 is generally above double; and between 30 and 40 near triple the number of deaths between 10 and 20; and the true account of this is, that from the age of 18 or 20 to 35 or 50, there is an influx of people every year to London from the country, which occasions a great increase in the number of inhabitants at these ages; and consequently raises the deaths for all ages above 20 considerably above their due proportion, when compared with the number of deaths before 20. This is observable in all the bills of mortality for towns with which we are acquainted, not excepting even the Breflaw bills. Dr Halley takes notice, that these bills give the number of deaths between 10 and 20 too small. This he considered as an irregularity in them owing to chance; and, therefore, in forming his table of observations, he took the liberty so far to correct it, as to render the proportion of those who die to the living in this division of life nearly the same with the proportion which he says, he had been informed die annually of the young lads in Christ-Church Hospital. But the truth is, that this irregularity in the bills was derived from the cause we have just alluded to. During the five years for which the Breflaw bills are given by Dr Halley, the births did indeed a little exceed the burials; but it appears that this was the effect of some peculiar causes that happened to operate just at that time; for during a complete century from 1633 to 1734, the annual medium of births was 1089, and of burials 1256. This town, therefore, must have been all along kept up by a number of yearly recruits from other places, equal to about a seventh part of the yearly births.

It appears from the account in the Philosophical Transactions (Abridgment, vol. vii. p. 380, p. 46, &c.), that from 1717 to 1725, the annual medium of births at Breflaw was 1252, of burials 1507; and also that much the greatest part of the births died under 10 years of age. From a table in Sufmilch's works, vol. i. p. 98, it appears, that in reality the greater part of all that die in this town are children under five years of age.

What has been now observed concerning the period of life at which people remove from the country to settle in towns, would appear sufficiently probable were there no such evidence for it as has been mentioned; for it might be well reckoned that these people in general must be single persons in the beginning of mature life, who, not having yet obtained settlements in the places where they were born, migrate to towns in quest of employments.

Having premised these observations, it will be proper next to endeavour to explain distinctly the effect which these accessions to towns must have on tables of obervation formed from their bills of mortality. This is a subject proper to be insisted on, because mistakes have been committed about it; and because also the diffusion of it is necessary to show how near to the truth the values of lives come as deduced from such tables.

The following general rule may be given on this subject. If a place has for a course of years been maintained in a state nearly stationary, as to number of inhabitants, by recruits coming in every year, to prevent the decrease that would arise from the excess of burials above the births, a table formed on the principle, "that the number dying annually after every particular age, is equal to the number living at that age," will give the number of inhabitants, and the probabilities of life, too great, for all ages preceding that at which the recruits cease; and after this it will give them right. If the accessions are so great as to cause an increase in the place, such a table will give the number of inhabitants and the probabilities of life too little after the age at which the accessions cease; and too great if there is a decrease.

Before that age it will in both cases give them too great; but much considerably so, in the former case, or when there is an increase.

Agreeably to these observations, if a place increases not in consequence of accessions from other places, but of a constant excess of the births above the deaths, a table constructed on the principle that has been mentioned will give the probabilities of life too low through the whole extent of life; because in such circumstances the number of deaths in the first stages of life must be too great, in comparison of the number of deaths in the latter stages; and more or less so as the increase is more or less rapid. The contrary, in all respects takes place where there is a decrease arising from the excess of the deaths above the births.

For example: Let us suppose that 244 of those born in a town attain annually to 20 years of age, and that 250 more, all likewise 20 years of age, come into it annually from other places, in consequence of which it has for a course of years been just maintained in the number of its inhabitants; without any sensible increase or decrease: in these circumstances, the number of the living in the town of the age of 20 will be always 244 natives and 250 settlers, or 494 in all; and since these are supposed all to die in the town, and no more recruits are supposed to come in, 494 will be likewise the number dying annually at 20 and upwards. In the same manner it will appear, on these suppositions, that the number of the living, at every age subsequent to 20, will be equal to the number dying annually at that age and above it; and consequently that the number of inhabitants and the decrements of life, for every such age will be given exactly by the table. But for all ages before 20, they will be given much too great. For let 280 of all born in the town reach 10; in this case, 280 will be the true number of the living in the town at the age of 10; and the recruits not coming in till 20, the number given:
Mortality.

given by the bills as dying between 10 and 20 will be the true number dying annually of the living in this division of life. Let this number be 36; and it will follow that the table ought to make the numbers of the living at the ages between 10 and 20, a series of decreasing means between 280 and (280 divided by 36, or) 244. But in forming the table on the principle just mentioned, 250 (the number above 20 dying annually in the town who where not born in it) will be added to each number in this series; and therefore the table will give the numbers of the living and the probabilities of life in this division of life, almost twice as great as they really are. This observation, it is manifest, may be applied to all the ages under 20.

It is necessary to add, that such a table will give the number of inhabitants and the probabilities of life equally wrong before 20, whether the recruits all come in at 20, agreeably to the supposition just made, or only begin then to come in. In this last case, the table will give the number of inhabitants and probabilities of life too great throughout the whole extent of life, if the recruits come in at all ages above 20. But if they cease at any particular age, it will give them right only from that age; and before, it will err all along on the side of excess; but less considerably between 20 and that age than before 20. For example: if of the 250 supposed to come in at 20, only 150 then come in, and the rest at 30; the number of the living will be given too high at every age between 20 and 30; but, as just shown, they will be given 250 too high at every age before 20. In general, therefore, the number of the living at any particular age must be given by the supposed table as many too great as there are annual settlers after that age; and if those settlers come in at all ages indiscriminately, during any certain interval of life, the number of inhabitants and the probabilities of life will be continually growing less and less wrong the nearer any age is to the end of that interval. These observations prove, that tables of observation formed in the common way, from bills of mortality for places where there is an excess of the burials above the births, must be erroneous for a great part of the duration of life, in proportion to the degree of that excess. They show likewise at what parts of life the errors in such tables are most considerable, and how they may be in a great measure corrected.

All this shall be exemplified in the particular case of London.

The number of deaths between the ages of 10 and 20 is always so small in the London bills, that it seems certain few recruits come to London under 20, or at least not so many as before this age are sent out for education to schools and universities. After 20 great numbers come in till 30, and some perhaps till 40 or 50: but at every age after 50, it is probable that more retire from London than come to it. The London tables of observation therefore, being formed on the principle already mentioned, cannot give the probabilities of life right till 40. Between 30 and 40 they must be a little too high; but more so between 20 and 30, and most of all so before 20. It follows also, that these tables must give the number of inhabitants in London much too great.

The first of the following tables is formed in the manner here explained, from the London bills for 10 years, from 1759 to 1768, and adapted to 1000 born as a radix. The sum of the numbers in the second column, diminished by half the number born, is 25,757. According to this table then, for every 1000 deaths in London there are 25 ½ as many inhabitants; or, in other words, the expectation of a child just born is 25 ½; and inhabitants are to the annual burials as 25 ½ to 1. But it has appeared, that the numbers in the second column, being given on the supposition that all those who die in London were born there, must be too great; and we have from hence a demonstration, that the probabilities of life are given in the common tables of London observations too high for at least the first 30 years of life; and also, that the number of inhabitants in London must be less than 25 ½ multiplied by the annual burials. The common tables therefore, of London observations, undoubtedly need correction, as Mr. Simpson suggested, and in some measure performed; though too imperfectly, and without going upon any fixed principles, or flowing particularly how tables of observation ought to be formed, and how far in different circumstances, and at different ages, they are to be depended on. The way of doing this, and in general the right method of forming genuine tables of observation for towns, may be learned from the following rule:

"From the sum of all that die annually, after any given age, subtract the number of annual settlers after that age; and the remainder will be the number of the living at the given time."

This rule can want no explication or proof after what has been already said.

If, therefore, the number of annual settlers in a town at every age could be ascertained, a perfect table of observations might be formed for that town from bills of mortality, containing an account of the ages at which all die in it. But no more can be learned in this instance, from any bills, than the whole number of annual settlers, and the general division of life in which they enter. This, however, may be sufficient to enable us to form tables that shall be tolerably exact. For instance: Suppose the annual deaths in a town which has not increased or decreased, to have been for many years in the proportion of 4 to 3 to the annual births. It will hence follow, that ⅔ of the persons who die in such a town are settlers, or emigrants from other places, and not natives; and the sudden increase in the deaths after 20 will also show, agreeably to what was before observed, that they enter after this age. In forming, therefore, a table for such a town, a quarter of all that die at all ages throughout the whole extent of life must be deducted from the sum of all that die after every given age before 20; and the remainder will be the true number living at that given age. And if at 20, and every age above it, this deduction is omitted, or the number of the living at every such age is taken the same with the sum of all that die after it, the result will be (supposing most of the settlers to come in before 30, and all before 40) a table exact till 20; too high between 20 and 30; but nearly right for some years before 40; and after 40 exact again. Such a table,
MOR

MOR

Mortality, it is evident, will be the same with the table described at all ages above 20, and different from it only under 20. It is evident also, that on account of the numbers of the dead.

be well

the knowledge of which

is derived from the particular enquiry and information of Mr Harris, the late ingenious master of the royal mathematical school in Christ-Church hospital.

The average of lads in this school, for 30 years past, been 831. They are admitted at all ages between 7 and 11; and few stay beyond 16; they are therefore in general, lads between the ages of 8 and 16. They have better accommodations than it can be supposed children commonly have; and about 300 of them have the particular advantage of being educated in the country. In such circumstances, it may be well reckoned, that not more than 500 of children dying annually must be less than the general proportion of children dying annually at the same ages in London. The fact is, that for the last 30 years 11½ have died annually, or one in 700.

According to Table II. one in 73 dies between 10 and 20, and one in 70 between 8 and 16. That table, therefore, probably gives the decrements of life in London at these ages, too little, and the numbers of the living too great: and if this is true of these ages, it must be true of all other ages under 20; and it follows demonstrably, in conformity to what was before shown, that more people settle in London after than the fourth above supposed; and that from 20 to at least 30 or 35, the numbers of the living are given too great, in proportion to the decrements of life.

In this table the numbers in the second column are doubled at 20, agreeably to what really happens in London; and the sum of the numbers in this column diminished by half the whole number of deaths, gives the expectation of life, not of a child living annually must be less than the general proportion of children dying annually at the same ages in London. The fact is, that for the last 30 years 11½ have died annually, or one in 700.

Of every 1000 then who die in London only 730 are natives, and 250 are recruits who come to it after 18 or 20 years of age; and, consequently, in order to obtain from the bills a more correct table than the first of the following tables, 250 must be subtracted from every one of the numbers in the second column till 20; and the numbers in the third column must be kept the same, the bills always giving these right. After 20, the table is to be continued unaltered; and the result will be, a table which will give the numbers of the living at all ages in London much nearer the truth, but still somewhat too high. Such is the second of the following tables. The sum of all the numbers in the second column of this table, diminished by 500, is 20,750. For every 1000 deaths, therefore, in London, there are, according to this table, 20,750 living person in it; or for every single death 20½ inhabitants. It was before shown, that the number of inhabitants in London cannot be so great as 23 times ¼ the deaths. It now appears, (since the numbers in the second column of this table are too high,) that the number of inhabitants in London cannot be so great as even 20 times ¼ the deaths. And this is a conclusion which every one who will bellow due attention on what has been said, will find himself forced to receive. It will not be amis, however, to confirm it by the following fact, the knowledge of which

Vol. XII.

Z z TABLE
TABLE I.

Showing the Probabilities of life in London, on the supposition that all who die in London were born there. Formed from the bills for 10 years, from 1759 to 1768.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Persons living.</th>
<th>Decr. of Life.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000</td>
<td>240</td>
</tr>
<tr>
<td>1</td>
<td>760</td>
<td>99</td>
</tr>
<tr>
<td>2</td>
<td>669</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>693</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>590</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>569</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>558</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>548</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>541</td>
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</tr>
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<tr>
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<td>506</td>
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<td>422</td>
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</tr>
<tr>
<td>30</td>
<td>413</td>
<td></td>
</tr>
</tbody>
</table>

TABLE II.

Showing the true probabilities of life in London till the age of 19.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Persons living.</th>
<th>Decr. of Life.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>750</td>
<td>240</td>
</tr>
<tr>
<td>1</td>
<td>514</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>411</td>
<td>14</td>
</tr>
<tr>
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</tr>
<tr>
<td>4</td>
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</tr>
<tr>
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<td>319</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>308</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
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<td>7</td>
</tr>
<tr>
<td>8</td>
<td>285</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>280</td>
<td>4</td>
</tr>
</tbody>
</table>

The numbers in the second column to be continued as in the last table.

The numbers in the second column to be continued as in the last table.

TABLE III.

Showing the true probabilities of life in London for all ages. Formed from the bills for 10 years, from 1759 to 1768.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Persons living.</th>
<th>Decr. of Life.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>486</td>
</tr>
<tr>
<td>1</td>
<td>1032</td>
<td>200</td>
</tr>
<tr>
<td>2</td>
<td>832</td>
<td>85</td>
</tr>
<tr>
<td>3</td>
<td>747</td>
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<tr>
<td>4</td>
<td>668</td>
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</tr>
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<td>646</td>
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</tr>
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<td>603</td>
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<tr>
<td>8</td>
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<td>9</td>
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<td>10</td>
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<tr>
<td>10</td>
<td>567</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>558</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>549</td>
<td>8</td>
</tr>
<tr>
<td>13</td>
<td>541</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>534</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>528</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>522</td>
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<td>515</td>
<td>3</td>
</tr>
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<td>18</td>
<td>508</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>501</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>496</td>
<td></td>
</tr>
<tr>
<td>21</td>
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<tr>
<td>24</td>
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<tr>
<td>25</td>
<td>455</td>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>30</td>
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</tr>
</tbody>
</table>

All the bills, from which the following tables are formed, give the numbers dying under 1 as well as under 2 years; and in the numbers dying under 1 are included, in the country parish in Brandenburg and at Berlin, all the still-borns. All the bills also give the numbers dying in every period of five years.
**TABLE IV.**

Showing the Probabilities of Life in the District of Vaud, Switzerland, formed from the Registers of 43 Parishes, given by Mr Muret, in the First Part of the Bern Memoirs for the year 1766.

<table>
<thead>
<tr>
<th>Age</th>
<th>Living</th>
<th>Decr.</th>
<th>Age</th>
<th>Living</th>
<th>Decr.</th>
<th>Age</th>
<th>Living</th>
<th>Decr.</th>
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</tr>
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**TABLE V.**

Showing the Probabilities of Life in a Country Parish in Brandenburg, formed from the Bills for 50 Years, from 1710 to 1759, as given by Mr Sufmilch in his Gottliche Orduung.

<table>
<thead>
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<th>Age</th>
<th>Living</th>
<th>Decr.</th>
<th>Age</th>
<th>Living</th>
<th>Decr.</th>
<th>Age</th>
<th>Living</th>
<th>Decr.</th>
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**TABLE II**

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Showing the Probabilities of Life at Vienna, formed from the Bills for Eight years, as given by Mr. Sufmilch, in his Gottliche Ordnung, page 32, Tables.

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</table>

Showing the Probabilities of Life at Berlin, formed from the Bills for Four Years, from 1752 to 1755, given by Mr. Sufmilch in his Gottliche Ordnung, vol. ii. page 37, Tables.

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<td>25</td>
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<tr>
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<td>8</td>
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<tr>
<td>32</td>
<td>368</td>
<td>7</td>
</tr>
</tbody>
</table>

Brief of MORTANCESTRY; in Scots law; an- ciently the ground of an action at the instance of an heir, in the special case where he had been excluded from the polluction of his ancestor's estate by the super- ior, or other person pretending right.

MORTAR, a preparation of lime and sand mixed with water, which serves as a cement, and is used by masons and bricklayers in building walls of stone and brick. Under the article Cement, we have already given the theory of mortar, as delivered by Mr. Anderson; which has now received a farther confirmation by a recent discovery, that if the lime is flaked, and the mortar made up, with lime-water instead of common water, the mortar will be much better. The reason of this is, that in common water, especially such as is drawn from wells, there is always a considerable quantity of fixed air, which, mingling with the mortar previous to its being used, spoils it by reducing the quicklime in part to an inert calcareous earth like chalk; but when it is built up in a perfectly caustic state, it attracts the air so slowly, that it hardens into a kind of stony matter as hard as was the rock from whence the limestone was taken.

MORTAR, a chemical utensil very useful for the division of bodies, partly by percussion and partly by grinding. Mortars have the form of an inverted bell. The matter intended to be pounded is to be put into them,
MOR [ 365 ] MOR

them, and there it is to be struck and bruised by a long instrument called a pelle. The motion given to the pelle ought to vary according to the nature of the substances to be pounded. Those which are easily broken, or which are apt to fly-out of the mortar, or which are hardened by the stroke of the pelle, require that this instrument should be moved circularly, rather by grinding and bruising than by striking. Those substances which are softened by the heat occasioned by rubbing and percussion, require to be pounded very slowly. Lastly, those which are very hard, and which are not capable of being softened, are easily pounded by repeated strokes of the pelle. They require no bruising but when they are brought to a certain degree of fineness. But these things are better learned by habit and practice than by any directions.

As mortars are instruments which are constantly used in chemistry, they ought to be kept of all sizes and materials; as of marble, copper, glass, iron, griffitone, and agate. The nature of the substance to be pounded determines the choice of the kind of mortar. The hardnes and dissolving power of that substance are particularly to be attended to. As copper is a soft metal, soluble by almost all menstruums, and hurtful to health, good artificers have some time ago proscribed the use of this metal.

One of the principal inconveniences of pulverization in a mortar proceeds from the fine powder which rises abundantly from some substances during the operation. If these substances be precious, the loss will be considerable; and if they be injurious to health, they may hurt the operator. These inconveniences may be remedied, either by covering the mortar with a skin, in the middle of which is a hole, through which the pelle passes; or by moistening the matter with a little water when this addition does not injure it; or, lastly, by covering the mouth and nose of the operator with a fine cloth, to exclude this powder. Some substances, as corrosive sublimate, arsenic, calxes of lead, cantharides, euphorbium, &c. are so noxious, that all these precautions ought to be used, particularly when a large quantity of them is pounded.

Large mortars ought to be fixed on a block of wood, so high, that the mortar shall be level with the middle of the operator. When the pelle is large and heavy, it ought to be suspended by a cord or chain fixed to a moveable pole, placed horizontally above the mortar; this pole considerably relieves the operator, because its elasticity assists the raising of the pelle.

MORTAR PIECE, in the military art, a short piece of ordnance, thick and wide, proper for throwing bombs, carcases, shells, stones, bags filled with grape-shot, &c. See GUNNERY, n° 50.

Land Mortars, are those used in sieges, and of late in battles, mounted on beds made of solid timber, consisting generally of four pieces, those of the royal and cohorn excepted, which are but one single block; and both mortar and bed are transported on block-carriages. There is likewise a kind of land-mortars, mounted on travelling carriages, invented by count Buckeburg, which may be elevated to any degree; whereas ours are fixed to an angle of 45 degrees, and firmly lathed with ropes. The following table exhibits the weight of land-mortars and shells; together with the quantity of powder the chambers hold when full; the weight of the shells, and powder for loading them.

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<th>Chamber's cont. of powder</th>
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<td>5-8-inch</td>
</tr>
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<td>C. qr. lb</td>
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Sea Mortars, are those which are fixed in the bomb-veffels for bombarding places by sea; and as they are generally fired at a much greater distance than that which is required by land, they are made somewhat longer and much heavier than the land-mortars. The following table exhibits the weight of the sea-mortars and shells, and also of their full charges.

### Nature of the mortar.

<table>
<thead>
<tr>
<th>Nature of the mortar</th>
<th>Powder contained in the chamber when full</th>
<th>Weight of the mortar</th>
<th>Weight of the shell when fixed</th>
<th>Weight of powder or contained in the shell</th>
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<tbody>
<tr>
<td>10-inch howitzer</td>
<td>lb. oz.</td>
<td>C. qr. lb.</td>
<td>lb.</td>
<td>lb. oz.</td>
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<tr>
<td>13-inch mortar</td>
<td>12</td>
<td>31</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>15-inch mortar</td>
<td>30</td>
<td>81</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10-inch mortar</td>
<td>12</td>
<td>34</td>
<td>2</td>
<td></td>
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To
To Charge or Load a Mortar, the proper quantity of gunpowder is put into the chamber, and if there be any vacant space they fill it up with hay; some choose a wooden plug; over this they lay a turf, some a wooden tampon fitted to the bore of the piece; and lastly the bomb; taking care that the fuse be in the axis thereof, and the orifice be turned from the muzzle of the piece: what space remains is to be filled up with hay, straw, turf, &c. so as the load may not be exploded without the utmost violence.

The quantity of gunpowder to be used is found by dividing the weight of the bomb by 30; though this rule is not always to be strictly observed.

When the proper quantity of powder necessary to charge a sea-mortar is put into the chamber, it is covered with a wad, well beat down with a rammer. After this the fixed shell is placed upon the wad, as near the middle of the mortar as possible, with the fuse-hole uppermost, and another wad pressed down close upon it, so as to keep the shell firm in its position. The officer then points the mortar according to the proposed inclination.—When the mortar is thus fixed, the fuse is opened; the priming-iron is also thrust into the touch-hole of the mortar to clear it, after which it is primed with the fine powder. This done, two of the матросы or sailors, taking each one of the matches, the first lights the fuse, and the other fires the mortar. The bomb, thrown out by the explosion of the powder, is carried to the place intended: and the fuse, which ought to be exhausted at the instant of the shell's falling, inflames the powder contained in it, and burns the shell in splinters; which, flying off circularly, occasion incredible mischief wherever they reach.

If the service of mortars should render it necessary to use pound-shots, 200 of them with a wooden bottom are to be put into the 13 inch mortar, and a quantity of powder not exceeding 5 pounds; and 100 of the above shot with 24 pounds of powder, for the 10 inch mortar, or three pounds at most.

To Elevate the Mortar fo as its axis may make any given angle with the horizon, they apply the artillery-level or gunner's quadrant. An elevation of 70 or 80 degrees is what is commonly chosen for rendering mortars serviceable in casting shells into towns, forts, &c. though the greatest range be at 45 degrees.

All the English mortars are fixed to an angle of 45 degrees, and lashed strongly with ropes at that elevation. Although in a siege there is only one cafe in which shells should be thrown with an angle of 45 degrees; that is, when the battery is so far off that they cannot otherwise reach the works: for when shells are thrown out of the trenches into the works of a fortification, or from the town into the trenches, they should have as little elevation as possible, in order to roll along, and not bury themselves; whereby the damage they do, and the terror they occasion, are much greater than if they sink into the ground. On the contrary, when shells are thrown upon magazines or any other buildings with an intention to destroy them, the mortars should be elevated as high as possible, that the shells may acquire a greater force in their fall, and consequently do greater execution.

If all mortar pieces were, as they ought to be, exactly similar, and their requisites of powder as the cubes of the diameters of their several bores, and if their shells, bombs, carcafe, &c. were also similar; then, comparing like with like, their ranges on the plane of the horizon, under the same degree of elevation, would be equal; and consequently on being well proved, i.e., the range of the grenade, bomb, carcafe, &c. being found to any degree of elevation, the whole work of the mortar-piece would become very easy and exact.

But since mortars are not thus similar, it is required, that the range of the piece, at some known degree of elevation, be accurately found by measuring; and from hence all the other ranges may be determined.

Thus, to find the range of the piece at any other elevation required; say, As the sign of double the angle under which the experiment was made, is to the sign of double the angle proposed, fo is the range known to the range required.

Suppose, for instance, it be found, that the range of a piece, elevated to 30°, is 2000 yards: to find the range of the same piece with the same charge when elevated to 45°; take the sign of 60°, the double of 30°, and make it the first term of the rule of three; the second term must be the sign of 90°, the double of 45°, and the third the given range 2000; the range of the piece will be 2310, the range of the piece at 45°. If the elevation be greater than 45°, instead of doubling it, take the sign of double its complement to 90°. As suppose the elevation of a piece to be 50°, take the sign of 80°, the double of 40°. Again, if a determinate distance to which a shot is to be cast, be given, and the angle of elevation to produce that effect be required; the range known must be the first term in the rule of three, which suppose 2000 yards; the range proposed, which we suppose 1600 yards, the second term; and the sign of 60 double of the elevation for the range of 2000 yards, the third term. The fourth term will be found the sign of 43° 52', whose half 21° 56' is the angle of elevation the piece must have to produce the desired effect. and if 21° 56' be taken from 90°, you will have 68° 4' for the other elevation of the piece, with which the same effect will likewise be produced.

Note, to avoid the trouble of finding signs of double the angles of proposed elevations, Galileo and Torricelli give us the following table, wherein the signs of the angles sought are had by inspection.

<table>
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<th>Degrees</th>
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<td>60°</td>
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MOR [367] MOR

The use of the table is obvious. Suppose, for instance, it be known by experiment, that a mortar is

MORT, to throw a bomb to the distance of

vated fiance, it be known by experiment, that a mortar is 6428. Find this number, or the nearest to it,

ing to 15 degrees, and you will find it

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I. or

fraudulent mortgagor forfeits all equity of redemption

or, in default thereof, to be ever foreclosed. And if the effate he of greater value than

the sum lent thereon, they will allow the mortgagor at

any reasonable time to re-call or redeem his effate;

paying to the mortgagge his principal, intereft, and

expenes: for otherwise, in fidethes of law, an effate

worth 100cl. might be forfeited for n n-payment of

100cl., or a lea sum.

This reasonable advantage, al-

lowed to mortgagors, is called the equity of redemption;

and this enables a mortgagor to call on a mortg-

gage, who has poiffeion of his effate, to deliver it

back, and account for the rents and profits received

on payment of his whole debt and intereft, thereby

turning the mortuum into a kind of vivum vadium; (see Vadium). But, on the other hand, the mort-

gagee may either compel the fale of the effate, in or-

der to get the whole of his money immediately; or

els call upon the mortgagor to redeem his effate pre-

tly, or, in default thereof, to be for ever foreclosed

from redeeming the fame; that is, to lose his equity

of redemption without poibillity of recall. And al-

fo, in fome cafes of fraudulent mortgages, the frau-

dulent mortgagor forfeits all equity of redemption

whatsoever. It is not, however, usual for mortgagors to

take poiffeion of the mortgaged effate, unlefs

where the feurity is precarious, or of small; or where

the mortgagor neglects even the payment of intereft

when the mortgagge is frequently obliged to bring an

ejement, and take the land into his own hands, in

the nature of a pledge, or the pingus of the Roman

law: whereas, while it remains in the hands of the

mortgagor, it more refembls their hypothetical, which

was where the poiffeion of the thing pledged remained

with the debtor. But by statute 7 Geo. II. c. 20,

after payment or tender by the mortgagor of prin-

cipal, intereft, and cofls, the mortgagge can maintain

no ejement; but may be compelled to re-affirm

his feurities.

In Glanvil's time, when the universal me-

thod of conveyance was by livery of fein or corporal

tradition of the lands, no gage or pledge of lands

was good unless poiffeion was also delivered to the

creditor; fi non feinur eflus valli tradidit, curia domini

regis byuufandi privatis conventione non fuset: for

which the rea:on given is, to prevent subfquent and

fraudulent pledges of the fame land; cum in coli eflu

poiffe vadium res pluribus aliis creditoribus tum prius tum

poffiterius invadiari. And the frauds which have

arifen, since the exchange of these public and noto-

rious.
MORTIER, an ensign of dignity, formerly borne by the chancellor and grand presidents of the parliament of France. That borne by the chancellor was a piece of cloth of gold, edged and turned up with ermine; and that of the first president was a piece of black velvet edged with a double row of gold lace, while that of the other presidents was only edged with a single row. This they formerly carried on their heads in grand ceremonies, such as the entry of the king; but ordinarily they carried them in the hand.

MORTIFICATION, in medicine and surgery, a total extirpation of the natural heat of the body, or a part thereof. Some define mortification a disease, wherein the natural juices of any part quite lose their proper motion; and by that means fall into a fermentative one, and corrupt and destroy the texture of the part. See Surgery.

MORTIFICATION, in religion, any severe penance observed on a religious account. How ancient and how universal the practice of it has been, and for what reasons observed, see Fast.

MORTIMER (John), a late English artist, born in 1743. According to Mr Strutt, he was endowed with every requisite to make a great painter; his genius fertile, and his imagination lively. There is an originality in his works which adds greatly to their value. No man perhaps touched the heads and other extremities of his figures with more spirit; and few could draw them more correctly. When he failed, it was from his haste to express his thoughts: so that at times he did not attend with that precision which historical painting requires to the proportion of his figures; and they are sometimes heavy. This defect is, however, well repaid by the lightness of his pencil, and the freedom which appears in his works. He died at his house in Norfolk-street in 1779, aged 36. — "King John granting the Magna Charta to the barons," and the "Battle of Agincourt," two of his capital pictures, have been engraved. The first was nearly finished by Mr Ryland, and completed by Mr Bartolozzi. The latter, intended as a companion to the former, was published by Mrs Mortimer.

MORZISE, or Morzize, in carpentry, &c., a kind of joint wherein a hole of a certain depth is made in a piece of timber, which is to receive another piece called a tenon.

MORTMAIN, or Alienation in Mortmain, is an alienation of lands or tenements to any corporation, fole or aggregate, ecclesiastical or temporal; but these purchases having been chiefly made by religious houses, in consequence whereof the lands became perpetually inherent in one dead hand, this hath occasioned the general appellation of mortmain to be applied to such alienations, and the religious houses themselves to be principally considered in forming the statutes of mortmain: in deducing the history of which statutes, it will be matter of curiosity to observe the great address and subtile contrivance of the ecclesiastics in eluding from time to time the laws in being, and the zeal with which successive parliaments have pursued them through all their finesse.

how new remedies were still the parents of new evils; till the legislature at last, though with difficulty, hath obtained a decisive victory.

By the common law any man might dispose of his lands to any other private man at his own discretion, especially when the feudal restraints of alienation were worfed away. Yet in consequence of these it was always, and is still necessary, for corporations to have a licence of mortmain from the crown, to enable them to purchase lands: for as the king is the ultimate lord of every fee, he ought not, unless by his own consent, to lose his privilege of sales and other feudal profits, by the velling of lands in tenants that can never be attained or die. And such licences of mortmain seem to have been necessary among the Saxons above 60 years before the Norman conquest. But, besides this general licence from the king as lord paramount of the kingdom, it was also requisite, whenever there was a man or intermediate lord between the king and the alienor, to obtain his licence under (upon the same feudal principles) for the alienation of the specific land. And if no such licence was obtained, the king or other lord might respectively enter on the lands so alienated in mortmain, as a forfeiture. The necessity of this licence from the crown was acknowledged by the constitutions of Clarendon, in respect of advowsons, which the monks always greatly coveted, as being the groundwork of subsequent appropriations. Yet such were the influence and ingenuity of the clergy, that (notwithstanding this fundamental principle) we find that the largest and most considerable donations of religious houses happened within less than two centuries after the conquest. And (when a licence could not be obtained) their contrivance seems to have been this: That as the forfeiture for such alienations accrued in the first place to the immediate lord of the fee, the tenant who meant to alienate first conveyed his lands to the religious house, and infantly took them back again to hold as tenant to the monastery; which kind of instantaneous seisin was probably held not to occasion any forfeiture: and then, by pretext of some other forfeiture, surrender, or escheat, the society entered into those lands in right of such they newly acquired signiority, as immediate lords of the fee. But when these donations began to grow numerous, it was observed that the feudal services, ordained for the defence of the kingdom, were every day visibly withdrawn; that the circulation of landed property from man to man began to flagrate; and that the lords were curtailed of the fruits of their signiories, their escheats, wardships, rights, and the like: and therefore, in order to prevent this, it was ordained by the second of King Henry III.'s great charters, and afterwards by that printed in the common statute-books, that all such attempts should be void, and the land forfeited to the lord of the fee.

But as this prohibition extended only to religious houses, bishops and other fole corporations were not included therein; and the aggregate ecclesiastical bodies (who, Sir Edward Coke observes, in this were to be commended, that they ever had of their counsel the best learned men that they could get) found many means to creep out of this statute, by buying in lands that were bona fide holden of themselves as lords of the fee, and thereby evading the forfeiture; or by taking long leases.
Mortmain, leaves for years, which first introduced those extensive terms, for a thousand or more years, which are now so frequent in conveyances. This produced the statute de religiosis, 7 Edward I. which provided, that no person, religious or other whatsoever, should buy, or sell, or receive, under pretence of a gift, or term of years, or any other title whatsoever, nor should by any art or ingenuity appropriate to himself, any lands or tenements, in mortmain; upon pain that the immediate lord of the fee, or, on his default for one year, the lords paramount, and, in default of all of them, the king, might enter thereon as a forfeiture.

This seemed to be a sufficient security against all alienations in mortmain: but as these statutes extended only to gifts and conveyances between the parties, the religious houses now began to set up a fictitious title to the land, which it was intended they should have, and to bring an action to recover it against the tenant: who, by fraud and collusion, made no defence, and thereby judgment was given for the religious house, which then recovered the land by a sentence of law upon a supposed prior title. And thus they had the honour of inventing those fictitious adjudications of right, which are since become the great assurance of the kingdom, under the name of common recoveries. But upon this the statute of Westminster the second, 13 Edw. I. c. 32, enacting, that in such cases a jury shall try the true right of the demandants or plaintiffs to the land; and if the religious house or corporation be found to have it, they shall still recover feisin; otherwise it shall be forfeited to the immediate lord of the fee, or else to the next lord, and finally to the king, upon the immediate or other lords default. And the like provision was made by the succeeding chapter, in case the tenants set up crofts upon their lands (the badges of knights templars and hospitalers) in order to prevent them from the feudal demands of their lords, by virtue of the privileges of those religious and military orders. And so careful was this provident prince to prevent any future evasions, that when the statute of quia emptores, 18 Edward I. abolished all sub-infeudations, and gave liberty for all men to alienate their lands to be held by their next immediate lord, a provision was inserted that this should not extend to authorize any kind of alienation in mortmain. And when afterwards the method of obtaining the king's licence by writ of ad quod damnum was marked out by the statute 27 Edward I. ft. 2, it was farther provided by statute 34 Edward I. ft. 3, that no such licence should be effectual without the consent of the seignors or intermediate lords.

Yet still it was found difficult to set bounds to ecclesiastical ingenuity: for when they were driven out of all their former holds, they devised a new method of conveyance, by which the lands were granted, not to themselves directly, but to nominal feoffees to the use of the religious houses; thus distinguishing between the possession and the use, and receiving the actual profits, while the feisin of the land remained in the nominal feoffee; who was held by the courts of equity (then under the direction of the clergy) to be bound in conscience to account to his cefius que afe for the rents and emoluments of the estate. And it is to these inventions that our prudences are indebted for the introduction of uses and trusts, the foundation of modern conveyancing. But, unfortunately for the inventors themselves, they did not long enjoy the advantage of their new device; for the statute 15 Richard II. c. 5, enacts, that the lands which had been so purchased to uses should be amortized by licence from the crown, or else be sold to private persons, and that for the future uses they shall be subject to the statutes of mortmain, and forfeit like the lands themselves. And whereas the statutes had been eluded by purchasing large tracts of land adjoining to churches, and confecrating them by the name of chanter-yards, such subtle imagination is also declared to be within the compass of the statutes of mortmain. And civil or lay corporations, as well as ecclesiastical, are also declared to be within the mischief, and of course within the remedy provided by those salutary laws. And lastly, as the times of povery lands were frequently given to superstitious uses, though not to any corporate bodies; or were made liable in the hands of heirs and devices to the charge of obits, chauntaries, and the like, which were equally pernicious in a well-governed state as actual alienations in mortmain; therefore at the dawn of the Reformation, the statute 27 Hen. VIII. c. 10, declares, that all future grants of lands for any of the purposes aforesaid, if granted for any longer term than 20 years, shall be void.

But during all this time, it was in the power of the crown, by granting a licence of mortmain, to remit the forfeiture, so far as related to its own rights; and to enable any spiritual or other corporation to purchase and hold any lands or tenements in perpetuity: which prerogative is declared and confirmed by the statute 18 Edw. III. ft. 3. But as doubts were conceived at the time of the Revolution how far such licencce was valid, since the king had no power to dis pense with the statutes of mortmain by a clause of non obstante, which was the usual course, though it seems to have been unnecessary; and as, by the gradual declension of mefne figniories through the long operation of the statute of quia emptores, the rights of intermediate lords were reduced to a very small compass; it was therefore provided by the statute 7 & 8 W. III. c. 37, that the crown for the future at its own discretion may grant licences to alienate or take in mortmain, of whomsoever the tenements may be holden.

After the dissolution of monastaries under H. VIII. though the policy of the next popish successor affected to grant a security to the poofeffors of abbey-lands, yet, in order to regain so much of them as either the zeal or timidity of their owners might induce them to part with, the statutes of mortmain were suspended for 20 years by the statute 1 & 2 P. & M. c. 8. and during that time any lands or tenements were allowed to be granted to any spiritual corporation were allowed to any licence whatsoever. And long afterwards, for a much better purpose, the augmentation of poor livings, it was enacted by the statute 17 Car. II. c. 3, that appropriators may annex the great tithes to the vicarages; and that all benefices under 100l. per annum may be augmented by the purchase of lands, without licence of mortmain in either case; and the like provision hath been since made in favour of the governours of queen Anne's bounty. It hath also been held, that the statute

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Morton, tute 23 Hen. VIII. before-mentioned, did not extend to any thing but superfluous uses; and that therefore a man may give lands for the maintenance of a school, an hospital, or any other charitable uses. But as it was apprehended from recent experience, that persons on their death-beds might make larges and Improvident dispositions even for these good purposes, and defeat the political ends of the statutes of mortmain; it is therefore enacted by the statute 9 Geo. II. c. 36, that no lands or tenements, or money to be laid out thereon, shall be given for or charged with any charitable uses whatsoever, unless by deed indented, executed in the presence of two witnesses: 3 calendar months before the death of the donor, and enrolled in the court of chancery within six months after its execution (except flocks in the public funds, which may be transferred within six months previous to the donor's death), and unless such gift be made to take effect immediately, and be without power of revocation; and that all other gifts shall be void. The two universities, their colleges, and their scholars upon the foundation of the colleges of Eton, Winchester, and Welfmifler, are excepted out of this act: but such exemption was granted with this proviso, that no college shall be at liberty to purchase more advowsons than are equal in number to one moiety of the fellows or students upon the respective foundations.

Morton (Thomas), a learned English bishop in the 17th century, was bred at St John's College, Cambridge, and was logic-lecturer of the university. After several preferments he was advanced to the fee of Chester in 1615, and translated to that of Litchfield and Coventry in 1618; at which time he became acquainted with Antonio de Dominis archbishop of Spalatro, whom he endeavoured to diffuse from returning to Rome. While he was bishop of Litchfield and Coventry, in which fee he sat 14 years, he educated, ordained, and prefented to a living, a youth of excellent parts and memory, who was born blind; and detected the imposture of the famous boy of Bilion in Staffordshire, who pretended to be possessed with a devil. In 1632 he was translated to the fee of Durham, in which he sat with great reputation till the opening of the long parliament, which met in 1640; when he received great insults from the common people, and was committed twice to custody. The parliament, upon the dissolution of bishops' courts, voted him 800l. per annum, of which he received but a small part. He died in 1649, in the 95th year of his age and 44th of his episcopal consecration. He published Apologia Catholica, and several other works; and was a man of extensive learning, great piety, and temperance.

MORTUARY, in law, is a fort of ecclesiastical heriot, being a cultumatory gift claimed by and due to the minister in very many parishes on the death of his parishioners. They feem originally to have been only a voluntary bequest to the church; being intended, as Lyndewode informs us, from a constitution of archbishop Langham, as a kind of expiation and amends to the clergy for the personal tythes, and other ecclesiastical duties, which the laity in their life-time might have neglected or forgotten to pay. For this purpose, after the lord's heriot or bell good was taken out, the second bell chattel was referred to the church as a mortuary. And therefore in the laws of king Canute, this mortuary is called fole-pecus, or symboolum sanitatis. Mortuary.

And, in pursuance of the same principle, by the laws of Venice, where no personal tythes have been paid during the life of the party, they are paid at his death out of his merchandize, jewels, and other moveables. So also, by a similar policy in France, every man that died without bequeathing a part of his estate to the church, which was called dying without confessio, was formerly deprived of Christian burial; or, if he died intestate, the relations of the deceased, jointly with the bishop, named proper arbitrators to determine what he ought to have given to the church, in case he had made a will. But the parliament, in 1409, redressed this grievance.

It was anciently usual in England to bring the mortuary to church along with the corpse when it came to be buried; and thence it is sometimes called a corpf-prent: a term which bespeaks it to have been once a voluntary donation. However, in Bracton's time, so early as Henry III. we find it riveted into an established custom: inasmuch that the bequests of heriots and mortuaries were held to be necessary ingredients in every tittlement of chattels. Imperium in rebus, quibus recognoscat, et fo praecipue in ecclesiastico, quibus recognoscat, et po;fo fenit, et herieta ecclesiastica de aliqua loci mortuaria; the lord must have the bell good left him as a heriot; and the church the second bell as a mortuary. But yet this custom was different in different places: in quibusdam locis habet ecclesia melius animal de confrutudine; in quibusdam fecondum, vel tertium melius; et in quibusdam nihil; et idio conferuntur in confrutudine loci. This custom still varies in different places, not only as to the mortuary to be paid, but the person to whom it is payable. In Wales a mortuary or corpf-prent was due upon the death of every clergyman to the bishop of the diocese; till abolished, upon a recom pense given to the bishop, by the statute 12 Ann. ii. c. 6. And in the archdeaconry of Chester a corpf also prevailed, that the bishop, who is also archdeacon, should have, at the death of every clergyman dying therein, his bell horse or palfrey, with his furniture; his bell gown or cloak; his cup and cover; his gold ring; and his mew or kennel of hounds.

This variety of customs with regard to mortuaries, giving frequently a handle to exactions on the one side, and frauds or expensive litigations on the other, it was thought proper by statute 21 Henry VIII. c. 6. to...
to reduce them to some kind of certainty. For this purpose it is enacted, that all mortuaries, or correfpondents to parties of any parish, shall be taken in the following manner, unless where by custom lefts or none at all is due: viz. for every person who does not leave goods to the value of ten marks, nothing: for every person who leaves goods to the value of ten marks and under 30 pounds, 3l. 4d. if above 30 pounds, and under 40 pounds, 6s. 8d. if above 40 pounds, of what value forever they may be, 10s. and no more. And no mortuary shall throughout the kingdom be paid for the death of any femme-covert; nor for any child; nor for any one of full age, that is not a housekeeper; nor for any wayfaring man; but such wayfaring man's mortuary shall be paid in the parish to which he belongs. And upon this statute stands the law of mortuaries to this day.

MORUS, the mulberry-tree: A genus of the tetrandria order, belonging to the monoeia class of plants; and in the natural method ranking under the 53d order, Scabridae. The male calyx is quadripartite; and there is no corolla; the female calyx is tetraphyllous; there is no corolla; two styles; the calyx like a berry with one seed. There are seven species, viz.

Species. 1. The nigra, or common black-fruited mulberry-tree, rises with an upright, large, rough trunk, dividing into a branchy and very spreading head, rising 20 feet high, or more. It has large, heart-shaped, rough leaves; and monocious flowers, succeded in the females by large fuculent black-berries. There is a variety with jagged leaves and smaller fruit.—

2. The alba, or white mulberry-tree, rises with an upright trunk, branching 20 or 30 feet high; garnished with large, oblique, heart-shaped, smooth, light-green, shining leaves, and monocious flowers succeded by pale-whitish fruit. There is a variety with purplish fruit.

3. The papyrifera, or paper mulberry-tree of Japan, grows 20 or 30 feet high; having large palmated leaves, some trilobate, others quinquenod; and monocious flowers, succeded by small black fruit—

4. The rubra, or red Virginia mulberry-tree, grows 30 feet high; is garnished with very large, heart-shaped, rough leaves, hairy underneath; and has monocious flowers, succeded by small black fruit—

5. The tartaria, dyer's mulberry, or fulfic, has oblong leaves more extended on one side at the base, with axillary thorns. It is a native of Brazil and Jamaica. 6. The tartarica, or Tartarian mulberry, has ovate oblong leaves equal on both sides and equally ferrated. It abounds on the banks of the Weiga and the Tanais. 7. The indica, or Indian mulberry, has ovate oblong leaves, equal on both sides, but unequally ferrated.

The last three species are tender plants in this country; but the four first are very hardy, and succeed in any common soil and situation. The leaves are generally late before they come out, the buds seldom beginning to open till the middle or towards the latter end of May, according to the temperature of the feason; and when these trees in particular begin to expand their foliage, it is a good sign of the near approach of fine warm settled weather; the white mulberry, however, is generally forward in leafing than the black. The flowers and fruit come out soon after the leaves; the males in amenuts, and the females in small roundish heads; neither of which are very conspicuous, nor possess any beauty, but for observation. The female or fruitful flowers always rise on the extremity of the young shoots on short spurs; and with this singularity, that the calyxes of the flowers become the fruit, which is of the berry kind, and composed of many tubercles, each of them furnishing one seed. The fruit matures here gradually from about the end of August until the middle of September. In dry warm seasons, they ripen in great perfection; but when it proves very wet weather, they ripen but indifferently, and prove devoid of flavour.

Uses, &c. Considered as fruit-trees, the nigra is the only proper sort to cultivate here; the trees being not only the most plentiful bearers, but the fruit is larger and much finer-flavoured than that of the white kind, which is the only other sort that bears in this country. The three last species are chiefly employed to form variety in ornamental plantations; tho' abroad they are adapted to more useful purposes.

The fruit of the black mulberry is exceedingly grateful to the taste, and is considered at the same time as laxative and cooling. Like the other acid-fruits, it allays thirst (as Dr Cullen observes), partly by refrigerating, and partly by exciting an excretion of moisture from the mouth and fauces; a similar effect is also produced in the stomach, where, by correcting putrefecency, a powerful cause of thirst is removed. A syrup is made from the berries gathered before they are ripe, which, taken as a gargle, is excellent for allaying inflammations of the throat, and for cleansing ulcers in the mouth. The bark of the root, which has an acrid bitter taste, possesses a cathartic power; and has been successfully used as a vermifuge, particularly in cafes of tania; the dose is half a dram of the powder, or a dram of the infusion. The juice of the black mulberry is also employed to give a colour to certain liquors and confections. Some make from it a wine which is not disagreeable; others employ it for giving a high colour to red wine; which it likewise contributes to make sweet.—Although this juice is of no use in dyeing, it gives a red colour to the fingers and to linen, which it is very difficult to remove. Ver juice, forre, lemon, and green mulberry, resemble familiar kinds of this kind from the hands; but with respect to linen, the best way is to wet the part which has been stained, and to dry it with the vapour of sulphur; the vitriolic acid which escapes from this substance during combustion, instantly takes off the stain.—The wood of the mulberry tree is yellow, tolerably hard, and may be applied to various uses in turnery and carving; But in order to separate the bark, which is rough, thick, thready, and fit for being made into ropes, it is proper to steep the wood in water.

Mulberry trees are noted for their leaves affording the principal food of that valuable insect the silk-worm. The leaves of the alba, or white species, are preferred for this purpose in Europe; but in China, where the belt silk is made, the worms are fed to be fed with those of the morus tartarica. The advantages of white mulberry trees are not confined to the nourishment of worms: they may be cut every three or four years like fallows and poplar trees, to make faggots;
and the sheep eat their leaves in winter, before they are burnt. This kind of food, of which they are extremely fond, is very nourishing; it gives a delicacy to the flesh, and a fineness and beauty to the wool. In short, in every climate and in most fields, it might be proper, as is the case in Spain, to wait for the first hoarfrost shaking off the leaves, which are gathered and placed to dry in sheds or cart-houses, taking care always to stir them from time to time. In Spain, the sheep are fed on these leaves during the cold and frosts. By this method no injury is done to the mulberries, which produce leaves every year; and it is thought that the beauty and fineness of the Spanish wool is in a great measure owing to the use of this kind of food. From these considerations M. Bourgeois infers, that even in countries where, from the nature of the climate, the scarcity of workmen and the high price of labour, or any other particular causes, silk-worms could not be raised to any advantage, the cultivation of mulberry trees ought not be neglected. — The fruit of the white mulberry has a sweetish and very inipid taste. Birds, however, are very fond of it; and it is remarked that those which have been fed with such fruit are excellent eating.

The *papyrifera*, or paper-mulberry, is so called from the paper chiefly used by the Japanzse being made of the bark of its branches; (see the article PAPER.) The leaves of this species also serve for food to the silk worm, and it is now cultivated with success in France. It thrives best in sandy soils, grows faster than the common mulberry, and at the same time is not injured by the cold. M. de la Bouvriere affirms that he procured a beautiful vegetable silk from the bark of the young branches of this species of mulberry, which he cut while the tree was in sap, and afterwards beat and steeped. The women of Louifiana procure the same kind of production from the shoots which issue from the stalk of the mulberry, and which are four or five feet high. After taking off the bark, they dry it in the sun, and then beat it that the external part may fall off; and the internal part, which is fine bark, remains entire. This is again beaten, to make it still finer; after which they bleach it with dew. It is then spun, and various fabrics are made from it, such as nets and fringes; they even sometimes weave it and make it into cloth.—The finest florf of cloth among the inhabitants of Otaheite and others of the South Sea Islands, is made of the bark of this tree, in the manner particularly described under the article BARK.

The *involutia* is a fine timber-tree, and a principal ingredient in most of our yellow dyes, for which it is chiefly imported into Europe. The berries are sweet and wholesome; but not much used, except by the winged tribe, by whose care it is chiefly planted.

Culture of the Mulberry. From the nourishment which it affords to the silk-worm, that valuable insect to which we are indebted for the materials of our finest stuffs, the method of cultivating the mulberry tree must be peculiarly interesting wherever its culture can be undertaken with success. In France and Italy, vast plantations of the trees are made solely for their leaves to feed the little animals we have mentioned, which amply reward the poulwer with the supply of silk which they spin from their bowels. Plantations of the mulberry have at different times been recommend-
ed in England for the same purpose; though nothing has yet been done in that way to any extent, and even the expediency of any such attempt has been doubted by others, upon the ground of its interfering with other branches of rural economics more productive and more congenial to the climate.

In the European silk-countries, a great many varieties of mulberry trees are distinguished, arising from difference of climate, soil, method of culture, and other accidental causes. Among the wild mulberries, we meet with some whose leaves are roundish, and resembling those of a rose; hence they have been called the rose-leaved mulberry.

Mulberry trees were first cultivated in France in the reign of Charles IX. It has been found by experience that this tree is not so peculiar to warm countries, such as Spain, Italy, Provence, Languedoc, and Piedmont; but it may also thrive very well in colder countries, such as Touraine, Poitou, Maine, Anjou, Angoumois near Rochefoucauld, and even in Germany, where it affords very good nourishment for silk-worms. They grow in all kinds of soil: they thrive best in strong and wet lands; but it is alleged that their leaves constitute too coarse food, prejudicial to the worms, and unfavourable to the quality of the silk. — A good light land is the best kind of soil for raising them. White mulberry trees have been found to grow in sandy soils where heat would scarcely vegetate; but their leaves are too dry, and afford not sufficient nourishment for the silk-worms.

Mulberry trees may be propagated either from shoots which have taken root, or by seed, by layers, and by slips. To raise black mulberry trees, the seed must be taken from the largest and most beautiful mulberries: in raising white ones, the seed is taken from the finest mulberries growing on trees with large whitish soft and tender leaves, and as little cut as possible. The best seed is commonly got from Piedmont, Languedoc, &c. According to M. Duhamel, that seed should be preferred which is gathered in counties where the cold is sometimes pretty severe; because in that case the trees are better able to resist the attacks of the frost. It frequently happens in severe winters, as M. Bourgeois observes, that the flanks of the young mulberry trees, especially during the first winter, are destroyed by the frost; but when they are cut close to the earth, they fend forth as beautiful and vigorous flanks as the former. Good seed ought to be large, heavy, light coloured, to produce a great deal of oil when it is pressed, and to crackle when thrown on a red hot flask. This seed must be sown in good land.

In the autumn of the second year, all those trees must be pulled up which have small leaves of a very deep green, rough, and deeply indented, for they would produce no leaves proper for the silk worms. — In the third year, when the mulberry tree is about the thickness of the finger, it must be taken up and put in the nursey. According to M. Bourgeois, mulberries ought to be transplanted in the spring of the second year, which makes them thrive better, and sooner attain their growth. Without this transplantation, they would put forth only one root like a pivot and most of them would be in danger of perishing when they are taken up to be put where they are intended.
tended to remain. Some cultivators of this tree tell us, that all the young trees, whether large or small, straight or crooked, ought to be cut close to the ground in the third year, that they may put forth a greater number of roots. Others never employ this method but with regard to those which are crooked, or in a languishing state.

White mulberries may be raised for the food of silk-worms, either in the form of a copse, or planted in a regular order, by letting them grow to their natural size. Ingrafting is one of the surest methods of producing fine leaves from mulberries. Mulberries ingrafted on wild flocks chosen from a good kind, such as those which are produced from the seed of the Italian mulberry, commonly called the *rofe-mulberry*, or of the Spanish mulberry, produce, as M. Bourgeois observes, much more beautiful leaves, and of a much better quality, for silk-worms, than those which are ingrafted on the common or prickly small-leafed wild-flock. The same observation has been made by a great many cultivators of mulberries, and in particular by M. Thomé of Lyons, whose authority has the greatest weight in whatever regards the cultivation of mulberries and the rearing of silk-worms.

Ingrafted mulberries, it must be confessed, produce a greater number of leaves, and these more nourishing for silk-worms, than wild mulberries. The latter, however, it has been found by experience, may exit for two centuries; whereas the extension of leaves middling size, inclining to a light yellow, and of an excellent size to those of a gourd. The *Laurus*, being of an excellent quality and much esteemed.

Of the white ingrafted mulberry-trees, the rofe, or Italian ingrafted mulberry, which is now the species most cultivated in France, Italy, and Piedmont, produces great abundance of large, thick and smooth leaves. It has now come into great repute, in consequence of the recommendation of M. Thomé, who prefers it to all other species of mulberry-trees for producing indented leaves, oblong, and very slender; but it is worth being attended to, because it thrives very well when planted in a hedge, and in a favourable exposure: it is also earlier in the spring than the other species. The wild mulberry, which is produced from the rofe or Italian ingrafted mulberry, bears a great many leaves, of a roundish shape and middling size, inclining to a light yellow, and of an excellent quality.

MOSA, (anc. geog.) a river of Belgica, rising in mount Vogelas on the borders of the Lingones, and which, after receiving a part of the Rhine called *PalaEURS*, forms the fland of the Batavi, and paffes off into the sea, at no greater distance than 80 miles: its mouth, which is large and broad, is that which Pliny calls *Helius*, denoting *Lower*, according to some German writers. Now called the *Moes", or *MOLF*, rising in Champaign, on the borders of the county of Burgundy, or the Franche Comté, at a village called *Moufl", whence the appellation; and running north through Lorrain and Champaign into the Netherlands: it afterwards directs its course north-east, and then west; and joining the Waal, runs to Dort, and...
falls into the German sea, a little below the Briel.—

According to Baudrand, it twice receives the Waal; by the first junction forming the island Bommel; and again receives it at Worcum, from which place proceeding to Dort, it divides into two branches, which again uniting together form one large mouth discharging itself into the German sea.

MOSÆ Fons (anc. geog.), supposed to be Maestricht, situated on the Maesse. E. Long. 5. 40. N. Lat. 50° 55'

MOSAIC LAW, or the Law of Moses, is the most ancient that we know of in the world, and is of three kinds; the moral law, the ceremonial law, and the judicial law. * The different manner in which each of these was delivered, may perhaps suggest to us a right idea of their different natures. The moral law, or ten commandments, for instance, was delivered on the top of the mountain, in the face of the whole world, as being of universal influence, and obligatory on all mankind. The ceremonial was received by Moses in private in the tabernacle, as being of peculiar concern, belonging to the Jews only, and defined to cease when the tabernacle was down, and the vail of the temple rent. As to the judicial law, it was neither so publicly nor so audibly given as the moral law, nor yet so privately as the ceremonial; this kind of law being of an indifferent nature, to be observed or not observed, as its rites suit with the place and government under which we live. The five books of Moses called the Pentateuch are frequently styled, by way of emphasis, the Law. This was held by the Jews in such a spirit of their different natures. The moral law, or the Law of Moses, is the most severe, as its rites suit with the place and government of an indifferent nature; to be observed or not observed. The MOSAIC LAW, or the Law of Moses, is the most severe, as its rites suit with the place and government of an indifferent nature; to be observed or not observed. The moral law, or the Law of Moses, is the most severe, as its rites suit with the place and government of an indifferent nature; to be observed or not observed. The judicial law

A TABLE or HARMONY of the MOSAIC LAW, digested into proper Heads, with References to the several Parts of the PENTATEUCH where the respective Laws occur.

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| CLASS II. The Ceremonial Law may be fitly reduced to the following heads, *viz. | | | | |
|---|---|---|---|
| Of the holy place, | 20. | 17. | --- | 12. |
| Of the matter and structure of the tabernacle, | 25. 26. | 25. 35. | --- | --- |
| Of the instruments of the same, *viz. | 30. | --- | --- | --- |
| The laver of brass, | 27. | --- | --- | --- |
| The altar of burnt offering, | 25. | --- | --- | --- |
| The altar of incense, | 25. 26. | --- | --- | --- |
| The candlestick of pure gold, | 28. | --- | --- | --- |
| The table of shew-bread, | --- | 18. 3. 8. | --- | --- |
| Of the priests and their vestments for glory and beauty, | --- | 3. 18. | --- | --- |
| Of the choosing of the Levites, | --- | --- | --- | --- |
| Of the priest's office in general, | --- | --- | --- | --- |
| Of their office in teaching, | 19. 10. | --- | 18. 12. | --- |
| Of their office in blessing, | --- | 6. | 17. 31. | --- |
| Of their office in offering; which function largely spreading itself, is divided into these heads, *viz. | --- | --- | --- | --- |
| What the sacrifice ought to be, | 22. | --- | 15. 17. | --- |
| Of the continual fire, | 6. | --- | --- | --- |
| Of the manner of the burnt offerings, | 6. 7. | --- | --- | --- |
| The peace offerings, | 3. 7. | --- | --- | --- |
Of the manner of the sacrifices, according to their several kinds, viz.

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<td>6. 17. 19. 20.</td>
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<td>In the dead bodies of men,</td>
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Of circumcision,
Of the water of expiation,
Of the mourning of the Israelites,
Of mixtures,
Of their garments, and writing the law privately,
Of young birds not to be taken with the dam,
Of their paddle leaves,

**Class III. The Political Law.**

N. B. The Magistrate is the Keeper of the Precepts of both Tables, and to have respect to human Society:—therefore the Political Laws of the Israelites are referred to both the Tables, and are to be reduced to the several Precepts of the Moral Law.

Laws referred to the first table, namely,

1st. To the first and second commandments, viz.
   Of idolators and apostates,
   Of abolishing idolatry,
   Of diviners and false prophets,
   Of covenants with other gods,

2d. To the third commandment, viz.
   Of blasphemies,

3d. To the fourth commandment, viz.
   Of breaking the sabbath,

Political laws referred to the second table,

1st. To the fifth commandment, viz.
   Of magistrates and their authority,
   Of the power of fathers,

2d. To the sixth commandment, viz.
   Of capital punishments,
   Of wilful murder,
   Of manslaughter unwittingly committed, and of the cities of refuge,
   Of heinous injury,
   Of punishments not capital,
   Of the law of war,

3d. To the seventh commandment, viz.
   Of unlawful marriages,
   Of fornication,
   Of whoredom,
   Of adultery and jealousy,
   Of copulation against nature,
   Of divorcements,

Other matrimonial laws,

4th. To the eighth commandment, viz.
   Of the punishment of thefts,
   Of sacrilege,
   Of not injuring strangers,
   Of not defrauding hirelings,
   Of just weights,
   Of removing the land-mark,
   Of lost goods,
   Of stray cattle,
   Of corrupted judgments,
   Of fire breaking out by chance,
   Of man-slaughtering,
   Of the fugitive servant,
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Of gathering fruits, - - -
Of contracts, viz. - - -
Borrowing, - - -
Of the pledge, - - -
Of injury, - - -
Of filling, - - -
Of the thing lent, - - -
Of a thing committed to be kept, - - -

5th. To the ninth commandment, viz.
Of witnesses,
The establishing the political law,
The establishing the divine law in general,

From the dignity of the lawgiver,
From the excellency of the laws,
From the promises,
From the threatenings,

MOSAIC, or MOSAIC-WORK, an assemblage of little pieces of glafs, marble, precious stones, &c. of various colours, cut square, and cemented on a ground of stucco, in such a manner as to imitate the colours and gradations of painting. The critics are divided as to the origin and reason of the name. Some derive it from MOSAICUM, a corruption of MUSAICUM, as that is of MUSIACUM, as it was called among the Romans. Scaliger derives it from the Greek mosaikos, and imagines the name was given to this sort of works as being very fine and ingenious. Nebricienis is of opinion it was so called, because ex hic pistoris ornamuntur musea.

1. The method of performing Mosaic-work of glafs is this: provide little pieces of glafs, of as many different colours and sizes as possible.

Now, in order to apply these several pieces, and out of them to form a picture, they in the first place procure a cartoon or design to be drawn; this is transferred to the ground or plaster by calking, as in painting in fresco. See FRESCO.

As this plaster is to be laid thick on the wall, and therefore will continue fresh and soft a considerable time, so there may be enough prepared at once to serve for as much work as will take up three or four days.

This plaster is composed of lime made of hard stone, with brick-dust very fine, gum tragacanth, and whites of eggs: when this plaster has been thus prepared and laid on the wall, and made the design of what is to be represented, they take out the little pieces of glafs with a pair of pliers, and range them one after another, still keeping strictly to the light, shadow, different tints, and colours represented in the design before; prefilling or flattening them down with a ruler, which serves both to fix them within the ground and to render the surface even.

Thus, in a long time, and with a great deal of labour, they finish the work, which is still the more beautiful, as the pieces of glafs are more uniform, and ranged at an even height.

Some of these pieces of mosaic-work are performed with that exactness, that they appear as smooth as a table of marble, and as finished and mellowly as a painting in fresco; with this advantage, that they have a fine lustre, and will last ages.

The finest works of this kind that have remained till our time, and those by whom the moderns have retrieved the art, which was in a manner lost, are those in the church of St Agnes, formerly the temple of Bacchus, at Rome; and some at Pisa, Florence, and other cities of Italy. The most esteemed among the works of the moderns are those of Joseph Pine and the Chevalier Lanfranc, in the church of St Peter at Rome: there are also very good ones at Venice.

2. The method of performing Mosaic-work of marble is this: The ground of Mosaic-works, wholly marble, is usually a massive marble, either white or black. On this ground the design is cut with a chisel, after it has been first calked. After it has been cut off a considerable depth, i.e. an inch or more, the cavities are filled up with marble of a proper colour, first fashioned according to the design, and reduced to the thickness of the indentures with various instruments. To make the piece thus formed into the indentures cleave fast, whose several colours are to imitate those of the design, they use a stucco, composed of lime and marble-dust; or a kind of mastic, which is prepared by each workman, after a different manner peculiar to himself. The figures being marked out, the painter or sculptor himself draws with a pencil the colors of the figures not determined by the ground, and in the same manner makes strokes or hatchings in the place where shadows are to be: and after he has engraved with the chisel all the strokes thus drawn, he fills them up with a black mastic, composed partly of Burgundy-pitch poured on hot; taking off afterwards what is superfluous with a
piece of soft stone or brick, which together with water and beaten cement, takes away the mastic, polishes the marble, and renders the whole so even that one would imagine it only composed of one piece. This is the kind of Mosaic-work that is seen in the pompous church of the invalids at Paris, and the fine chapel at Versailles, with which every entire apartments of that palace are incrustated.

3. As for Mosaic-work of precious stones, other and finer instruments are required than those used in marble; as drills, wheels, &c., used by lapidaries and engravers on stone. As none but the richest marbles and stones enter this work, to make them go the farther, they are fawn into the thinnest leaves imaginable, scarce exceeding half a line in thickness; the block to be sawn is gradually with cords on the bench, and only raised a little on one side the block and which besides has this convenience, which it admits of continued pieces or framing of the design, they are applied to the ground.

The ground which supports this Mosaic-work is usually of free-stone. The matter with which the stones are joined together is a mastic, or kind of stucco, laid very thin on the leaves as they are fashioned; and this being done, the leaves are applied with plicys.

If any contour, or fide of a leaf, be not either squared or rounded sufficiently, so as to fit the piece exactly into which it is to be inserted, when it is too large, it is to be brought down with a brass file or rasp; and if it be too little, it is managed with a drill and other instruments used by lapidaries.

Mosaic-work of marbles is used in large works, as in pavements of churches, basilicas, and palaces; and in the incrustation and vaneering of the walls of the same edifices.

As for that of precious stones, it is only used in small works, as ornaments for altar pieces, tables for rich cabinets, precious stones being so very dear.

4. Manner of performing Mosaic-work of gypsum. Of this stone calcined in a kiln beating in a mortar, and sifted, the French workmen made a sort of artificial marbles, imitating precious stones; and of these they compose a kind of Mosaic-work, which does not come far short either of the durability or the vivacity of the natural stones; and which besides has this advantage, that it admits of continued pieces or painting of entire compartments without any visible jointing.

Scene make the ground of plaster of Paris, others of free stone. If it be of plaster of Paris they spread it in a wooden frame, of the length and breadth of the work intended, and in thickness about an inch and a half. This frame is so contrived, that the tenons being only joined to the mortises by single pins, they may be taken afunder, and the frame be dismounted when the plaster is dry. The frame is covered on one side with a strong linen cloth, nailed all round; which being placed horizontally with the linen at the bottom, is filled with plaster passed through a wide sieve. When the plaster is half dry, the frame is set up perpendicularly, and left till it is quite dry; then it is taken out, by taking the frame to pieces.

In this Mosaic, the ground is the most important part. Now in order to the preparation of this sifted gypsum, which is to be applied on this ground, it is divided and boiled in the belt English glue, and mixed with the colour that it is to be of; then the whole is worked up together into the usual consistence of plaster, and then is taken and spread on the ground five or six inches thick. If the work be such, as that mouldings are required, they are formed with gouges and other instruments.

It is on this plaster, thus coloured like marble or precious stone, and which is to serve as a ground to a work, either of lapis, agate, alabaster, or the like, that the design to be represented is drawn; having been first pounced or calqued. To hollow or impress the design they use the same instruments that sculptors do; the ground wherein they are to work not being much less hard than the marble itself. The cavities being thus made in the ground, are filled with the same gypsum boiled in glue, only differently coloured, and thus are the different colours of the original represented. In order that the necessary colours and tints may be ready at hand, the quantities of the gypsum are tempered with the several colours in pots. After the design has been thus filled and rendered visible, by half-polishing it with brick and soft stone, they go over it again, cutting such plates as are either to be weaker or more shadowed, and filling them with gypsum; which work they repeat till all the colours are added one after the other, represent the original to the life. When the work is finished, they scour it with soft stone, sand, and water; after that, with a pumice-stone; and in the last place polish it with a wooden mullet and emery. Lastly, they give it a lustre, by fine-sieving it over with oil, and rubbing it a long time with the palm of the hand, which gives it a lustre no ways inferior to that of natural marble.

5. In Clavigero's history of Mexico is described a curious kind of Mosaic-work made by the ancient Mexicans of the most delicate and beautiful feathers of birds. They raised for this purpose various species of birds of fine plumage with which that country abounds, not only in the palaces of the king, where there were all sorts of animals, but likewise in private houses; and at certain times they called them off their feathers to make use of them on this kind of work, or to sell them at market. They set a high value on the feathers of those wonderful little birds which they call Huiafinius, and the Spanish Pliefores, on account of the smallness, the fineness, and the various colours of them. In these other beautiful birds, nature supplied them with all the colours which art can produce, and also some which art cannot imitate. At the undertaking of every Mosaic-work several artists assembled: After having agreed upon a design, and taken their measures and proportions, each artist charged himself with the execution of a certain part of the image; and exerted himself so diligently in it with such patience and application, that he frequently spent a whole day in adorning a feather; first tuning one, then another, viewing it sometimes one way, then another.
MOSCHION, a name common to four different writers, whose compositions, character, and native place, are unknown. Some fragments of their writings remain, some few verses, and a treatise De Mulierum affedibus.

MOSCHUS, a Grecian poet of antiquity, usually coupled with Bion; and they were both of them contemporaries with Theocritus. In the time of the latter Grecians, all the ancient Idyls were collected and attributed to Theocritus; but the claims of Moschus and Bion have been admitted to some few little pieces; and this is sufficient to make us inquisitive about their characters and story; yet all that can be known about them must be collected from their own remains. Moschus, by composing his delicate elegy on Bion, has given the best memorials of Bion's life. See Bion. Moschus and Theocritus have by some critics been supposed the same person; but there are irrefragable evidences against it: others will have him as well as Bion to have lived later than Theocritus, upon the authority of Suidas: while others again suppose him to have been the scholar of Bion, and probably his successor in governing the poetic school; which, from the elegance of Moschus, does not seem unlikely. Their remains are to be found in all the editions of the Poetae Minores.

MOSCHUS, in zoology, a genus of quadrupeds of the order of pecora, having no horns. There are eight small cutting teeth in the lower jaw; in the upper, no cutting or fore teeth; but two long tusks, one on each side, projecting out of the mouth.

1. The mochiferus, or Thibet mule, has a bag or tumour on the belly near the navel, and a very short tail almost hid in the fur. The length of the male is about three feet three inches from the nose to the origin of the tail, and about two feet three inches high at the shoulder; the female is less than the male, has a sharper nose, has no hair on the maxilla hare; and is provided with two teats. The head resembles that of the roe: the fur is coarse like that of the animals of the deer kind; but softer, very smooth, ereft, plentiful, thick, and long: the colour varies according to the age of the animal and time of the year; but is chiefly blackish brown on the upper, and heary, seldom white, on the under parts of the body: the hoofs are long, black, and much divided, and the spurious hoofs of the fore feet are very long: the scrotum is of a bright red colour, and the penis very small. It inhabits the Aftatic Alps, especially the highest rocky mountains from the Aftatic chain to that which divides Thibet from India; likewise in China and Tonquin, and in eastern Siberia about lake Baikal and the rivers Jenisea and Argun. It avoids mankind, dwelling solitarily in the most precipitous places of the mountains, among rocks in the small narrow valleys surrounded by these snowy hills, and the pine forests which grow in their interstices. It is a very gentle and timid animal, excepting in rutting time, when the males fight violently with their tusks for the females; it is exceedingly active in leaping, running, climbing, and swimming, and is very difficultly tamed; the flesh is edible, and that of the younger animals is reckoned delicate. The
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Moscow, the chief province of the empire of Russia, deriving its name from the river Muscovy, or Moskva, on which the capital is situated. It was from this duchy that the czars of old took the title of dukes of Moscovy. The province is bounded on the north by the duchies of Tver, Rostow, Sufdal, and Wolodimer; on the south by Rezan, from which it is separated by the river Ocka; on the east by the principality of Cachin, and the same river Ocka parting it from Nisf Novgorod; and on the west by the duchies of Rezva, Biela, and Smolenko. It extends about 200 miles in length, and about 100 in breadth; and is watered by the Moskva, Ocka, and Clefn, by the Wolga; which fall into the Wolga: nevertheless, the soil is not very fertile. The air, however, though sharp, is salubrious; and with this advantage, with the advantage of its being situated in the midst of the best provinces in the empire, induced the czars to make it their chief residence. In the western part of Moscovy is a large forest, from whence flows the celebrated river Nieper, or Borythenes, which, traversing the duchy of Smolensko, winds in a serpentine course to Ukraine, Lithuanian, and Poland.

Moscow, the capital of the above province, and till the beginning of the present century the metropolis of all Russia, is situated in a spacious plain on the banks of the river Moskova. The Russian antiquaries differ considerably in their opinions concerning the first foundation of Moscow. The following relation, Mr. Coxe says, is generally esteemed by the best authors the most probable account. Kiof was the metropolis, when George son of Vladimir Monomakoff ascended in 1154 the Russian throne. That monarch, being infatuated in a progress through his dominions by a rich and powerful nobleman named Stephen Kutchko, put him to death, and confiscated his domains, which contained the lands now occupied by the city of Moscow and the adjacent territory. Kiof was situated near the river of that name. Upon the death of George, the new town was not neglected by his son Andrew, who transferred the seat of empire from Kiof to Vladimir; but it fell into such decay under his immediate successors, that when Daniel, son of Alexander Nevski, received, in the division of the empire, the duchy of Muscovy as his portion, and fixed his residence upon the confluence of the Moskva and Neglin, he may be said to have new founded the town. The spot now occupied by the Kremlin was at that time overspread with a thick wood and a morass, in the midst whereof was a small island containing a single wooden hut. Upon this part Daniel constructed churches and monasteries, and various buildings, and enclosed
Mocov. enclosed it with wooden fortifications; he first assumed the title of duke of Mocov, and so was attached to this situation, that when in 1304 he succeeded his brother Andrew Alexanderovich in the great duchy of Vladimir, he did not remove his court to Vladimir, but continued his residence at Mocov, which then became the capital of the Russian dominions. His successors followed his example; among whom his son Ivan considerably enlarged the new metropolis, and in 1567 his grandson Demetrius Ivanovitch Donfki surrounded the Kremlin with a brick wall. These new fortifications, however, were not strong enough to prevent Tamerlane in 1382 from taking the town, after a short siege. Being soon evacuated by that defeat, it again came into the possession of the Russians; but was frequently invaded and occupied by the Tartars, who in the 14th and 15th centuries over-ran the greatest part of Russia, and who even maintained a garrison in Mocov until they were finally expelled for Ivan Vaflilevitch I. To him Mocov is indebted for its principal splendor, and under him it became the principal and most considerable city of the whole empire.

Mocov continued the metropolis of Russia until the beginning of the present century, when, to the great dissatisfaction of the nobility, but with great advantage probably to the state, the seat of empire, was transferred to Peterburgh.

Notwithstanding the predilection which Peter conceived for Peterburgh, in which all the succeeding sovereigns excepting Peter II. have fixed their residence, Mocov, according to Mr. Coxe, is still the most populous city of the Russian empire. Here the chief nobles who do not belong to the court of the empress reside: they here support a larger number of retainers; they love to gratify their taste for a ruder and more expensive magnificence in the ancient style of feudal grandeur; and are not, as at Peterburgh, eclipsed by the superior splendor of the court.

Mocov is represented as the largest town in Europe; its circumference within the rampart, which encloses the suburbs, being exactly 39 versts or 26 miles; but it is built in a straggling and disjointed manner, that its population in no degree corresponds to its extent. Some Russian authors state its inhabitants at 500,000 souls, a number evidently exaggerated. According to a late computation, which Mr. Coxe may be depended upon, Mocov contains within the ramparts 250,000 souls, and in the adjacent villages 50,000. The streets of Mocov are in general exceedingly long and broad; some of them are paved; others, particularly those in the suburbs, are formed with trunks of trees, or are boarded with planks like the floor of a room; wretched hovels are blended with large palaces; cottages of one story stand next to the most superb and stately mansions. Many brick structures are covered with wooden tops; some of the wooden houses are painted; others have iron doors and roofs. Numerous churches present themselves in every quarter, built in a peculiar style of architecture; some with domes of copper, others of tin, gilt or painted green, and many roofed with wood.

In a word, some parts of this vast city have the look of a deserted fort, other quarters of a populous town; some of a contemptible village, others of a great capital.

Mocov may be considered as a town built upon the Asiatic model, but gradually becoming more and more European, and exhibiting in its present state a motley mixture of discordant architecture. It is distributed into the following divisions. 1. The Kremlin. This stands in the central and highest part of the city; is of a triangular form, and about two miles in circumference; and is surrounded by high walls of stone and brick, which were constructed in the year 1491, under the reign of Ivan Vaflilevitch I. It contains the ancient palace of the czars, several churches, two convents, the patriarchal palace, the arsenal now in ruins, and one private house, which belonged to Boris Godunov before he was raised to the throne. 2. Khitaigorod, or the Chinese town, is enclosed on one side by that wall of the Kremlin which runs from the Mokva to the Neglina; and on the other side by a brick wall of inferior height. It is much larger than the Kremlin, and contains the university, the printing-house, and many other public buildings, and all the trade and manufacturing shops. The edifices are generally stuccoed or white-washed, and it has the only street in Mocov in which the houses stand close to one another without any intervals between them. 3. The Biegorod, or White Town, which runs quite round the two preceding divisions, is supposed to derive its name from a white wall with which it was formerly enclosed, and of which some remains are still to be seen. 4. Semlainogorod, which environs all the three other quarters, takes its denomination from a circular rampart of earth with which it is encompassed. These last-mentioned divisions exhibit a grotesque group of churches, convents, palaces, brick and wooden houses, and mean hovels; and a degree of poverty prevailing that at the present day. The Sloboda, or suburbs, form a vast exterior circle round all the parts already described, and are inhabited by a low rampart and ditch. These suburbs contain, besides buildings of all kinds and denominations, corn fields, much oxen pasture, and some small lakes, which give rise to the Neglina. The river Mokva, from which the city takes its name, flows through it in a winding channel; but, excepting in spring, is only navigable for rafts. It receives the Yaufa in the Semlainogorod, and the Neglina at the western extremity of the Kremlin; the beds of both these last-mentioned rivulets are in summer little better than dry channels.

The places of divine worship at Mocov are exceedingly numerous; including chapels, they amount to above 1000; there are 484 public churches, of which 199 are of brick, and the others of wood; the former are commonly stuccoed or white-washed, the latter painted of a red colour. The most ancient churches of Mocov are generally square buildings, with a cupola and four small domes; some whereof are of copper or iron gilt; others of tin; either plain or painted green. These cupolas and domes for the most part ornamented with croffes entwined with thin chains or wires. The church of the Holy Trinity sometimes called the church of Jerusalem, which stands in the Khitaigorod, close to the gate leading into the Kremlin, has a kind of high steeple and nine or ten domes.
Kremlin, are both in the same elegant. In the cathedral of St. Michael, in chronological order with such manuscripts relative to foreign kingdoms and about two feet in height. When Mr. Coxe visited it, the manu- scripts were expediently to the ceiling and occasionally touching the ground with their heads. The bell, which form no considerable part of public worship in this country, as the length or shortness of their peals affirms the greater or lesser sanctity of the day, are hung in belfries detached from the church: they do not swing like our bells; but are fixed immovably to the beams, and are rung by a rope tied to the clapper and pulled sideways. Some of these bells are of a stupendous size: one in the tower of St. Ivan's church weighs 3551 Russian pounds, or 127,836 English pounds. It has always been esteemed a meritorious act of religion to present a church with bells: and the piety of the donor has been measured by their magnitude. According to this mode of estimation, Boris Godunoff, who gave a bell of 288,000 pounds to the cathedral of Moscow, was the most pious sovereign of Russia; until he was surpassed by the empress Anne, at whose expense a bell was cast weighing 432,000 pounds, and which exceeded in bigness every bell in the known world. The height of this enormous bell is 19 feet, its circumference at the bottom 21 yards 11 inches; its greatest thickness 23 inches. The beam to which this vast machine was fastened being accidentally burnt, the bell fell down, and a fragment was broken off towards the bottom, which left an aperture large enough to admit two persons abreast without stopping.

The palace, inhabited by the ancient czars, stands at the extremity of the Kremlin. Part of this palace is old, and remains in the same state in which it was built under Ivan Vassilievitch I. The remainder has been successively added at different intervals without any plan, and in various styles of architecture, which has produced a motley pile of building, remarkable for nothing but the incongruity of the several structures. The top is thickly set, with numerous little gilded spires and globes; and a large portion of the front is decorated with the arms of all the provinces which compose the Russian empire. The apartments are in general exceedingly small, excepting one single room called the council-chamber, in which the ancient czars used to give audience to foreign ambassadors, and which has been repeatedly defribed by several English travellers who visited Moscow before the imperial residence was transferred to Petersburg. The room is large and vaulted, and has in the centre an enormous pillar of stone which supports the ceiling. In this palace Peter the Great came into the world, in the year 1672. In that part called the treasury are reposited the crown, jewels, and royal robes, used at the coronation of the sovereign, besides several curiosities relative to the history of the country. Of the great number of churches contained in this city, two in particular, namely, that of St. Michael and that of the Assumption of the Virgin Mary, are remarkable; the one for being the place where the sovereigns of Russia were formerly interred, and the other where they are crowned. These edifices, which are situated in the Kremlin, are both in the same style of architecture; and their exterior form, though modelled according to the ancient style of the country, is not absolutely elegant. In the cathedral of St. Michael, which contains the tombs of the Russian sovereigns, the bodies are not, as with us, deposited in vaults, but are entombed in raised pulpits, mostly of brick, in the shape of a coffin, and about two feet in height. When Mr. Coxe visited the cathedral, the most ancient were covered with piles of red cloth, others of red velvet, and that of Peter II with gold tissue, bordered with silver fringe and ermine. Each tomb has at its lower extremity a small silver plate, upon which is engraved the name of the deceased sovereign, and the era of his death.

The cathedral of the Assumption of the Virgin Mary, which has long been appropriated to the coronation of the Russian sovereigns, is the most splendid and magnificent in Moscow. The screen is in many parts covered with plates of solid silver and gold richly worked. From the centre of the roof hangs an enormous chandelier of maffy silver, weighing 2940 pounds; it was made in England, and was a present from Morosoff, prime minister and favourite of Alexey Michaelovitch. The sacred utensils and episcopal vestments are extraordinarily rich, but the taste of the workmanship is in general rude, and by no means equal to the materials. Many of the paintings which cover the inside walls are of a colossal size; none are very ancient, and were executed so early as in the latter end of the 11th century. It contains, amongst the rest, a head of the virgin, supposed to have been delineated by St. Luke, and greatly celebrated in this country for its sanctity and the power of working miracles. Its face is almost black; its head is ornamented with a glory of precious stones and its hands and body are gilded, which gives it a most grotesque appearance. It is placed in the ikreen, and enclosed within a large silver covering, which is only taken off on great festivals, or for the curiosity of strangers. In this cathedral are deposited the remains of the Russian patriarchs.

The place in the Khitaigorod, where the public archives are deposited, is a strong brick building, containing several vaulted apartments with iron floors. These archives consisting of a numerous collection of flat-papers, were crowded into boxes, and thrown aside like common lumber, until the present empress ordered them to be revised and arranged. In conformity to this mandate, Mr. Muller has disposed them in chronological order with such perfect regularity, than any single document may be inspected with little trouble. They are enclosed in separate cabinets with glass doors; those relative to Russia are all clasped according to the several provinces which they concern; and over each cabinet is inscribed the name of the province to which it is appropriated. In the same manner the manuscripts relative to foreign kingdoms are placed in separate divisions under the respective titles of Poland, Sweden, England, France, Germany, Sc.

The university of Moscow, also situated in the Khitaigorod, was founded, at the instance of Count Shuvalof, by the empress Elizabeth, for 600 students; who are clothed,
Moscow is the centre of the inland commerce of Russia, and particularly connects the trade between Europe and Siberia. The only navigation to this city is formed by the Moskva, which falling into the Oka near Columna, communicates by means of that river with the Volga. But as the Moskva is only navigable in spring upon the melting of the snows, the principal merchandise is conveyed to and from Moscow upon flegdes in winter. As to the retail commerce here, the whole of it is carried on in the Khlitagorod, where, according to a custom common in Russia, as well as in most kingdoms of the East, all the shops are collected together in one spot. The place is like a kind of fair, confiting of many rows of low brick buildings; the interval between them resembling alleys. These shops or booths occupy a consider-able space; they do not, as with us, make part of the houses inhabited by the tradesmen, but are quite detached from their dwellings, which for the most part are at some distance in another quarter of the town. The tradesman comes to his shop in the morning, remains there all day, and returns home to his family in the afternoon. Every trade has its separate department; and they who sell the same goods have booths adjoining to each other. Furs and skins form the most considerable article of commerce in Moscow; and the shops which vend those commodities occupy several streets.

Among the curiosities of Moscow, the market for the sale of houses is not the least remarkable. It is held in a large open space in one of the suburbs; and exhibits a great variety of ready-made houses, thickly strewn upon the ground. The purchaser who wants a dwelling, repairs to this spot, mentions the number of rooms he requires, examines the different timbers, which are regularly numbered, and bargains for that which suits him. The house is then painted on the spot and taken away by the purchaser; or sometimes the vender contrives to transport and erect it upon the place where it is designed to stand. It may appear incredible to assert, that a dwelling may be thus bought, removed, raised, and inhabited, within the space of a week; but we shall conceive it practicable by considering that these ready-made houses are in general merely collections of trunks of trees tenanted and mortoiled at each extremity into one another, so that nothing more is required than the labour of transporting and assembling them. But this summary mode of building is not always peculiar to the meaner houses; as wooden structures of very large dimensions and handsome appearance are occasionally formed in Russia with an expedition almost inconceivable to the inhabitants of other countries. A remarkable instance of this dispatch was displayed the last time the embassy came to Moscow. Her ma-

jesty proposed to reside in the mansion of prince Ga-

litzin, which is esteemed the completest edifice in this city; but as it was not sufficiently spacious for her reception, a temporary addition of wood, larger than the original house, and containing a magnificent suite of apartments, was begun and finished within the space of six weeks. This material was like fabric was so handsome and commodious, that the materials which were taken down at her majesty's departure, were to be re-constructed as a kind of imperial villa upon an emi-
nence near the city.

Mr Cox mentions an admirable police in this city for preventing riots, or for fopping the concourse of people in case of fires, which are very frequent and violent in those parts, where the houses are mostly of wood, and the fire is laid with timber. At the entrance of each street there is a chevaux-frize gate, one end whereof turns upon a pivot, and the other rolls upon a wheel; near it is a cen-
y-box in which a man is occasionally stationed. In times of riot or fire the sentinel flusts the gate, and all passage is immediately stopped.

Among the public institutions of Moscow, the most remarkable is the Foundling Hospital, endowed in 1764 by the present empress, and supported by voluntary contributions and legacies, and other charitable gifts. In order to encourage donations, her majesty grants to all benefactors some valuable privileges, and a certain degree of rank in proportion to the extent of their liberality. Among the principal contributors must be mentioned a private merchant named Dimidoff, a person of great wealth, who has expended in favour of this charity above L. 100,000.

The hospital, which is situated in a very airy part of the town upon a gentle ascent near the river Moskva, is an immense pile of building of a quadrangular shape, part of which was only finished when Mr Cox (who account we are transmitting) was at Moscow. It contained, at that time, 3000 foundlings; and, when the whole is completed, will receive 8000. The children are brought to the porter's lodge, and admitted without any recommendation. The rooms are lofty and large; the dormitories, which are separate from the work rooms, are very airy, and the beds are not crowded; each foundling, even each infant has a separate bed; the bead-boards are of iron; the sheets are changed every week, and the linen three times a-week. Through the whole range of building, the whole range is sometimes painted; even the nurseries being uncommonly clean, and without any unwholesome smells. No cradles are allowed, and rocking is particularly forbidden. The infants are not swaddled according to the custom of the country but loosely drefled. — The foundlings are divided into separate classes, according to their respective ages. The children remain two years in the nursery, when they are admitted into the lowest clafs; the boys and girls continue together until they are seven years of age, at which time they are separated. They all learn to read, write, and count accounts. The boys are taught to knit; they occasionally card hemp, flax, and wool, and work in the different manufactories. The girls learn to spin and weave lace; they are employed in cookery, baking, and house-work of all sorts. At the age of 14 the foundlings enter into the first clafs; when they have the liberty of choosing
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there are different species of manufactures established in the hospital, of which the principal are embroidery, silk flossings, ribbons, lace, gloves, buttons, and cabinet work. A separate room is appropriated to each trade. Some boys and girls are instructed in the French and German languages, and a few boys in the Latin tongue; others learn music, drawing, and dancing. About the age of 20, the foundlings receive a sum of money, and several advantages, which enable them to follow their trade in any part of the empire: a very considerable privilege in Russia, where the peasants are slaves, and cannot leave their village without the permission of the master. The girls and boys eat separately. The dining rooms, which are upon the ground-floor are large and vaulted, and distinct from their work-rooms. The first classes sit at table; the little children are attended by servants; but those of the first or second classes alternately wait upon each other. Their victuals are of the most wholesome and nourishing kinds. Each foundling has a napkin, pewter plate, a knife, fork and spoon: the napkin and table-cloth are clean three times in the week. They rise at 6, dine at eleven, and sup at six. The little children have bread at seven and at four. When they are not employed in their necessary occupations, the utmost freedom is allowed, and they are encouraged to be as much in the air as possible.

MOSELLE, a river of Germany, which rises in the mountains of Vauge in Lorrain, and, running through that duchy and the electorate of Trier, falls into the Rhine at Coblenz.

MOSES, the son of Amram and Jochebed, was born in the year 1571 before Christ. Pharaoh king of Egypt, perceiving that the Hebrews were becoming a formidable nation, issued forth an edict commanding all the male children to be put to death. Jochebed, the mother of Moses, having, to avoid this cruel edict, concealed her son for three months, at length made an ark or basket of bulrushes, daubed it with pitch, laid the child in it, and exposed him on the banks of the Nile. Thermuthis the king’s daughter, who happened to be walking by the river’s side, perceived the floating cradle, commanded it to be brought to her, and struck with the beauty of the child, determined to preserve his life. In three years afterwards the princess adopted him for her own son, called his name Mofes, and caused him to be diligently instructed in all the learning of the Egyptians. But his father and mother, to whom he was reared by a fortunate accident, were at still greater pains to teach him the history and religion of his fathers. Many things are related by historians concerning the first period of Mofes’s life, which are not to be found in the Old Testament. According to Josephus and Eusebius, he made war on the Ethiopians, and completely defeated them. They add, that the city Saba, in which the enemy had been forced to take refuge, was betrayed into his hands by the king’s daughter, who became deeply enamoured of him, when the beheld from the top of the walls his valorous exploits at the head of the Egyptian army. But as the truth of this expedition is more than doubtful, we shall therefore confine ourselves to the narrative of sacred writ, which commences at the fortieth year of Mofes’s life. He then left the court of Pharaoh, and went to visit his countrymen the Hebrews, who groaned under the ill-usage and oppression of their unfeeling masters. Having perceived an Egyptian slaying an Hebrew, he slew the Egyptian, and burnt him in the land. But he was obliged, in consequence of this murder, to fly into the land of Midian, where he married Zipporah, daughter of the priest Jethro, by whom he had two sons, Gershom and Eliezer. Here he lived 40 years; during which time his employment was to tend the flocks of his father-in-law. Having one day led his flock towards Mount Horæb, God appeared to him in the midst of a bush which burned with fire but was not consumed, and commanded him to go and deliver his brethren from their bondage. Moses at first refused to go, but was at length prevailed on by two miracles which the Almighty wrought for his conviction. Upon his return to Egypt, he, together with his brother Aaron, went to the court of Pharaoh and told him that God commanded him to let the Hebrews go to offer sacrifices in the desert of Arabia. But the impious monarch disregarded this command, and caused the labour of the Israelites to be doubled. The messengers of the Almighty again returned to the king, and wrought a miracle in his sight, that they might move his heart, and induce him to let the people depart. Aaron having cast down his miraculous rod, it was immediately converted into a serpent; but the same thing being performed by the magicians, the king’s heart was hardened more and more; and his obstinacy at last drew down the judgements of the Almighty on his kingdom, which was afflicted with ten dreadful plagues. The first was the changing of the waters of the Nile and of all the rivers into blood, so that the Egyptians died of thirst. In consequence of the second plague, the land was covered with innumerable swarms of frogs, which entered even into Pharaoh’s palace. By the third plague, the dust was converted into lice, which cruelly tormented both man and beast. The fourth plague was a multitude of destructive flies which spread throughout Egypt, and infected the whole country. The fifth was a sudden pestilence, which destroyed all the cattle of the Egyptians, without injuring those of the Israelites. The sixth produced numberless ulcers and fiery bites upon man and upon beast. The seventh was a dreadful storm of hail, accompanied with thunder and lightning, which destroyed every thing that was in the field, whether man or beast, and spared only the land of Gothen where the children of Israel dwelt. By the eighth plague swarms of locusts were brought into the country, which devoured every green herb, the fruit of the trees and the produce of the harvest. By the ninth plague thick darkness covered all the land of Egypt, except the dwellings of the children of Israel. The tenth and last plague was the death of the first-born in Egypt, who were all in one night cut off by the destroying angel, from the first-born of the king to the first-born of the slaves and of the cattle. This dreadful calamity moved the heart of the hardened Pharaoh, and he at length consented to allow the people of Israel to depart from his kingdom.

Proune authors who have spoken of Moses, seem to have been in part acquainted with these mighty wonders.
the commandments

Moses, who built a house for the God of his fathers after

years. He ed the levites to its service. He likewise gave various

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—The Egyptians determined to follow the same course; but God caused a violent wind to blow, which brought back the waters to their bed, and the whole army of Pharaoh perished in the waves.

After the miraculous passage of the Red Sea, the army proceeded towards Mount Sinai, and arrived at Marah, where the waters were bitter; but Moses, by casting a tree into them, rendered them fit for drinking. Their tenth encampment was at Rephidim; where Moses drew water from the rock in Horeb, by fmiting it with his rod. Here likewise Amaelek attacked Israel. While Joshua fought against the Amalekites, Moses stood on the top of a hill, and lifted up his hand; in consequence of which the Israelites prevailed and cut their enemies in pieces. They at length arrived at the foot of Mount Sinai on the third day of the ninth month after their departure from Egypt. Moses having ascended several times into the mount, received the law from the hand of God himself in the midst of thunders and lightnings, and concluded the famous covenant betwixt the Lord and the children of Israel. When he descended from the mount, he found that the people had fallen into the idolatrous worship of the golden calf. The mef­ fenger of God, shocked at such ingratitude, broke in pieces the tables of the law which he carried in his hands, and put 23,000 of the transgressors to the sword. He afterwards recended into the mountain, and there obtained new tables of stone on which the law was inscribed. When Moses descended, his face shone so that the Israelites dared not to come nigh unto him, and he was obliged to cover it with a veil. The Israelites were here employed in constructing the tabernacle according to a pattern shown them by God. It was erected and consecrated at the foot of Mount Sinai on the first day of the first month of the second year after their departure from Egypt; and it served the Israelites instead of a temple till the time of Solomon, who built a house for the God of his fathers after a model shown him by David.

Moses having dedicated the tabernacle, he consecrated Aaron and his sons to be its ministers, and appointed the levites to its service. He likewise gave various commandments concerning the worship of God and the political government of the Jews. This was a theocracy in the full extent of the word. God himself governed them immediately by means of his servant Moses, whom he had chosen to be the interpreter of his will to the people; and he required all the honors belonging to his king to be paid unto himself. He dwelt in his tabernacle, which was situated in the middle of the camp, like a monarch in his palace. He gave answers to those who consorted with him, and himself denounced punishments against the transgressors of his laws. This properly was the time of the theocracy, taken in its fullest extent; for God was not only considered as the divinity who was the object of their religious worship, but as the sovereign to whom the honors of supreme majesty were paid. The camp was nearly the same under Joshua; who, being filled with the spirit of Moses, undertook nothing without consulting God. Every measure, both of the leader and of the people, was regulated by the direction of the Almighty, who rewarded their fidelity and obedience by a series of miracles, victories, and successes. After Moses had regulated every thing regarding the civil administration, and the marching of the troops, he led the Israelites to the confines of Canaan, to the foot of Mount Nebo. Here the Lord commanded him to ascend into the mountain; whence he showed him the promised land, whereunto he was not permitted to enter. He immediately after yielded up the ghost, without sickness or pain, in the 120th year of his age, and 145 years before Jesus Christ.

Moses is incontestably the author of the first five books of the Old Testament, which go by the name of the Pentateuch; and which are acknowledged to be inspired, by the Jews and by Christians of every persuasion. Some, however, have denied that Moses was the author of these books; and have found their opinion on this, that he always speaks of himself in the third person. But this manner of writing is by no means peculiar to Moses; it occurs also in several ancient historians such as Xenophon, Caesar, Josephus, &c. who, possessed of more modesty or good sense than some modern historians, whose egotism is altogether disgusting, have not like them left to posterity a spectacle of ridiculous vanity and self conceit. After all it is proper to observe that profane authors have related many falsehoods and absurdities concerning Moses, and concerning the origin and the religion of the Jews, with which they were but little acquainted. Plutarch, in his book concerning Isis and Osiris, says, that Judeus and Hierofoylus were brothers, and descended from Typhon; and that the former gave his name to the country and its inhabitants, and the latter to the capital city. Others say that they came from Mount Ida in Phrygia. Strabo is the only author who speaks any thing like reason and truth concerning them; tho' he too says that they were descended from the Egyptians, and considers Moses their legislator as an Egyptian priest. He acknowledges, however, that they were a people strictly just and sincerely religious. Other authors by whom they are mentioned, seem not to have had the smallest acquaintance either with their laws or their worship. They frequently confound them with the Christians, as is the case with Juvenal, Tacitus, and Quintilian.

MOSEHEIM (John Laurence), an illustrious German divine, was born in 1695, of a noble family, which might seem to open to his ambition a fair path to civil promotion; but his zeal for the interests of
religion, his thirst after knowledge, and particularly his taste for sacred literature, induced him to consecrate his talents to the service of the church. The German universities loaded him with literary honours; the king of Denmark invited him to settle at Copenhagen; the duke of Brunswick called him thence to Halmstadt, where he filled the academical chair of divinity; was honoured with the character of ecclesiastical councillor to the court; and presided over the seminaries of learning in the duchy of Wolfenbuttle and the principality of Blackenburgh. When a design was formed of giving an uncommon degree of lucre to the university of Gottingen, by filling it with men of the first rank in letters, Dr Mosheim was deemed worthy to appear at the head of it, in quality of chancellor; and here he died, universally lamented, in 1755. In depth of judgment, in extent of learning, in purity of taste, in the powers of eloquence, and in a laborious application to all the various branches of erudition and philosophy, he had certainly very few superiors. His Latin translation of Cudworth's Intellectual System, enriched with large annotations, discovered a profound acquaintance with ancient learning and philosophy. His illustrations of the Scriptures, his labours in defence of Christianity, and the light he cast upon religion and philosophy, appear in many volumes of sacred and profane literature; and his Ecclesiastical History, from the birth of Christ to the beginning of the present century, is unquestionably the best that is extant. This work, written in Latin, has been translated into English, and accompanied with notes and chronological tables by Archibald Maclaine, D. D. and from this translator's preface to the second edition, 1758, in 5 vols 8vo, this short account is taken.

MOSQUITO-COUNTRY, is situated in North America, between 85 and 88 degrees of west longitude, and between 13 and 15 degrees of north latitude; having the north sea on the north and east, Nicaragua on the south, and Honduras on the west; and indeed the Spaniards esteem it a part of the principality of Honduras, though they have no colonies in the Mosquito country. When the Spaniards first invaded this part of Mexico, they massacred the greatest part of the natives, which gave those that escaped into the inaccessible part of the country an insuperable aversion to them and they have always appeared ready to join any Europeans that come upon their coasts against the Spaniards, and particularly the English, who frequently come hither; and the Mosquito men being excellent marksmen, the English employ them in striking the maratee sith, &c. and many of the Mosquito Indians come to Jamaica, and fail with the English in their voyages.

These people are so situated between morassies and inaccessible mountains, and a coast full of rocks and fisals, that no attempts against them by the Spaniards whom they mortal hate, could ever succeed. Nevertheless, they are a mild inoffensive people, of great morality and virtue, and will never trufl a man who has once deceived them. They have so great a veneration towards the English, that they have spontaneously put themselves and their lands under the protection and dominion of the crown of England. This was first done when the duke of Albemarle was governor of Jamaica, and the king of the Moskitos received a commission from his grace, under the seal of that island; since which time they have not only been steady in their alliance with the English, but warm in their affections, and very useful to them on many occasions.

When their king dies, the male heir goes to Jamaica, to certify that he is next in blood, and receives a commission in form from the governor of Jamaica to be king of the Moskitos, till which he is not acknowledged as such by his countrymen. So fond are these people of every thing that is English, that the common people are proud of every Christian or surname given them by our seamen, who honour their chief men with the titles of some of our nobility.

MOSQUE, a temple or place of religious worship among the Mahometans.

All mosques are square buildings, generally constructed of stone. Before the chief gate there is a square court paved with marble; and low galleries round it, whose roof is supported by marble pillars. In these galleries the Turks wash themselves before they go into the mosque. In each mosque there is a great number of lamps; and between these hang many crystal rings, ostrich eggs, and other curiosities, which when the lamps are lighted, make a fine show. As it is not lawful to enter the mosque with stockings or shoes on, the pavements are covered with pieces of stuff folded together, each being wide enough to hold a row of men kneeling, sitting, or prostrate. The women are not allowed to enter the mosque, but stay in the porches without. About every mosque there are fix high towers, called minarets, each of which has three little open galleries one above another; these towers, as well as the mosques, are covered with lead, and adorned with gilding and other ornaments; and from thence, instead of a bell, the people are called to prayers by certain officers appointed for that purpose. Most of the mosques have a kind of hospital belonging to them, in which travellers of what religion lower are entertained three days. Each mosque has also a place called tare, which is the burying-place of its founders; within which is a tomb fix or seven feet long, covered with green velvet or satin; at the ends of which are two tapers, and round it several seats for those who read the koran and pray for the souls of the deceased.

Moss (Dr Robert), dean of Ely, was eldest son of Mr Robert Mos, a gentleman in good circumstances; and was born at Gillingham in Norfolk in 1666. He was bred at Benet-college, Cambridge; and acquired great reputation both as a disputant and a preacher. He became preacher to the society of Grays-inn, London, in 1698; and assistant preacher to Dr Wake at St James's, Westminster, 1699. He was sworn chaplain in three succeeding reigns, to King William, Queen Anne, and George I. and being one of the chaplains in waiting when Queen Anne visited the university of Cambridge, April 5, 1705, he was then created D. D. In 1708 he was invited by the parishioners of St Lawrence Jewry, on the resignation of dean Stanhope, to accept of their Tuesday lecture, which he held till 1727, and then resigned it on account.
In the year 1712, on the death of Dr Roderick, he was nominated by the queen to the deanery of Ely, which was the highest, but not the last, promotion he obtained in the church; for in 1716 he was collated, by Robinion bishop of London, to Gildon, a small rectory on the eastern side of Hertfordshire. The poet deprived him of the use of his limbs for some of the last years of his life; and he died March 26, 1729, in his 63rd year, and was buried in the presbytery of his own cathedral, under a plain stone with a simple inscription. His character may be seen in the preface to the eight volumes of his Sermons, which has usually been attributed to Dr Snape, the editor of the sermons; but the credit of it has lately been transferred to Dr Zachary Grey. Dean Moss is also supposed to have been the author of a pamphlet printed in 1717, intitled. "The report vindicated from misreports: being a defence of my lords the bishops, as well as the clergy of the lower house of convocation; in a letter from a member of that house to the preluder concerning their late confusions about the bishop of Bangor's writings." He wrote also some poems, both Latin and English.

Moss, or Mosses, in botany. See Musci.

Moss on Trees, in gardening. The growth of large quantities of moss on any kind of tree is a disturber of very bad consequence to its increase, and much damages the fruit of the trees of our orchards.

The present remedy is the scraping it off from the body and large branches by means of a kind of wooden knife that will not hurt the bark, or with a piece of rough hair cloth, which does very well after a soaking rain. But the most effectual cure is the taking away the cause. This is to be done by draining off all the superfluous moisture from about the roots of the trees, and may greatly be guarded against in the first planting of the trees, by not setting them too deep.

If trees stand too thick in a cold ground, they will always be covered with moss; and the best way to remedy the fault is to thin them. When the young branches of trees are covered with a long and shaggy moss, it will utterly ruin them; and there is no way to prevent it but to cut off the branches near the trunk, and even to take off the head of the tree if necessary; for it will sprout again; and if the caufe be in the mean time removed by thinning the plantation, or draining the land and stirring the ground well, the young shoots will continue clear after this.

If the trees are covered with moss in consequence of the ground's being too dry, as this will happen from either extreme in the soil, then the proper remedy is the laying mud from the bottom of a pond or river pretty thick about the root, opening the ground to some distance and depth to let it in; this will not only cool it, and prevent its giving growth to any great quantity of moss, but it will also prevent the other great mischief which fruit-trees are liable to in dry grounds, which is the falling off of the fruit too early.

The mosses which cover the trunks of trees, as they always are freethelt and moist vigorous on the side which points to the north, if only produced on that, serve to preserve the trunk of the tree from the severity of the north winds, and direct the traveller in his way, by always plainly pointing out that part of the country.

Moss is also a name given by some to the boggy ground in many parts of England, otherwise called a fen and bog.

In many of these grounds, as well in England and Ireland as in other parts of the world, there are found vast numbers of trees standing with their thumps erect, and their roots piercing the ground in a natural posture as when growing. Many of these trees are broken or cut off near the roots, and lie along, and this usually in a north-east direction. People who have been willing to account for this, have usually resolved it into the effect of the deluge in the days of Noah; but this is a very wild conjecture, and is proved false by many unanswerable arguments. The waters of this deluge might indeed have washed together a great number of trees, and buried them under loads of earth; but then they would have lain irregularly and at random; whereas they all lie lengthwise from south-west to north-east, and the roots all stand in their natural perpendicular posture, as close as the roots of trees in a forest.

Beyond these, these trees are not all in their natural state, but many of them have the evident marks of human workmanship upon them, some being cut down with an ax, some split, and the wedges still remaining in them; some burnt in different parts, and some bored through with holes. These things are also proved to be of a later date than the deluge, by other matters found among them, such as utensils of ancient people, and coins of the Roman emperors.

It appears from the whole, that all the trees which we find in this mossy state, originally grew in the very places where we now find them, and have only been thrown down and buried there, not brought from elsewhere. It may appear indeed an objection to this opinion, that most of these mossy trees are of the fir-kind; and that Cæsar says expressly, that no firs grew in Britain in his time: but this is easily answered by observing, that these trees, though of the fir-kind, yet are not the species usually called the fn, but pitch tree; and Cæsar has no where said that pitch-trees did not grow in England. Norway and Sweden yet abound with these trees; and there are at this time whole forests of them in many parts of Scotland, and a large number of them wild upon a hill at Wareton in Staffordshire to this day.

In Hatfield marsh, where such vast numbers of the mossy trees are now found, there has evidently once been a whole forest of them growing. The laft of these was found alive, and growing in that place within 70 years last past, and cut down for some common use.

It is also objected by some to the system of the fir growing where they are found fossil, that these countries are all bogs and moors, whereas these farts of trees grow only in mountainous places. But this is founded on an error; for though in Norway and Sweden, and some other cold countries, the fir kinds all grow upon barren and dry rocky mountains, yet in warmer places they are found to thrive as well on wet plains. Such are found plentifully in Pomerania, Livonia, and Courland, &c. and in the west parts of New England.
England there are vast numbers of fine flatly trees of them in low grounds. The whole truth seems to be, that these trees love a sandy soil; and such as is found at the bottoms of all the mosses where these trees are found fertile. The roots of the fir-kind are always found fixed in these; and those of oaks, where they are found fertile in this manner are usually found fixed in clay; so that each kind of tree is always found rooted in the places where they stand in their proper soil; and there is no doubt to be made but that they originally grew there. When we have thus found that all the fertile trees we meet with once grew in the places where they are now buried, it is plain that in these places there were once noble forests, which have been destroyed at some time; and the question only remains how and by whom they were destroyed. This we have reason to believe, by the Roman coins found among them, was done by the people of that empire, and that at the time when they were established or establishing themselves there.

Their own historian tells us, that when their armies pursued the wild Britons, these people always sheltered themselves in the miry woods and low watery forests. Caesar expressly says this; and observes, that Cassibelain and his Britons, after their defeat, passed the Thames, and fled into such low morasses and woods, that there was no pursuing them; and we find that the Silures secured themselves in the same manner when attacked by Ostorius and Agricola. The same thing is recorded of Venutius king of the Britons, who inhabited this forest and the Roman troops under Ostorius. The Romans slew many of the Britons, and drove the rest back into this forest, which at that time overspread all this low country. On this the conquerors taking advantage of a strong south-westerly wind, set fire to the pitch-trees, of which this forest was principally composed; and when the greater part of the trees were thus destroyed, the Roman soldiers and captive Britons cut down the remainder, except a few large ones which they left standing as memorials of the destruction of the reft. Their fingle trees, however, could not stand long against the winds, and these falling into the rivers which ran through the country, interrupted their currents; and the water then overspreading the level country, made one great lake, and gave origin to the mosses or moorly bogs, which were afterwards formed there, by the workings of the waters, the precipitation of earthy matter from them, and the putrefaction of rotten boughs and branches of trees, and the vast increase of water-mosses and other pitchy plants which grow in prodigious abundance in all these sorts of places. Thus were these burnt and felled trees buried under a new-formed spongy and watery earth, and afterwards found on the draining and digging through this earth again.

Hence it is not strange that Roman weapons and Roman coins are found among these buried trees; and hence it is that among the buried trees found burnt, some chapped and hewn; and hence it is that the bodies of the trees all lie by their proper roots, and with their tops lying north-east, that is, in that direction in which a south-westerly wind would have blown them down: hence also it is, that some of the trees are found with their roots lying flat, thebe being not cut or burned down, but blown up by the roots afterwards when left fingle; and it is not wonderful, that such trees as these should have continued to grow even after their fall, and shoot up branches from their sides which might easily grow into high trees. Phil. Trans. N° 275.

By this system it is also easily explained why the
moss in the country is in some places two or three yards thicker than in others, or higher than it was formerly, since the growing up of peat-earth or bog-ground is well known, and the moss added by overflowing of waters is not a little.

As the Romans were the destroyers of this great and noble forest, so they were probably also of the several other ancient forests; the ruins of which furnish us with the bog-wood of Staffordshire, Lancashire, Yorkshire, and other counties. But as the Romans were not much in Wales, in the Isle of Man, or in Ireland, it is not to be supposed that forests cut down by those people gave origin to the foillie wood found there: but though they did not cut down these forests, others did; and the origin of the bog-wood is the same with them and with us. Holinghead informs us, that Edward I. being not able to get at the Welch because of their hiding themselves in boggy woods, gave orders at length that they should all be destroyed by fire and by the axe; and doubtless the roots and bodies of trees found in Penbrokeshire under ground, are the remains of the execution of this order. The foillie wood in the bogs of the island of Man is doubtless of the same origin, though we have not any accounts extant of the time or occasion of the forests there being destroyed; but as to the foillie trees of the bogs of Ireland, we are expressly told, that Henry II. when he conquered that country, ordered all the woods to be cut down that grew in the low parts of it, to secure his conquests by cutting away the places of resort of rebels.

MOVING-MOSS. We have an account in the Philosophical Transactions of a moving moss near Churchtown in Lancashire, which greatly alarmed the neighbourhood as miraculous. The moss was observed to rise to a surprising height, and soon after funk as much below the level, and moved flowly towards the south.

A very surprising instance of a moving moss is that of Edway in Scotland, which happened in the year 1771, after severe rains which had produced terrible inundations of the rivers in many places. For the better understanding this event, we shall give the following description of the spot of ground where it happened. Along the side of the river Esk there is a vale, about a mile broad, less or more in different places. It is bounded on the south-east by the river Esk, and on the north west by a steep bank 30 feet in height above the level of the vale. From the top of the bank the ground rises in an easy ascent for about a quarter of a mile, where it is terminated by the moss; which extends about two miles north and south, and about a mile and a half east and west, and is bounded on the north-west by the river Sark. It is probable that the solid ground from the top of the bank above the vale was continued in the same direction under the moss, before its eruption, for a considerable space; for the moss at the place where the eruption happened, was inclined towards the sloping ground. From the edge of the moss there was a gully or hollow, called by the country people the gap, and said to be 30 yards deep where it entered the vale; down which ran a small rill of water which was often dry in summer, having no supply but what filtered from the moss. The eruption happened at the head of this gap, on Saturday November 16th 1771, about ten or eleven at night, when all the neighbouring rivers and brooks were prodigiously swelled by the rains. A large body of the moss was forced, partly by the great fall of rain, and partly by some springs below it, into a small beck or burn, which runs within a few yards of its border to the south-east. By the united pressure of the water behind it, and of this beck, which was then very high, it was carried down a narrow glen between two banks about 300 feet high, into a wide and spacious plain, over part of which it spread with great rapidity. The moss continued for some time to send off considerable quantities; which, being borne along by the torrent on the back of the first great body, kept it for many hours in perpetual motion, and drove it still farther on. This night at least 400 acres of fine arable land were covered with moss from 3 to 12 or 15 feet deep. Several houses were destroyed, a good deal of corn lost, &c. but all the inhabitants escaped. When the waters subsided, the moss also ceased to flow; but two pretty considerable streams continued to run from the heart of it, and carried off some pieces of moss matter to the place where it burst. There they joined to the beck already mentioned; which, with this addition, resumed its former channel; and, with a little assistance from the people of the neighbourhood, made its way to the Esk, through the midst of that great body of moss which obstructed its course. Thus, in a great measure drained, the new moss fell several feet, when the fair weather came in the end of November, and settled in a firmer and more solid body on the lands it had over-run. By this inundation about 800 acres of arable ground were overflowed before the moss stopped, and the habitations of 27 families destroyed. Tradition has preferred the memory of a similar inundation in Monkist in Scotland. A moss there altered its course in one night, and covered a great extent of ground.

MOSS of Kincardine: A remarkable tract of ground in the shire of Perth in Scotland, which deserves particular notice, not merely as a topographical curiosity, or as a subject of natural history; but for the information, equally uncommon and important, which it affords, respecting agricultural improvement, and the promotion of industry and population.

The moss of Kincardine is situated in the parish of the same name, comprehended between the rivers Forth and Teith, and in that district of Perthshire called Monticull. The moss begins about a mile above the confluence of these rivers; from thence it extends in length about four miles, and from one to two in breadth; and before the commencement of the operations (an account of which is to be given), comprehend near 2000 Scotch acres, of which about 1500 belong to the estate of Blair Drummond, the property of Lord Kames by his marriage with Mrs Drummond of Blair Drummond.

As mosses are extremely various in their nature, before entering upon the improvements made in Kincardine moss, it will be proper to give a short description of that moss, and of the subjacent foil which is the object of those improvements.

The moss lies upon a field of clay, which is a continuation of those rich, extensive flats in the neighbourhood
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The brown mould is highly fertile; the other, especially in a dry season, is very unproductive. The crop that had occupied this mould when the trees were felled is found still entire. It consists chiefly of heath; but several other smaller plants are also very distinguishable.

Immediatly above the stratum lies the moss, to the height, upon an average, of seven feet. It is composed of different vegetables arranged in three distinct strata. Of these the first is three feet thick. It is black and heavy, and preferable to the others for the purpose of fuel. It consists of bent-grass (Agrostis), which seems to have grown up luxuriantly among the trees after they were felled. The second stratum also is three feet thick. It is composed of various kinds of mosses, but principally of bog moss (Sphagnum). It is of a fallow or iron colour, and remarkably elastic. It is commonly called white peat; and for fuel is considered as much inferior to that above mentioned. The third stratum is composed of heath and a little bent-grass, but chiefly of the deciduous parts of the former. It is about a foot thick, and black.

Three strata of different vegetables lying above each other, the limits of each distinctly marked, and each distinguishable by a different colour, is certainly a curious natural phenomenon.

An inquiry will here occur, What has occasioned this succession in the vegetables of which the moss is composed?

Every vegetable has a particular foil, more or less moist, peculiarly adapted to its nature. Let a piece of ground be in a mossy state, rushes will introduce themselves; drain the ground sufficiently, the rushes will disappear, and finer vegetables will succeed. It seems reasonable to account for the succession of the different plants that compose the moss on similar principles.

Let us imagine an extensive plain covered with trees lying in all directions, full of branches, and possibly loaded with leaves. This it is evident would produce a great stagnation of water, which, as the crops of bent-grass accumulated, would still increase: and the probability is, that at length it had so increased, as to be the cause why the bent-grasses and other congenial plants of the first stratum ceased to grow. But it is evident that a plant was to be found that could live in such a situation. Accordingly we see that bog-mosses has established itself; a plant that loves even to swim in water.

When the accumulations of bent-grass and the mosses had, in process of time, risen to the height of six feet above the surrounding carse ground, the water that fell upon the surface had by no means an opportunity to discharge itself. It had accordingly formed many channels which are often three feet deep; and the intermediate surface being wholly turned into little hillocks has become dry and firm. By this means it became unfit for mosses, and heath succeeded.

Such seems to have been the process in the formation of what is now called a moss.

By far the greatest part of the moss in question is, upon an average, full seven feet deep, and has in all probability lain undisturbed since its formation; this is called High Moss. The remainder called the Low Moss, lies to a considerable breadth around the extremities of the high; and is, upon an average, not above three feet in depth.
The peats. These are formed of that stratum of the
M., fol. bro.:ught from the adjacent grounds. But what
Many farmers were wont to
acres of which they for that end left unfown. Here
cause in a dry season the superficial covering of clay
the clay was carried, and the softness of the moss, this
It has been attempted to cover the moss with clay
Hence it is evident, that all attempts to
DRAINING has also been proposed as another mode of
Draining has also been proposed as another mode of
improvement; and it must be acknowledged, that, by
the means of draining, many mosses have been converted
both into arable and meadow grounds, which, in the
end became interesting improvements. But in a moss,
as that of Kinardine, this method would be
ineffectual; as for several feet deep it is of such a
nature, that upon being dry and divided into parts, it
would blow with the wind like chaff; and when thrown
aside in the operation of digging peats, it lies for years
without producing a single vegetable, except only a
few plants of forrel.

By the methods described from 100 to 200
acres of moss had been removed. When the
present plan was introduced, there still remained covered
with moss from 1300 or 1400 acres of carse clay—a
treasure for which it must be ever interesting to dig.

In the year 1766 Lord Kames entered into posses-
sion of the estate of Blair Drummond. Long before
that period he was well acquainted with the moss, and
often lamented that no attempt had ever been made to
turn it to advantage; Many different plans were now
proposed; at length it was resolved to attempt, by
means of water as the most powerful agent, entirely to
sweep off the whole body of moss.

That moss might be floated in water, was abundantly
obvious; but to find water in sufficient quantity
was difficult, the only stream at hand being employed
to turn a corn-mill. Convinced of the superior con-
sequence of dedicating this stream to the purpose of
floating off the moss, Lord Kames having made an
agreement with the tenant who farmed the mill, and
the tenants thirled confenting to pay the rent, he im-
mediately threw down the mill, and applied the water
to the above purpose.

In order to determine the best manner of condu-
ting the operation, workmen were now employed for
a considerable time upon Law Moss. But both the
day and by the piece, to ascertain the expense for
which a given quantity of moss could be removed.
It was then agreed to operate at a certain rate per
acre; and in this manner several acres were removed.
But this was to be a very expensive process. The
ground gained might, indeed, be afterwards let to ten-
ants; but every acre would require an expenditure
from £12 to £15, before it could be ready for sowing;
so that the acquisition of the whole, computing it at a
medium to be 1350 acres, would flink a capital of near-
ly 20,000l. sterling.

One other method still remained; namely, to at-
tempt letting portions of the moss, as it lay, for a
term of years sufficient to indemnify tenants for the
expenses incurred in removing it. For some time both
these plans were adopted; but several reasons made
the latter preferable. 1. The quantity of water to be
used had been small; and being also uncertain, it was very
inconvenient for an undertaker; neither were there
any house near the spot, which occasioned a great
loss of time in going and coming; but when a man
should live upon the spot, then he could be ready to
seize every opportunity. 2. The moss was an unces-
taneous waste. To let it to tenants would increase the popu-
lation of the estate, and afford to a number of indus-
trious people the means of making to themselves a
comfortable livelihood.

In the mean time it was determined, till as many
tenants should be got as could occupy the whole wa-
ter, to carry on the work by means of undertakers.
But before proceeding farther, it will be necessary to
describe the manner of applying water to the purpose
of floating the moss.

A stream of water sufficient to turn a common corn-
mill will carry off as much moss as 20 men can throw
into it, provided they be stationed at the distance of
100 yards from each other. The first step is to make
in the clay, along-side of the moss, a drain to convey
the water; and for this operation the carse-clay below
the moss is peculiarly favourable, being perfectly free
from stones and all other extraneous substances, and at
the same time, when moil, slippery as soap; so that not
only is it easily dug, but its lubricity greatly facilitates
the progress of the water when loaded with moss.
The dimensions proper for the drain are found to be
two feet for the breadth, and the same for the depth.
If smaller, it could not conveniently receive the spade-
fuls of moss; if larger, the water would escape, lea-
ving the moss behind. The drain has an inclination
of one foot in 100 yards; the more regularly this in-
nclination is observed throughout, the less will the moss
be liable to obstructions in its progress with the water.
The drain being formed, the operator marks off to a
convenient extent, along-side of it a portion of moss
to feet broad; the greatest distance from which he
may heave his spadeful into the drain. This be-
repeatedly does till the entire moss be removed down to
the clay. He then digs a new drain at the foot of
the
As before, leaving the mofs-bank, turns the water into it, and proceeds as before, leaving the mofs to pursue its course into the river Forth, a receptacle equally convenient and capacious; upon the fortunate situation of which, happily forming for several miles the southern boundary of the estate, without the interposition of any neighbouring proprietor, depended the very existence of the whole operations. When the mofs is entirely removed, the clay is found to be encompassed with the roots of different kinds of trees standing in it as they grew, often very large; their trunks also are frequently found lying beside them. All these the tenants remove often with great labour. In the course of their operations they over, when the dryness admits, with a plough, and, where too soft, with a spade. A month's exposure to the sun, or an inch of rain, is sufficient to turn the crop of oats and pulse into powder fitting it for the feed in March and April. A crop of oats separated at first, with the crop of pulse, which often falls of being plentiful, yielding from eight to ten bolls after one.

In the year 1769 an agreement was made with one tenant for a portion of the Low Mofs. This, as being the first step towards the intended plan, was viewed as a considerable acquisition. The same terms agreed upon with this tenant have ever since been observed with all the rest. They are as follow:

The tenant holds eight acres of mofs by a tack of 38 years; he is allowed a proper quantity of timber, and two bolls of oatmeal to support him while employed in rearing a house; the first seven years he pays no rent; the eighth year he pays one merk Scots; the ninth year two merks; and so on with the addition of one merk yearly till the end of the first 19 years; during the last five years of which he also pays a hen yearly. Upon the commencement of the second 19 years, he begins to pay a yearly rent of 12s. for each acre of land cleared from mofs, and 2s. 6d. for each acre not cleared, also two hens yearly; a low rent indeed for so fine a soil; but no more than a proper reward for his laborious exertions in acquiring it.

In the year 1768 another tenant was settled. These two were tradesmen; to whom the preference was always given, as having this great advantage to recommend them, that even when deprived of water they need never want employment. The motives that induced these people to become settlers were, 1st, the prospect of an independent establishment for a number of years. 2dly, The mofs afforded them a great abundance of excellent fuel; to which was added the comfortable consideration, that, whilst busied in providing that necessary article, they had the double advantage of promoting, at the same time, the principal object of their settlement.

Notwithstanding these inducements, still settlers offered slowly; to which two circumstances chiefly contributed; 1st, The whole farmers surrounding the mofs threw every possible obstruction in their way. 2dly, By people of all denominations the scheme was viewed as a chimærical project, and became a common topic of ridicule. The plan however supported itself; and in the year 1769 five more tenants agreed for eight acres each; and thus 56 acres of Low Mofs were disposed of. From the progress made by the first settlers, and the addition of thefe, the obloquy of becoming a mofs-tenant gradually became less regarded; so that in the year 1772 two more were added; in 1773, three; and in 1774, one; in all 13; which disposed of 104 acres; all the Low Mofs to which water could then be conveyed. As water is the main spring of the operation, every tenant, beside the attention necessary to his share of the principal stream, collected water by every possible means, making ditches round his portion of the mofs, and a reservoir therein to retain it till wanted.

The tenants in the Lower Mofs having now begun to raise good crops, in the year 1774 several persons offered to take possessions in the High Mofs, upon condition that access to it should be rendered practicable. The High Mofs wanted many advantages that the Low possessed. To the Low Mofs, lying contiguous to the surrounding arable lands, the access was tolerably good; but from the arable lands the High Mofs was separated by 300 or 400 yards of the Low, which, even to a man, affords but indifferent footing, and to horses is altogether impracticable. The Low Mofs is in general only three feet deep; the High Mofs is from six to twelve feet in depth.

It will appear at first sight, that without a road of communication the High Mofs must for ever have proved unconquerable. Without delay, therefore, a road was opened to the breadth of twelve feet, for several hundred yards in length, by floating off the mofs down to the clay.

This being effected, and at the same time an opening given to admit water, in the year 1775 twelve tenants agreed for eight acres of High Mofs each. In consideration of the greater depth of this part of the mofs, it was agreed, that during the first 19 years they should pay no rent; but for the second 19 years the terms of agreement were the same as those made with the tenants in the Low Mofs. To the above-mentioned tenants every degree of encouragement was given; as upon their success depended, in a great measure, the disposal of the great quantity of mofs still remaining. But their success, however problematical, was such, that next year,

1776, 6 more took 8 acres each,
1777, 1
1778, 4
1779, 3
1780, 1
1781, 1
1782, 1

In all, including those upon the Low Mofs, 42 tenants, occupying 366 acres.

Though for some time the disposal of the High Mofs went but slowly on, it was not for want of tenants; but the number of operators was already sufficient for the quantity of water; to have added more would evidently have been imprudent.

In the year 1783 Mr Drummond entered into possession of the estate of Blair Drummond, and went fully into the plan adopted by his predecessor for subduing the mofs. At this time there still remained undisposed of about 1000 acres of High Mofs. As water was the great defideratum, it was determined, that
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te to obtain that necessary article neither pains nor expense should be wanting. Steps were accordingly taken to ascertain in what manner it might be procured to most advantage.

Meanwhile, to prepare for new tenants a second road parallel to the former, at the distance of half a mile, was immediately begun and cut with what water could be got, down to the clay, 12 feet broad and 2570 yards long, quite across the moss. This opening was previously necessary, that operators might get a drain formed in the clay to direct the water; and it was to remain as a road that was absolutely necessary, and which relieved settlers from an expense they were unable to support. These preparations, the progress of the former tenants, and the prospect of a farther supply of water, induced 10 more to take possession in the year 1783; in the year 1784, 18 more took possessions; and in 1785 no fewer than 27—in all, 55 tenants in three years, which disposed of 440 acres more of the High Mosses.

As the introduction of an additional stream to the moss was to be a work both of nicety and expense, it was necessary to proceed with caution. For this reason several engineers were employed to make surveys and plans of the different modes by which it might be procured. In one point they all agreed, that the proper source for furnishing that supply was the river Teith; a large and copious stream that paffes within a mile of the moss: but various modes were proposed for effecting that purpose.

To carry a stream from the river by a cut or canal into the mosses was found to be impracticable; and Mr Whitworth (a) gave in a plan of a pumping machine, which he was of opinion would answer the purpose extremely well.

Soon after this Mr George Meikle of Alloa, a very skilful and ingenious mill-wright, gave in a model of a wheel for raising water entirely of a new construction, of his own and his father's invention jointly. This machine is so exceedingly simple, and acts in a manner so easy, natural, and uniform, that a common observer is apt to undervalue the invention: But persons skilful in mechanics view machinery with a very different eye; for to them simplicity is the first recommendation a machine can possess. Accordingly, upon seeing the model set to work, Mr Whitworth, with that candour and liberality of mind that generally accompany genius and knowledge, not only gave it the greatest praise, but declared that, for the purpose required, it was superior to the machine recommended by himself, and advised it to be adopted without hesitation.

The better, to explain this machine, two sketches are annexed, to the first of which the following letters refer. The explanation of the second will be found upon the sketch.

Plate CCCCXVI.

a. Sluice through which is admitted the water that moves the wheel.

b, b. Two sluices through which is admitted the water raised by the wheel.

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(a) This gentleman is superintendent of the London water-works, and an engineer of great reputation in England. He was several years employed in Scotland in completing the great canal.
somewhat more complex, and would also increase the friction, he thought it more advisable to keep it in its present state. At the same time he fully observed, that as the stream by which the wheel is moved is at all times copious and powerful, the small loss of power occasioned by the above circumstances was of little or no avail.

This stream is detached from the Teith at the place where that river approaches nearest to the moss. The surface of the latter is about 15 feet higher than that of the former; the cistern is therefore placed 17 feet above the surface of the stream, so as to leave a declivity sufficient to deliver the water upon the surface of the moss.

The pipes through which the water descends from the cistern are composed of wooden barrels, hooped with iron 4 feet long and 18 inches in diameter within. In these pipes, having been conveyed under ground for 354 yards from the cistern, the water at once emerges into an open aqueduct. This aqueduct, which was formed according to a plan by Mr Whitworth, is constructed wholly of earth or clay; and in order to keep the water on a level with the surface of the moss, it is for nearly two thirds of its course elevated from 8 to 10 feet above the level of the adjacent grounds; the base being 40 feet broad, the summit 18 feet, and the water-course 10 feet broad. It commences at the termination of the pipes; from whence extending above 1400 yards, it discharges the water into a canal formed for its reception on the surface of the moss.

For raising the water to this height there were two reasons. 1st. That not only where it was delivered on the mosses, but even after being conveyed to the moss, diffusing currents, it might still retain sufficient power to transport the mosses to the river Forth. 2dly. That reservoirs of a sufficient height might be formed in the moss to retain the water delivered during night.

In consequence of Mr Whitworth's advice, a contract was entered into with Mr Meikle in spring 1787; and by the end of October in that year, the wheel, pipes, and aqueduct, were all completely finished, and what in fo complex and extensive an undertaking, is by no means common, the different branches of the work were so completely executed, and so happily adjusted to each other, that upon trial the effect answer'd the most sanguine expectations. The total expense exceeded L 1500 Sterling.

To induce the proprietor to embark in this undertaking, the mosses tenants laid of their own accord previously come under a formal engagement to pay the interest of any sum that might be expended in procuring a supply of water. But he was determined they should not enjoy by halves the sweets of this long-wished for acquisition. With a view therefore, not only to reward their past industry, but to render them future exertions, he at once set them free from their engagement; nor has any interest ever been demanded.

This new supply was a most acceptable boon to the mosses tenants—in order to make an equitable distribution, the water raised through the day was allotted to one division of operators; that raised during the night to another. To retain the latter, a canal was formed, extending almost three miles through the centre of the moss. From place to place along the sides are inflected sluices to admit water to the reservoirs of the potholders; each sluice having an aperture proportioned to the number of operators to be supplied from the reservoir which it fills. For the water raised through the day no reservoirs are necessary; as it is immediately used by the division to which it is allotted.

This additional stream, though highly beneficial, yet is not more than sufficient to keep 40 men at constant work. But such a quantity as would give constant work is not necessary; the operators must be often employed in making and repairing their drains, grubbing up roots of trees, &c.: so that a quantity sufficient to give five or six hours work per day to the whole inhabitants is as much as would be wanted. But as the quantity procured was still insufficient for this purpose, a small stream that descended from the higher grounds was diverted from its course and brought into the mosses. From want of level this stream could not be delivered to the greatest advantage; namely, upon the surface of the mosses. Yet by making, at a considerable expense, a drain half a mile long, and a reservoir for the night-water, it was rendered of much importance. And during the whole winter months, as well as in summer, after every fall of rain, it keeps 15 persons fully employed.

In the year 1787 two more tenants agreed for eight acres each; in 1788, four; in 1789, eight; in 1790, four tenants, all agreed for the same number of acres.

The whole moss was now disposed of, except that part called Flow-moss, which comprehended about 400 acres. Here it is twice the usual breadth, so fluid that a pole may be thrust with one hand to the bottom; and the interior part, for near a mile broad, is three feet above the level of all the rest of the mosses. Neither to the many and various difficulties that presented themselves had been overcome by perseverance and expense. But here the extraordinary elevation of the mosses, joined to its great fluidity, seemed to exclude all possibility of admitting a stream of water; and it was the general opinion that the moss operations had now arrived to the ne plus ultra, and that this moss would remain a nuisance for ages to come.

But the proprietor had now advanced so far that he could not submit to retreat; and he considered himself, as, in some measure, pledged to the country for the completion of this undertaking. To detail the various methods adopted to introduce a stream of water into that mosses, would prove tedious. It is sufficient to say, that after a thousand unsuccessful efforts, attended with much trouble and considerable expense, the point at last was gained, and a stream of water was brought in, and carried fairly and at the centre of the mosses.

The greatest obstacle was now indeed overcome; but still another remained of no small moment, namely, the discouragement given to settlers from the total impossibility of erecting habitations upon the surface of this mosses. To find a remedy for this evil was difficult. Happily a resource at last occurred. This was to bargain with a certain number of the old tenants who inhabited were nearest, to take lessees of portions of the mosses. But as some additional aid was here necessary, it was agreed that L 1200 Sterling should be gradually advanced to each tenant till he should accomplish the clearing of an acre, for which he or his successor is bound to pay 12s. of yearly rent, equal
Sketch of the Wheel for raising Water by a Screw

Sketch of the manner in which the water is filled from the Arches into the Buckets

Here the Buckets carry themselves

Here the arms of the Wheel move

Here the Buckets carry themselves

R. Sacq. et S. Blanchard
equal to five per cent. upon the sum advanced. When
this point shall be gained, they are bound to dispose,
and adjust agreeable to themselves, either of their old or
of their new possession; for which, when once an acre
is cleared, purchasers will not be wanting.

In consequence of the above arrangement, during
the year 1791, no fewer than 35 of the old tenants
agreed, upon the foreseen conditions, for eight acres
each of the Flow-mosses. Thus 1200 acres are now
dispersed of to 115 tenants. But when these 35 tenants
shall each have cleared their acre, then, according to
agreement, 35 additional tenants will speedily be ac-
quired; and the mosses will then contain in all 150
families.

To the leaves already granted to the tenants in the
High Mosses, it is now determined to add a further
period of 19 years (making in all 37 years), during
which they are to pay one guinea per acre; a rent
not greater than the land is worth even at present, but
greatly below its probable value as that distant period.
This, it is hoped, will prove to the tenants a fufficient
inducement to continue their operations till their pos-
sessions are completely cleared from mofs.

Having now gone through, in detail, the whole pro-
gress of the colony since its first settlement in the
year 1767, it still remains to take a general view of
the results produced by that establishment.

For several years, at first, the water was used chiefly
to carry off mosses, in the forming of new roads, and
preparing reservoirs; which considerably retarded the
principal object of gaining land. Nevertheless there
have been cleared full 500 acres of excellent land pro-
ducing wheat, barley, oats, and clover, yielding from
fix to twelve bolls after one.

From the nature of the undertaking, there is good
reason to suppose that the operations will yearly ad-
vance with greater rapidity; especially as the greater
number of the settlers have only of late begun to
operate. Many, besides maintaining their families
otherwise by occasional employments, have in the
High Moss cleared in a year one rood of land; some
have cleared two, some three roods, and in the Low
Moss an acre.

It was a remark often made, even by persons of some
observation, that by collecting together such a number
of people, Kincardine would be overstocked; and the
consequence would be their becoming a burden on the
parish: for as the bulk of them were labourers not bred
to any trade, and polled of little stock, it was foreseen
that, for some time, they could not afford to con-
fine themselves solely to the mosses, from which the
return must be slow, but believed, for immediate
subsistence, to work for daily hire. Happily these pre-
dictions have proved entirely groundless; for fish is
the growing demand for hands in this country, that not
only do the whole of these people find employment
whenever they choose to look for it, but their wages
have been yearly increasing from the time of their
first establishment. In short, they have proved to the
corner where they are set down a most useful nursery
of labourers; and those very farmers who, at first, so
strongly opposed their settlement, now fly to them as
a sure resource for every purpose of agriculture. Still
they consider the moss-operatives as their principal
business; none pay them so well; and when they do
leave it to earn a little money, they return with cheer-
fulness to their proper employment. Many of them
already rile from 10 to 60 bolls of grain, and have no
occasion to go off to other work, which will soon be
the cafe with the whole. Their original stock, indeed,
did not often exceed L. 25, and some had not even
L. 10; but what was wanting in stock is compensated
by industry.

Of the whole inhabitants full nine-tenths are High-
landers, from the neighbouring parishes of Callender,
Balquhidder, &c.: a sober, frugal, and industrious
people, who, insured to hardships in their own country,
are peculiarly qualified to encounter so arduous an un-
taking. From this circumstance, too, arises a very
happy consequence; that wearing a different garb and
speaking a different language from the people amongst
whom they are settled, they consider themselves in a
manner as one family, and not as inhabitants of a foreign
province. And hence upon all occasions of difficulty, they fly
with alacrity to each others relief. Neither ought it
to be forgotten, that, from their first settlement to the
present day, not a single instance has occurred amongst
them of theft, bad neighbourhood, or of any other mil-
demeanor, that required the interposition of the civil
magistrate. Nor, however poor in circumstances, has
any one of them ever stooped to solicit assistance
from the funds of the parih appropriated to that purpose.

Though few of the tenants entered with a large
stock, one only has been obliged to leave the mosses
from incapacity to proceed. Many indeed have spent
their small stocks, and even run a little in debt: but
in this case they have been permitted to sell their tacks
upon the following conditions: 1/4, That the purchaser
shall be a good man; 1/4, That the feller shall take
another possession. By this manoeuvre a new inhabi-
tant is gained; while the old one, relieved from debt,
and aided by palt experience, recommences his opera-
tions with double spirit upon a new possession. The
monied man, again, has at once a house and a piece of
ground; the want of which, chiefly, startled new be-
ginners.

Some have even made a kind of trade of selling: in-
fomuch, that from the year 1774 to the present year
1792, no fewer than fifty sales have taken place, pro-
ducing in all the sum of L. 849 Sterling. This proved
from time to time a most fashionable recruit to the
colony, and gave new vigour and spirits to the whole.

The number of the settlers is productive of an ex-
cellent effect; and although some are generally absent,
and the others remain to occupy the water saltantly.
In a favourable day there may be seen hundreds, men,
women, and children, labouring with the utmost affi-

duity. The women declare they can make more by
working at the mosses than at their wheel; and fuch is
the general attachment to that employment, that they
have frequently been discovered working by moon-
light.

Another happy consequence arising from their num-
bers is the great quantity of moss they consume for
fuel. There are in all 115 families. Each family
requires at an average 10 dargues (a) of peats yearly.

\[S\] 2

(a) A dargue (or darg) of peats, is the quantity that one man can calf and two can wheel in a day to the
field where they are spread out to dry.
Each darg uncovers a space equal to 10 square yards of clay; so that by castingpeats, the mof tenants gain yearly about 6 roods of land.

The advantage, too, of providing their fuel with so little trouble, is very great. They require yearly 1150 dargs of peats; which, as each darg when dried and stacked is valued at five shillings, are worth 287 l. 10s. sterling; a sum which otherwise must have been expended on the prime coat and carriage of coals. Many of them call peats for sale; and L. 100 worth are yearly disposed of in the town of Sterling, the village of Down, &c.

Though mof-work be laborious, it is at the same time amusing. The operator moves the mofs five feet only at a medium; and the water, like carts in other cafes, carrying it off as fast as it is thrown in, excites him to activity. Still he must submit to be wet from morning to night. But habit reconciles him to this inconvenience; while his house and arable land fill his eye and cheer his mind. Nor is it found that the health of the inhabitants is in the smallest degree injured either by the nature of the work or the vicinity of the mofs.

The quantity of mofs that one man can move in a day is surprising; when he meets with no interruption, seldom less than 48 cubic yards, each weighing 90 flones. The weight, then, of mofs moved per day is no less than 4320 flones. A cubic yard is moved into the water, and of course carried into the river Forth for one farthing. It follows, that the expense of moving 48 cubic yards is one shilling. But the same quantity moved to the same distance by carts would cost 24 shillings. Hence the advantage derived from the possibility of floating mofs in water, and the great importance of having water for that purpose.

The mofs, when contrived with the rich lands surrounding, appeared, especially before the improvements, a very dreary spot; one wide unvaried wild, totally unproductive, unfit even to furnish sustenance to any animal, except here and there a few wretched straggling sheep. Besides, it entirely cut off all connection between the farms on either side; amongst which no intercourse was practicable but by a circuit of several miles.

The scene is already greatly changed. The following are the numbers of the inhabitants now residing in the mofs; also of their cows and horses, and of the acres gained by them from the mofs, together with their produce.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>115</td>
<td>113</td>
<td>199</td>
<td>193</td>
</tr>
<tr>
<td>Ditto of cows, at least</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ditto of horses and carts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ditto of acres cleared from mofs</td>
<td>300</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The produce in bolls cannot be exactly ascertained; but, considering the goodness of the soil, may be fairly stated at 8 bolls per acre, inde 2400 bolls.

As oats are the staple commodity, the calculation shall be confined to that grain. According to the tariffs of Stirlingshire, crop 1790 (the last crop for which they have been struck), carfe oats are valued at 14s. per boll.

An excellent gravelled road 20 feet wide and a mile and a half long, is now carried quite across the mofs. By this means, in the first place, a short and easy intercourse is established between two considerable parts of the estate, formerly as little connected as if separated by a lake or an arm of the sea. Secondly, the inhabitants of the Mofs, to whom, hitherto, all paffage with carts or horses was impracticable for at least one half of the year, have now obtained the essential advantage of being able, with ease, to transport all their different commodities at every season of the year. This road was entirely formed by the hands of the mofs-tenants, and gravelled by their own carts and horses; a work which, it will not be doubted, they performed with much alacrity; when it is considered that, to the prospect of procuring a lafting and material benefit to themselves, there was joined the additional inducement of receiving an immediate supply of money, the whole being done at the proprietor's expense.

The possessons are laid off in the manner best fitted for the operations; and are divided by lanes running in straight lines parallel to each other. Parallel to these again the drains are carried; and this straight direction greatly facilitates the progress of the water with its load of mofs. Upon the bank of mofs fronting the lanes, the operation of floating is begun; and twenty or thirty people are sometimes seen heaving mofs into the same drain. That the water may be the more conveniently applied, the lanes include between them the breadth of two possessons only. The new houses are erected upon each side of these lanes at the distance of 100 yards from each other.

Before the formation of lanes and roads, and while yet no ground was cleared, the first settlers were obliged to erect their houses upon the surface of the mofs. Its softness denied all access to flones; which, at any rate, are at such a distance as would render them too expensive. Settlers, therefore, were obliged to construct their houses of other materials. Upon the Low Mofs there is found for this purpose great plenty of sod or turf, which accordingly the tenants use for the walls of their houses. For the rudeness of the fabric nature in some measure compensates, by overtopping the outside with a luxuriant coating of heath and other moorish plants, which has a very picturesque appearance.

But upon the High Mofs there is no sod to be found. There the tenant must go differently to work. Having chosen a proper situation for his house, he first digs four trenches down to the clay, so as to separate from the rest of the mofs a solid mafs, containing an oblong, rectangular area, sufficiently large for his intended house. This being done, he then scoops out the middle of the mafs, leaving on all sides the thickness of three feet for walls; over which he throws a
offered.

Upon the foottart parts of the moss, even these walls cannot be obtained. In such places the houfes are built with peat dug out of the moss, and closely compressed together while in a humid state. It is necessary even to lay upon the surface a platform of boards to prevent the walls from sinking; which they have frequently done when that precaution was neglected. After all, to flamp with the foot will make the whole fabric as well as the moss for fifty yards around. This, at first, startled the people a good deal; but custom soon rendered it familiar.

The colonists have now made considerable advancement in rearing better habitations for their comfort and convenience. Their huts of turf are but temporary lodgings. As soon as they have cleared a little ground, they build houses of brick; when the proprietor a second time furnishes them with timber gratis. It has also been found necessary to remove them entirely from the payment of the burdensome tax upon bricks; a tax which surely was never intended to fall on such poor industrious adventurers; and which, without this allowance, would have proved a most effectual bar to the employment of these materials.

There are now erected in the moss 69 brick-houses, substantially built with lime. The total expense amounted to £33. Sterling. And it is a very comfortable circumstance, that the money expended upon these houses is wholly kept in circulation among the inhabitants themselves: for as a number of them have learned not only to manufacture but also to build bricks, and as others who have hores and carts furnish the carriage of lime and coals, they thus interchange services with each other.

With a view to excite the exertion of the colonists, the following premiums have lately been offered: 1. To the person who shall in the space of one year remove the greatest quantity of moss down to the clay, a plough of the best construction. 2. To the person who shall remove the next greatest quantity, a pair of harrows of the best kind. 3. For the next greatest quantity, a spade of the best kind, and 10 lb. of red clover-feed. But as these premiums, if contested for by the whole inhabitants, could reach but a very few of the number, they have therefore been divided into six districts according to their situation, and the above premiums have been offered to each district.

The establishment of this colony has no doubt been attended with a very considerable share of expense and difficulty; for the undertaking was altogether new, and there were many prejudices against it, which it was necessary to overcome. At the same time it was noble and interesting; it was to make a valuable addition to private property; it was to increase the population of the country, and to give bread to a number of people; many of whom having been turned out of their farms and cottaries in the Highlands, might otherwise, by emigration, have been lost to their country; and that too at a time when, owing to the great enlargement of farms, depopulation prevails but too much even in the low countries. And it was to add to the arable lands of the kingdom, making many thousand bolls of grain to grow where none ever grew before.

These considerations have hitherto preponderated with the proprietors against the various obstacles that present themselves to the execution of so extensive an undertaking. Should their example tend in any degree to stimulate others, who both in Scotland and in England possess much ground equally useless to the country, to commence similar improvements, it would be a most grateful consideration, superadded to the pleasure already arising from the progress of the infant colony.

Most-Troopers, a rebellious sort of people in the north of England, that lived by robbery and rapine, not unlike the tories in Ireland, the Buccaneers in Jamaica, or banditti of Italy. The counties of Northumberland and Cumberland were charged with an yearly sum, and a command of men to be appointed by justices of the peace, to apprehend and suppress them.

Mostroha, in the Italian music, a mark at the end of a line or space, to show that the first note of the next line is in that place: and if this note be accompanied with a sharp or flat, it is proper to place their characters along with the moltra.

MOSUL, or Moussul. See Mousul.

MOTACILLA, in ornithology, the Wagtail and Yellow Wagtail. A genus of birds of the order of passerous; distinguished by a straight or bill of a fubulated figure, a tongue lacerated at the end, and very slender legs.

1. The alba, or white wagtail, frequents the sides of ponds and small streams, and feeds on insects and worms. The head, back, and upper and lower side of the neck, as far as the breast, are black; in some the chin is white, and the throat marked with a black crescent: the breast and belly are white; the quill feathers are dusky; the covert black, tippet and edged with white. The tail is very long, and always in motion. Mr. Willoughby observes, that this species shifts its quarters in the winter; moving from the north to the south of England during that season. In spring and autumn it is a constant attendant on the plough, for the sake of the worms thrown up by that instrument. These birds make their nest on the ground, composed of dry grafts, fine fibres of roots, and moss lined within with hair or feathers. The eggs are five in number, white, spotted with brown; and for the most part there is only one brood in a year.

2. The flava, or yellow wagtail, migrates in the north of England, but in Hampshire continues the whole year. The male is a bird of great beauty; the breast, belly, thighs, and vent feathers, being of a most vivid and lovely yellow: the throat is marked with some large black spots; above the eye is a bright yellow
yellow line: beneath that, from the bill, crook the eye, is another of a dusky hue; and beneath the eye is a third of the same colour: the head and upper part of the body is of an olive-green, which brightens in the coverts of the tail; the quill-feathers are dusky; the coverts of the wings olive-coloured; but the lower rows dusky, tipped with yellowish white; the two outmost feathers of the tail half white; the others black, as in the former. The colours of the female are far more obscure than those of the male: it wants also those black spots on the throat. It makes its nest on the ground, in corn-fields: the outside is composed of decayed stems of plants, and small fibrous roots; the inside is lined with hair: it lays five eggs.

3. The regulus, or gold-crested wren, is a native of Europe, and of the correspondent latitudes of Asia and America. It is the least of all the European birds, weighing only a single dram. Its length is about four inches and an half; and the wings, when spread out, measure little more than six inches. On the top of its head is a beautiful orange-coloured spot called its crest, which it can hide at pleasure; the margins of the crest are yellow, and it ends in a pretty broad black line; the sides of the neck are of a beautiful yellowish green; the eyes surrounded with a white circle: the neck and back of a dark green mixed with yellow; the breast of a dirty white; the tail composed of 12 feathers of a brown colour, an inch and a half long, but not forked. In America it associates with the titmice, running up and down the bark of lofty oaks with them; and collecting its food in the company as if they were all of one brood. It feeds on insects lodged in their winter dormitories in a torpid state. It is said to sing very melodiously.

4. The sialis, or blue-bird, is a native of most parts of North America; and is about the bigness of a sparrow. The eyes are large; the head and upper part of the body, tail, and wings, are of a bright blue, excepting that the ends of the feathers are brown. The throat and breast are of a dirty white: so that the hawk generally pursues it in vain. It makes its nest in holes of trees; resembles the robin-red breast in its song. They are not found in America, though several of their birds improperly bear that name; and it is uncertain whether they are found in Africa. This bird visits Britain in the beginning of April, and leaves it in August; and during its continuance there, its range is confined to but a part of the island: it is not found in Scotland, Ireland, or North Wales, nor in any of the northern counties except Yorkshire; and it does not migrate so far to the west as Devonshire and Cornwall. They are solitary birds, never uniting into even small flocks; and in respect to the nests, it is very seldom that two are found near each other. The female builds in some low bush or quickset hedge well covered with foliage, for such only this bird frequents; and lays four or five eggs of a greenish brown. The nest is composed of dry leaves on the outside, mixed with grass and fibres, lined with hair or down within, though not always alike. The female alone sits on and hatches the eggs, while the male not far off regales her with his delightful song; but as soon as the young are hatched, he commonly leaves off singing, and joins with the female in the task of providing for and feeding them. After the young can provide for themselves, the old female provides for a second brood, and the song of the male recommences. They have been known to have three broods in a year, and in the hot countries even four. These birds are often brought up from the nest for the sake of their song. They are likewise caught at their first coming over; and though old birds, yet by management can be made to bear confinement, and to sing equally with those brought up from the nest. None but the wildest epicure, as Mr. Latham remarks, would think of eating these charming songsters; yet, we are told that their flesh is equal to that of the ortolan, and they are fattened in Gascony for the table. Every school-boy must have read of Helioagabalus eating of nightingales tongues; and that famed dith of the Roman tragedian Æsop, which was composed of those of every singing or talking bird, and is said to have cost about £. 6843 of our money.

7. The hippophaeis, or pettychaps, is somewhat less than a linnet. The bill is short; the upper mandible black, the under bluish: above and below the eye there is a yellowish line: the head, neck, and upper parts are of a greenish ash-colour; the quills and tail of a mouse-colour, with greenish edges and black shafts; and the under wing-coverts are yellow: the belly is of a clear white; the breast darker, and tinged with yellow: the legs are bluish or lead-coloured. This species is frequent in several parts of England, and makes a nest.
8. The atricapilla, or blackcap, is smaller than the pittychaps. The bill is brown; the top of the head is black; and the upper parts of the body are of a greenish ash-colour; the sides of the head and under parts are grey, changing to very light grey, or almost white, towards the vent; the quills and tail are cinereous brown, margined with the same colour as the upper parts; the legs are lead-coloured, and the claws black. This bird is pretty common in England, and elsewhere in Europe, as far as Italy; in all which places it is known to breed; coming in spring, and retiring in September. In Italy it builds twice in the year; in England only once. The nest, which is generally placed in some low bush not far from the ground, is composed of dried flalks, mixed with a little wool and green moss round the verge; the inside lined with the fibres of roots, thinly covered with black horse-hair. The eggs are five in number; of a pale reddish brown, mottled with a deeper colour, and sprinkled with a few dark spots. The male and female sit by turns during incubation; and the young very early leap out of the nest, especially if any one approaches it, and forake it for ever. The food is chiefly insects; but in defect of these they will eat the fruits of spurge laurel, service, and ivy; and seem to be even fond of the moss; nightingale. It is migratory; coming hither in spring, and departing in autumn about October. It is not so shy as many birds in respect to itself; for it approaches habitations, and frequently makes its nest in some hole of a wall where numbers of people pass by frequently; yet it is content, if no one meddles with the nest; for the least derangement of the eggs, or almost looking at them, especially if the female is disturbed thereby, causes her to forake the nest altogether. It frequently builds also in some hole of a tree. The nest is composed chiefly of moss, lined with hair and feathers. The eggs are blue, and four or five in number. This bird frequently wags its tail; but does it sideways like a dog when he is pleased, and not up and down like the wagtail. It is with difficulty that these birds are kept in a cage; nor will they submit to it by any means if caught old. Their song has no great strength; yet it is agreeable enough; and they will, if taught young, imitate the note of other birds, and sing by night frequently as well as in the day time.

11. The falcicaria, or sedge-bird, is about the size of the blackcap, but more slender. The head is brown, marked with dusky streaks: the cheeks are brown; with a white line over each eye, and above that a black one: the upper parts of the neck and back are of a reddish brown; and the wing-coverts and quills dusky; the under parts are white; but the breast and belly have a yellow tinge; the tail is brown, and much rounded; and the legs are dusky. This bird is common in England, and frequents places where reeds and fedges grow; among which it is said to make the nest, though it has been known to do this on the lowest branches of trees. The nest is composed of straw and dried fibres of plants, lined with hair; and the eggs five in number, of a dirty white, marbled with brown. It is observed to imitate the note of the swallow, sky-lark, bunting, and other birds, in a pleasing but hurrying manner, and sings all night.

12. The ficedula, or epicurean warbler, is in length five inches; the upper parts are grey brown; the under parts greyish white, with a tinge of brown on the breast; and the legs are blackish. This bird is much esteemed on the continent for the delicate flavour of its flesh. Their chief food is insects; except in autumn, when they make great havoc among the figs and grapes; whence it is supposed their great delicacy in some measure arises. It is not found in England, but met with in most of the intermediate parts between Sweden and Greece; where, however, it is only a summer inhabitant, probably retiring still more south at the approach of winter. In the isle of Cyprus and Candia they abound greatly, infomuch as to be an article of commerce. They transport them in vessels filled with vinegar and sweet herbs: the isle of Cyprus alone collects 1200 or 1200 of these pots every year.

13. The rubecula, or red-breast, is universally known; the upper parts are of a greenish ash-colour; the forehead, throat, neck, and breast, a rufous orange; the belly and vent whitish; the bill, legs, and sides of the body, dusky. It is a constant inhabitant of Britain, as well as of the whole European continent from Sweden to Italy. It abounds in Burgundy and Lorraine, where numbers are taken for the table, and thought...
thought excellent. It builds not far from the ground if in a bush; though it sometimes fixes on an out-house, or retired part of some old building. The nest is composed of dried leaves, mixed with hair and moss, and lined with feathers. The eggs are of a dull white, marked with irregular reddish spots; and are from five to seven in number. The young, when full feathered, may be taken for a different bird, being spotted all over. The first rudiments of the red break forth on the breast about the end of August; but it is quite the end of September before they come to the full colour. Infants are their general food; but in defect of these they will eat many other things. No bird is so tame and familiar as this; closely attending the heels of the gardener when he is using his spade, for the sake of worms; and frequently in winter entering houses where windows are open, when they will pick up the crumbs from the table while the family is at dinner. Its familiarity has caused a petty name to be given it in several countries. The people about Bornholm call it tommer-liden; in Norway, Peter Ronmad; the Germans, Thomas Gierdet; and we, the Robin Red-breast.

14. The rubicola, or stone-chatter, is in length about four inches and three quarters. The male has the upper parts of the body mixed blackish and pale rufous; on each side the neck there is a transverse streak of white; the breast is of a reddish yellow; the belly paler; and the legs are black. The female has the colours much less vivid. This bird inhabits dry places, such as heaths and commons; living on insects of all kinds. It makes its nest early, at the foot of some low bush, or under a stone; and lays five or six eggs of a bluish green, sparingly marked with faint rufous spots. It is so very crafty as not to betray the place of the nest, never alighting but at some distance, and creeping on the ground to it by the greatest stealth. It is a nestless bird, incessantly flying from bush to bush; and seems to have received its English name from its notes, resembling the clicking of two stones together.

15. The rubetra, or whin-chat, is somewhat bigger than the stone-chatter. The upper parts are blackish, edged with rufous: from the bill arises a streak of white, which passes over the eye on each side, almost to the hind head: beneath this the cheeks are blackish; the chin is white; the rest of the under parts rufous white: on the wing, near the shoulder, is a transverse white mark, and another smaller near the baffard wing, on the outer edge: the legs are black. The female differs in being paler, and the spots on the wings and the white trace over the eye being far less conspicuous. This is not uncommon in Britain, and is seen along with the stone-chatter on the heaths during the summer months; where it breeds, making the nest much after the manner of that bird. It lays five dirty white eggs, dotted with black. This species is common also on the continent of Europe, in France, Italy, Germany, and the more temperate parts of Russia; but is said to be less common than the stone-chatter there, as it is also in England. Its food is chiefly insects; and is said to be as good as the ortolan, when fat and in good condition.

16. The cananthrus, or wheat ear, is in length five inches and a half. The top of the head, hind part of the neck, and back, are of a bluish grey; and over the eye a streak of white; the under parts of the body are dull yellow, changing to pure white at the vent: the breast is tinged with red; and the legs are black. This bird is met with in most parts of Europe, even as far as Greenland; and specimens have also been received from the East Indies. It visits England annually in the middle of March, and leaves it in September. It chiefly frequents heaths. The nest is usually placed under shelter of some turf, clod, stone, or the like; always on the ground, and not unfrequently in some deserted rabbit-burrow. It is composed of dry grass or moss, mixed with wool, fur of the rabbit, &c. or lined with hair and feathers. The eggs are from five to eight in number, of a light blue, with a deeper blue circle at the large end. The young hatch in the middle of May. In some parts of England these birds are in vast plenty. About East-bourn in Sussex they are taken in snares made of horse-hair placed beneath a long turf: Being very timid birds, the motion of a cloud, or the appearance of a hawk will drive them for shelter into these traps, and so they are taken. The numbers annually ensnared in that district alone amount to about 1840 dozen, which usually fall at sixpence per dozen. Quantities of these are eaten on the spot by the neighbouring inhabitants; others are picked, and sent up to the London poulterers and many are posted, being as much esteemed in England as the ortolan on the continent. Their food is insects only; though in rainy summers they feed much on earth-worms, whence they are fated in such feasons.

17. The cyanea, or superb warbler, a most beautiful species, is five inches and a half long. The bill is black: the feathers of the head are long, and stand erect like a full crest; from the forehead to the crown they are of a bright blue; from thence to the nape, black like velvet; through the eyes from the bill there runs a line of black; and beneath the eye springs a tuft of the same blue feathers; beneath which, and on the chin, it is of a deep blue almost black, and feeling like velvet; on the ears is another patch of blue, and across the back part of the head a band of the same: the whole giving the head a greater appearance of bulk than is natural: the hind part of the neck, and upper parts of the body and tail, are of a deep blue black; the under parts, purplish blue: the wings are dusky; the shafts of the quills chestnut: the legs are dusky brown; the claws black. It inhabits Van Diemen's Land, the most southern part of New Holland. The female of this species, of which a figure is given in Phillips's Voyage to Botany Bay, is discovered to be entirely destitute of all the fine blue colours, both pale and dark, by which the male is adorned, except that there is a very narrow circle of azure round each eye, apparently on the skin only: all the upper feathers composed of shades of brown, and the whole throat and belly is pure white. Except from the shape and size, this bird would not be suspected at first sight to belong to the same species as the male: the epithet of superb applies very ill to the female.

18. The troglodytes, or wren, is a very small species, in length only three inches three quarters; though some have measured four inches. The bill is very slender, and of a dusky brown colour: the head, neck, and back, are of a reddish brown; and over each eye a pale
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"There is no small advantage (says Bayle) to be made of reading this writer: and we have no French author that approaches nearer to Plutarch than he. We find beautiful thoughts, and solid arguments interwoven and dispersed through all he wrote; wit and learning go hand in hand. His style concerning the education of the young, and that of pagan philosophy, are the best which he hath written."

MOTHER, a term of relation, denoting a woman who hath born a child.

Mother of Pearl. See Mytilus.

MOTION is now generally considered incapable of definition, being a simple idea or notion received by the senses. The ancients, however, thought differently. Some of them defined it to be a passage out of one state into another; which conveys no idea to him who is ignorant of the nature of motion.—The peripatetic definition has been mentioned elsewhere, and shown to be wholly unintelligible, as well as their celebrated division of motion into some classes belonging to the three categories, quality, quantity, and relation: (see Metaphysics, B 185, 186, 190.) The several definitions of motion as presented by the ancients, too, among the moderns, pretend to define motion by calling it a change of one part of matter, out of the neighbourhood of those parts to which it is immediately contiguous, into the neighbourhood of others. Borelli defines motion to be the successive passage of a body from place to place. Others say that it is the application of a body to different parts of infinite and immovable space; and a lacemaker of uncommon acuteness has given as a definition of motion — change of place.

We have elsewhere offered our opinion of every possible attempt to define motion; but as the author of the last quoted definition has endeavoured to obviate such objections as ours, candour requires that he be heard for himself. "It is said (he observes) by some, that change implies motion, and therefore cannot be a part of its definition being the very thing defined. To this I answer, We are speaking of the sensible idea of motion, as it appears to our faculties: now changes do appear to our view, and to all our senses, which give us no idea of motion. Changes in heat or cold: in colour, smell, scent, hardness, softness, pain, pleasure: in these, and many other ideas, changes do not produce ideas like that produced by a ball rolling or a stone falling. We may perhaps, ultimately trace them to motion, but to inensible motions; to motions which arise only in reflection, and conflute no part of the actual idea of change. We can, therefore, conceive of change without conceiving at the same time of motion.—Change is a generic idea, including many species; motion, as a sensible idea, is a species of that genus. Change is therefore a necessary part of the definition of motion; it marks the genus of the thing defined. Motion is a change; but as there are many species of change, which of those species is motion? The answer is, It is a change of place. This marks the species; and differentiates it from change of colour, of temper, and figure."

This is the ablest defence of an attempt to define motion that we have ever seen; and at first view the definition itself appears to be perfect. Aristotle, the prince of definers, "confiders a definition 3 as a sketch of speech Man.

Note 1. See Dr Reid's account of Aristotle's logic, in Lord Kames's 3 E.
The definition under consideration seems to consist of the genus, signified by the word change; and of the specific difference, denoted by the words of place. But does the speech change of place really declare what motion is? We cannot admit that it does; as, in our apprehension, a change of place is the effect of motion, and not motion itself. Suppose a lover of dialectic undertaking to define the stroke by which he saw his neighbour wounded with a bludgeon: what should we think of his art were he to call it a contusion on the head? He might say that contusion is a general term, as contusions may be produced on the arms, on the legs, and on various parts of the body; and as there are many species of contusion, if he were asked which of those species was the stroke to be defined, he might answer, "a contusion on the head. Here would be apparently the genus and specific difference; the former denoted by contusion and the latter by the words on the head. But would this be a definition of a stroke? No, surely: a contusion on the head may be the effect of a stroke; but it can no more be the stroke itself, than a blow can be a bludgeon, or a flesh-wound the point of a sword. Equally evident it is, that a change of place cannot be motion; because every body must have been actually moved before we can discern, or even conceive, a change of its place. The effect of changing place would perhaps come nearer to a definition of motion; but so far would it be from "a speech declaring what motion is," that we are confident a man who had never by any of his senses perceived a body in actual motion, would acquire no ideas whatever from the words "act of changing place." He might have experienced changes in heat, cold, smell, and sound; but he could not possibly combine the ideas of such changes with the signification of the word place, were he even capable of understanding that word, which to us appears to be more than doubtful. (See Metaphysics, § 40, 41.)

The distinctions of motion into different kinds have been no less various, and no less insignificant, than the several definitions of it. The moderns who reject the peripatetic division of motion into four classes, yet consider it themselves as either absolute or relative. Thus we are told, that "absolute motion" is the change of absolute place, and that its celerity must be measured by the quantity of absolute space which the moving body runs through in a given time." "Relative motion, on the other hand, is a mutation of the relative or vulgar place of the moving body, and has its celerity estimated by the quantity of relative space run through." Now it is obvious, that this distinction conveys no ideas with a farther explanation of the terms by which it is expressed: but that explanation is impossible to be given. Thus, before we can understand what absolute motion is, we must understand what is meant by absolute place. But absolute place is a contradiction: for all place is relative and consists in the positions of different bodies with regard to one another. Were a globe in the regions of empty space to be put in motion by Almighty Power, and all the rest of the corporeal worlds to be flown afterwards annihilated, the motion would undoubtedly continue unchanged; and yet, according to this definition, it would be at first relative and afterwards absolute. That the beginning of such a motion would be peregrine, and the remainder of it imperceptible, is readily granted; but on this account to consider it as of two kinds, is as absurd as to suppute the motion of the minute-hand of a clock to be affected by our looking at it.

Leaving therefore these unintelligible distinctions, we now come to consider a question full of a very strutting nature, but much agitated among philosophers: viz. What is the original source of motion in the creation? Is it natural to matter? or are we to ascribe it to the immediate and continual agency of some immaterial being? The former has been strenuously argued by the Cartesians, and the latter by the Newtonians. The arguments of the former, founded upon the chimerical hypothesis of vortices and the original momentum of matter, were evidently inconclusive; and the hypothesis of Sir Isaac Newton, who asserted that it was naturally incapable of motion, appeared more probable. To account for the quantity of motion in the universe, therefore, it became necessary to have recourse either to the Deity, or to some subordinative spiritual agent; and this became the more necessary, as the doctrine of an absolute vacuum in the celestial spaces, that is, throughout the incomparably greatest part of the creation, was one of the fundamental maxims of the system. As it was absolutely denied that matter existed in those spaces, and it was plain that the celestial bodies affected one another at immense distances, the powers of attraction and repulsion were naturally called in as the sources of motion by their impulses upon inert and sluggish matter. Those being admitted, a speculation ensued concerning their nature. By natural it was confessed, they were: but whether they were to be accounted the immediate action of the divine Spirit himself, or of some subordinate and inferior spirit, was a matter of no little dispute. Sir Isaac Newton, towards the latter part of his life, began to relax somewhat of the rigidity of his former doctrine; and allowed that a very subtle medium, which he called ether, A subtle ether the probable cause of attraction and repulsion, and thus of the whole phenomena of nature. Since his time the multitude of discoveries in electricity, the similarity of that fluid to fire and light, with the vast influence it has on every part of the creation with which we are acquainted, have rendered it very probable that the other mentioned by Sir Isaac is no other than the element of fire, "the most subtle" and clas.

Siris, duce of all bodies, which seems to pervade and expand itself throughout the whole universe. Electrical experiments show that this mighty agent is everywhere present, ready to break forth into action if not restrained and governed with the greatest wisdom. Being always relives and in motion, it actuates and vivifies the whole visible mass; is equally fitted to produce and to destroy; distingishes the various phases of nature, and keeps up the perpetual round of generations and corruptions, pregnant with forms which
Motion. The animal spirit in man is the instrument both of sense and motion. To supply the senses in the corporeal world would be gross and unwarranted; but local motive faculties are evident in all its parts. The Pythagoreans, Platonists, and Stoics, held the world to be an animal; though some of them have chosen to confider it as a vegetable. However, the phenomena do plainly show, that there is a spirit that moves, and a mind or providence that presides. This providence, Plutarch faith, was thought to be in regard to the world what the soul is in regard to man. The order and course of things, and the experiments we daily make, show that there is a mind which governs and actuates this mundane sytem as the proper and real agent and cause; and that the inferior instrumenal cause is pure ether, fire, or the substance of light, which is applied and determined by an infinite mind in the macrocosm or universe, with unlimited power, and according to fitated rules, as it is in the microcosm with limited power and skill by the human mind. We have no proof either from experiment or reason of any other agent or efficient cause than the mind or spirit. When, therefore, we speak of corporeal agents, or corporeal causes, this is to be understood in a different, subordinate, and improper sense; and such an agent we know light or elementary fire to be.

That this elementary fire, absorbed and fixed in all bodies, may be the cause of the universal principle of gravity, is made sufficiently evident by number of experiments. Homburg having calcined in the focus of a burning-glass some regulus of antimony, found that it had gained one tenth in weight, though the regulus, during the whole time of the operation, fent up a thick fumoke, and thereby lost a considerable part of its own substance. It is vain to alledge that any heterogeneous matter floating in the air, or that the air itself, may have been hurried into the mafs by the action of the fire. And that by this additional matter the weight was increased: for it is known experimentally, that if a quantity of metal be even hermetically fecured within a vessel of glass to keep the air and all foreign matter, and the vessel be placed for some time in a strong fire, it will exhibit the fame effect. "I have seen the operation performed (says Mr Jones,) on two ounces of pewter-filings, hermetically sealed up in a Florence flate, which in two hours gained 15 grains, that is nearly one 17th. Had it remained longer in the fire, it might probably have gained something more; as, in one of Mr Boyle's experiments, flite-filings were found to have gained a fourth.

"Of accounting for thefe effects there are but two possible ways: 1. If the quantity of matter be the fame, or, in the cafe of calcination, be somewhat lefs, after being exposed to the action of the fire, while the gravity of the whole is become greater; then does it follow that gross and heavy matter, to the quantity of matter, and of course is not one of its properties. 2. If there be an increafe of the mass, it can be imputed to nothing but the matter of light or fire entangled in its passage through the substance, and so fixed in its parts, or combined with its solid parts, as to gravitate together with it. Yet it is certain, from the phenomenon of light darting from the sun, that this elementary fire does not gravitate till it is fixed in metal, or some other solid substance.

Here then we have a fluid which gravitates, if it gravitate at all, in some cases and not in others. So that which way ever the experiment be interpreted, we are forced to conclude that elementary or solar fire may be the cause of the law of gravitation.

That it is likewise in many cafes the caufe of repulsion, is known to every one who has seen it fuse metals, and convert water and mercurial into elastic vapour. But there is a fæt recorded by Mr Jones, which feems to evalue that the fame fluid, which as it issues from the fun exhibits itself in the form of light and heat, is in other circumftances converted into a very fine air, or cold æther, which rushes very forcibly towards the body of that luminary. "As a sequel to what has been observed (fays he) concerning the impregnation of solid substances with the particles of fire, give me leave to subjoin an experiment of M. de Stair. He tells us, that upon heating red lead in a glafs whence the air was exhausted by the rays of the sun collected in a burning-glafs, the veffel in which the folid red lead was contained burst in pieces with a great noise. Now, as all explosions in general must be ascribed either to an admiufion of the fire into a rarefied space, or to what is called the generation of it; and as air was not admitted upon this occasion, it must have been generated from the calx within the veffel; and certainly was so, because Dr Hales has made it appear that this subfance, like crude tartar and many others, will yield a confiderable quantity of air in diftillation. What went into the metal therefore as fire, came out of it again as air; which in a manner forces upon us conclusions of ineffable value in natural philosophy, and such as may carry us very far into the most sublime part of it."

One of the conclusions which the ingenious author thinks thus forced upon us, is, that the motion of the planets round the fun, as well as round their own axis, is to be attributed to the continual agency of this fluid, under its two forms of elementary fire and pure air. As fire and light, we know that it rushes with inconceivable rapidity from the body of the fun, and penetrates every corporeal subfance, exerting itself sometimes with such a force as nothing with which we are acquainted is able to refist. If it be indeed a fæt, that this elementary fire, or principle of light and heat, afterwards cools, and becomes pure air, there cannot be a doubt, but that under fuch a form it will return with great force, though furely in a somewhat different direction, towards the fun, forming a vortex, in which the planets are included, and by which they muft of course be carried round the centre. Mr Jones does not fuppofe that the air into which the principle of light and heat is converted, is of fo gross a nature as our atmosphere. He rather confiders it as cool æther, gravitate at all, his æther, in its aerial form though not fit for human respiration, is a better pumulo of fire than the air which we breathe.

This theory is exceedingly plausible; and the au-

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indeed, convinced us that the folar light is inverted or convertible into pure air; but he has, by just reasoning from undoubted facts, proved that the whole expanse of heaven, as far as comets wander, is filled not only with light, which is indeed obvious to the senses, but also with a fluid, which, whatever it may be called, supplies the place of air in feeding the fire of these ignited bodies.

That the motion of the heavenly bodies should result from the perpetual agency of such a medium, appears to us a much more rational hypothesis, than that which makes them act upon each other at immense distances through empty space. But the hypothesis is by no means to complete a solution of the phenomena as some of its fond admirers pretend to think it. This fluid, whether called ether, heat, light, or air, is still material; and the question returns upon him who imagines that it is sufficient to account for gravitation, repulsion, magnetism, and cohesion, &c. "What moves the fluid itself, or makes the parts of which it is composed cohere together?" However widely it may be extended, it is incapable of positive infinity; and therefore may be divided into parts separated from each other; so that it must be held together by a foreign force, as well as a ball of lead, or a piece of wax. As matter is not essentially active, the motion of this ether, under both its forms, must likewise be considered as an effect, for which we do not think that any propelling power, in the body of the sun can be admitted as a sufficient cause. For how comes the sun to pofefs that power, and what makes the fluid return to the sun? We have no notion of power, in the proper sense of the word, but as intelligence and volition; and by the pious and excellent author of the Essay on the First principles of Natural Philosophy, we are certain that the sun was never suppossed to be intelligent.

Bishop Berkeley, who admits of light or aether as the instrumental cause of all corporeal motion, gets rid of this difficulty, by supposing, with the ancients, that this powerful agent is animated. "According to the Pythagoreans and Platonists (says his Lordship), there is a life infused throughout all things; the air, water, fire, an intellectual and artificial fire, an inward principle, animal spirit, or natural life, producing and forming within, as art does without; regulating, moderating, and reconciling the various motions, qualities, and parts of this mundane system. By virtue of this life, the great masses are held together in their ordinary courses, as well as the minutest particles governed in their natural motions, according to the several laws of attraction, gravity, electricity, magnetism, and the rest. It is this gives infinites, teaches the spider her web, and the bee her honey. This it is that directs the roots of plants to draw forth juices from the earth, and the leaves and cortical vessels to separate and attract such particles of air and elementary fire as suit their respective natures." This life or animal spirit seems to be the same thing which Cudworth calls plastic nature, and which has been considered elsewhere. (See Metaphysics, p. 200 and Plastic Nature.) We shall therefore dismiss it at present, with just admitting the truth of the Bishop's position, "that if nature be suppossed the life of the world, animated by one soul, composed into one frame, and directed or governed in all its parts by one supreme and distinct intelligence, this system cannot be accused of atheism, though perhaps it may of mistake or impropriety."

A theory of motion somewhat similar to that of Berkeley, though in several respects different from it, was not many years ago flattered with great clearness, supported with much ingenuity, in an Essay on the Powers and Mechanism of Nature, intended to improve, and more firmly establish, the grand superstructure of the Newtonian system. Mr Young, the author of the essay, admits, with most other philosophers of the present age, that body is composed of atoms which are impenetrable to each other, and may be denominated fluid. These atoms, however, he does not consider as primary and simple elements, incapable of resolution into principles; but thinks that they are formed by certain motions of the parts of a substance immaterial and essentially active.

As this notion is uncommon, and the offspring of a vigorous mind, we shall consider it more attentively under the article Plastic Nature. It is mentioned at present as being insufficient to form a necessary introduction to the author's theory of a principle of motion, of which he attributes both the origin and the vesture to the agency of this elementary substance universal, pervading the most solid atoms of the densest bodies. Of every body and every atom he holds the constituent principles to be essentially active; but their principles act in such a manner as to counterbalance each other; so that the atom or body considered as a whole is inert, unless in so far as it refits the compulsion or separation of its parts. No body or atom can of itself begin to move, or continue in motion for a single instant; but being pervious to the active substance, and composing with it, that substance, when it enters any body, carries it along with it, till, meeting some other body in the way, either the whole of the active substance lodged in the former body remains in the obstacle, in which case the impelling body instantly ceases to move; or else part of that substance passes into the obstacle, and part remains in the impelling body; and in this case both bodies are moved with a velocity in proportion to the quantity of matter which each contains, combined with the quantity of active substance by which they are respectively penetrated.

Proof of the existence of one uniform active substance, he observes, that "change being an essential constituent part of motion, and change implying action, it follows that all motion implies action, and depends on an active cause. Every motion (he continues) has a beginning, a middle, and an end. The beginning is a change from rest to motion; the middle is a continuance in motion; the end is a change from motion to rest." He then proceeds to show, that the beginning of motion is by an action begun; the continuance of motion by an action continued; and the end of motion by a cessation of action.

The drift of these positions is admitted by every body. That the continuance of motion is by an action continued, will be proved, if it shall be shown that the continuance of a motion is nothing different from its beginning, in regard to any point of time allumed in the continued motion. Now the beginning of motion (he says) consists in the beginning of change of place,
place. But if any given portions of time and of space are assumed, a body beginning to move in the commencement of that time, and in the first portion of the space assumed, then and there begins that particular motion: and whether the body began to move in that space it was moving in other spaces and times, has no relation to the motion in question; for this being in a space and time altogether different, is a distinct motion from any which might have preceded it immediately, as much as from a motion which preceded it a thousand years before. It is therefore a new motion begun: and so it may be said of every assumable point in the continued motion. The term *continua* serves only to connect any two distinct motions, the end of one with the beginning of the other; but does not destroy their distinctness.

He then proceeds to combat, which he does very successfully, the arguments by which the more rigid Newtonians endeavour to prove that a body in motion will continue to be moved by its own inertia, till stopped by some opposite force. Having done this, he establishes the contrary conclusion by the following syllogisms:

"I. Whatever requires an active force to stop its motion, is disposed to move.

   Every body in motion requires an active force to stop its motion:

   Therefore every body in motion is disposed to move.

II. Whatever is disposed to motion is possessed of action.

   But a body in motion is disposed to continue in motion.

   Therefore a body in motion is possessed of action.

Thus it appears, that the middle part of any motion is action equally with the beginning.

"The last part of motion is its termination. It is admitted that all motion is terminated by an action contrary to the direction of the motion. It is admitted, too, that the moving body *ails* at the time its motion is destroyed. Thus the beginning and the end of any uniform motion are confessed to be actions; but all the intermediate actions which connect the beginning with the end is denied to be action. What can be more unaccountable than this denial? Is it not more consonant to reason and analogy, to ascribe to the whole continued motion one uninterrupted action? Such a conclusion true philosophy, we think, requires us to make.

"To move or act, is an attribute which cannot be conceived to exist without a substance. The action of a body in motion is indeed the attribute of the body, and the body relatively to its own motion is truly a substance, having the attribute or quality of motion. But the body being a name signifying a combination of certain ideas, which ideas are found to arise from action (see PLATO *Nature*), that action which is productive of those ideas whose combination we denominate body, is of the nature of an attribute. In other terms, body is to be considered as an attribute so long as it is considered as constituted of action.—To this attribute we must necessarily ascribe its substance. The actions which constitute body must be actions of something, or there must be something which acts. What then is this active something from whose agency we get the idea of body, or whose actions constitute body? Is it not sufficient that it is something active? A name might be surely given it, but a name would not render the idea more clear. Its description may be found in every sensation; it is colour to the eye, flavour to the palate, odour to the nose, sound to the ear, and feeling to the touch; for all our sensations are but so many ways in which this active something is manifested to us. A substratum of solidity philosophers have imagined to exist, and have vainly sought to find. Our active substance is the substratum for long sought for, and with so little success. We give it a quality by which it may be perceived; it acts. One modification of action produces matter, another generates motion. These modifications of action are modes of the active substance, whose presence is action: matter and motion constitute the whole of nature. There is therefore throughout nature an active substance, the constituent essence of matter, and immediate natural agent in all effects."

By an argument which we do not think very conclusive, our author determines this active substance to be unintelligent. "In our sensations individuality, not discovering (says he) the traces, not seeing the characters of intelligence, but finding only action present and necessary, our inferences go no farther than our observations warrant us to do; and we conclude in all these things an action only, and that action unintelligent." Having given our opinion of real agency elsewhere (see METAPHYSICS, No. 118), we shall not here stop to examine this reasoning. We may, however, ask, Whether all our sensations individually be not excited for a certain end? If they be, according to our author's mode of arguing in another place, the excitable agent must be an intelligent being. By this we are far from meaning to deny the reality of a secondary or instrumental cause of sensation which is distinct of intelligence. We are strongly inclined to think that there is such a cause, though our persuasion results not from this argument of our author. In our opinion, he reasons better when he says, "that a subordinate agent constructed as the master of creation, invested with perpetual laws, and producing agreeably to those laws all the forms of being, through the varieties of which inferior intelligences can, by progressive steps, arrive ultimately at the supreme contriver, is more agreeable to our ideas of dignity, and tends to impress us with more exalted sentiments, than viewing the Deity directly in all the individual impressions we receive, divided in the infinity of particular events, and unwary, by his continual presence in operations to view insignificant and mean."

This active substance, or secondary cause, our author concludes to be neither matter nor mind. "Matter, matter (says he) is a being, as a whole quiescent and inactive, but constituted of active parts, which reftitute separation, or cohere, giving what is usually denominated vitality to the mass. Mind is a subtle one which thinks. A being which should answer to neither of these definitions, would be neither matter nor mind; but an immanent, and, if I may so say, an immaterial substance." Such is the active substance of Mr. Young, which,
The man ingenio motion. The

active substance must be considered as a being naturally either active or motive. But it cannot be

natural: if it were, there would be no such thing as a tendency to motion, cannot originate in a tendency to rest. Therefore the active substance is by nature motive, that is, tending to motion. The active substance is not solid, and does not resist penetration. It is therefore incapable of impelling or of sustaining impulse. Whence it follows, that as it tends to move, and is incapable of having its motion impeded by impulse, it must actually and continually move: in other words, motion is essential to the active substance.

In order that this substance may act, some other thing upon which it may produce a change is necessary; for whatever suffers an action, receives some change. The active substance, in acting on some other thing, must impart and unite itself thereto; for its action is communicating its activity. But it cannot communicate its activity without imparting its substance; because it is the substance alone which possesses activity, and the quality cannot be separated from the substance. Therefore the active substance acts by uniting itself with the substance on which it acts. The union of this substance with bodies, is not to be conceived of as a junction of small particles intimately blended together, and attached at their surfaces; but as an entire diffusion and incorporation of one substance with another in perfect coalescence. As bodies are not naturally active, whenever they become so, as they always do in motion, it must be by the accession of some part of the active substance. The active substance being imparted to a body, penetrates the most solid or resisting parts, and does not reside in the pores without, and at the surfaces of the solid parts. For the activity is imparted to the body itself; and not to its pores, which are no parts of the body: therefore, if the active substance remained within the pores, the cause would not be present with its effect; but the cause would be in one place and the effect in another, which is impossible.

Bodies by their impulse on others lose their activity in proportion to the impulse. This is matter of observation. Bodies which suffer impulse acquire activity in proportion to the impulse. This also is matter of observation. In impulse, therefore, the active substance paves out of the impelling body into the body impelled. For since bodies in motion are active, and activity consists in the presence of the active substance, and by impulse bodies lose their activity, therefore they lose their active substance, and the loss is proportional to the impulse. Bodies impelled acquire activity; therefore acquire active substance, and the acquisition is proportioned to the impulse. But the active substance left by the impelling body ought to be concluded to be that found in the other; because there is no other receptacle than the impelled body to which the substance parted from can be traced, nor any other source than the active body whence that which is found can be derived. Therefore, in impulse, the active substance ought to be concluded to pass from the impelling body to the body impelled. The flowing of such a substance is a sufficient cause of the communication of activity, and no other rational cause can be assigned.

The continued motion of a body depends not upon its inertia, but upon the continuance of the active substance within the body. The motion of a body is produced by the motion of the active substance in union with the body. It being evident, that since the active substance itself does always move, whatever it is united to will be moved along with it, if no obstacle prevent. In mere motion, the body moved is the patient, and the active substance the agent. In impulse, the body in motion may be considered as an agent, as it is made active by its active substance.

While the active substance is flowing out of the active body into the obstacle or impelled body, the active body will press or impel the obstacle. For while the active substance is yet within the body, although flowing through it, it does not cease to impart to the body its own nature, nor can the body cease to be active, because not yet deprived of the active substance. Therefore, during its sloughing out of the body, such portion of the active substance as is yet within, is urging and dispersing the body to move, in like manner as if the active substance were continuing in the body; and the body being thus urged to move, but impeded from moving, presses or impels the obstacle.

The question which has been so long agitated, and cause of the phenomenon, is given by Mr. Young.
Motions complex; the more motions simple and in all things first in order, and out of the more simple the more complex arises in order posterior. The most simple motion is rectilinear; therefore a rectilinear motion is to be considered as that which is the original and natural state of things and consequently that to which all things tend. It will follow from hence, that when any portion of active substance in which the law of union operates, has in the manner above explained been compelled to assume a revolving motion, that is, a motion in some curve; a tendency to a rectilinear motion will continually exist in every part of the revolving portion, and in every point of the curve which it describes during its revolution. And this rectilinear tendency will be a tendency to recede from the centre in every point of the revolving orbit, and to proceed in a tangent to the orbit of each point. These two tendencies, if not originally equal, must necessarily in all cases arrive at an equality. For the tendency towards the centre, called the centripetal tendency, that is the law of union, operating first, if we suppose the motion approaches the centre, the tendency to recede from it called the centrifugal tendency, will have its proportion to the centripetal continually increased as the orbit of revolution grows less, so as ultimately to equal the centripetal tendency, and restrain the motion from its central course, at which point it will no longer seek the centre but revolve round it."

As our author holds that every atom of matter is formed by the motion of parts of the active substance, and every body formed by the motion of atoms; so he maintains, not only that the sun, moon, earth, planets and stars, are penetrated by the same substance, but that each is the centre of a vortex of that substance and that of these vortices some are included within others. "The subtle revolving fluid, the centre of whose vortex the earth occupies, not only surrounds but pervades the earth, and other vortices their earths, to their centres; and the earth and planets are by its revolutions carried around on their own axes. The earth is an inactive mass, and all its component masses are severally as well as collectively inactive; but the earth and all its parts have various collective and separate movements, imparted from the fluid which surrounds, pervades, and constitutes it. Being immersed together with its proper surrounding sphere or vortex, in the larger sphere or vortex of the sun, it is carried thereby in a larger orbit about the sun, at the same time that by the revolution of its proper sphere it rotates on its own axis."

Such is the most complete view which our limits will permit us to give of Mr Young's theory of motion. To the philosopher who considers experiment theory, as the only test of truth, and who in all his inquiries employs his hands more than his head, we are fully aware that it will appear in no better light than as "the baleful fabric of a vixion." Even to the intellectual philosopher who is not frightened at the word metaphysics, we are afraid than such an active substance as the author contends for, as I appear as adequate to the production of the phenomena of gravitation and repulsion as the material ether of Mr Jones and his followers. A being void of intelligence, whether it be material or immaterial, quiescent or motive, cannot
be the subject of law, in the proper sense of the word. The laws of which Mr. Young speaks as necessary to regulate the motions of the active substance, must be more free, applied by some extrinsic and superior power. And since "motion, as it is effective to the active substance, is power without direction, agency without order, activity to no end; since it is of such a nature, that from its unguided agitations there could result neither connection, order, nor harmony;" it follows that those extrinsic forces must be perpetually applied, because what is effective to any substance can never be destroyed or changed so long as the substance itself remains.

Forces producing order out of confusion, can be applied only by a being possessed of intelligence; and if the immediate and perpetual agency of an intelligent being is necessary to regulate the motions of the active substance, that substance itself may be thought superfluous, and its very existence be denied. "Et a non sunt muti licentia ab fine nostris," is a rule of philosophy which every man of science acknowledges to be just. And it will hardly be denied, that the immediate and perpetual agency of an intelligent being upon Mr. Jones's ethereal fluid, or even upon the matter of solid bodies themselves, would be capable of producing every kind of motion with that instrumentality of a substance which is neither mind nor matter.

Such we conceive, are the objections which our metaphysical readers may make to this theory. Part of their force, however, will perhaps be removed by the ingenious manner in which our author analyzes matter into an inmaterial principle. But so much of it remains, that the writer of this article is inclined to believe that no mechanical account can be given of the motions of the heavenly bodies, the growth of plants, and various other phenomena which are usually solved by attraction and repulsion. In the present age, philosophers in general are strangely averse from admitting on any occasion the agency of mind; yet as every effect must have a cause, it is surely not irrational to attribute such effects as mechanism cannot produce to the operation either of intelligence or infirmity. To suppose the Deity the immediate agent in the great motions of the universe, has been deemed impious; and it must be confessed that very ingenious conclusions have been deduced from that principle. But there is surely no impropriety in supposing, with the excellent bishop of Cloyne, that the fluid which is known to pervade the solar system, and to operate with irresistible force, may be animated by a powerful mind, which acts intuitively for ends of which itself knows nothing. For the existence of such a mind, no other evidence, indeed, can be brought than what is afforded by a very ancient and very general tradition, and by the impossibility of accounting for the phenomena upon principles of mere mechanism. Perhaps some of our more pious readers may be inclined to think that the Supreme Being has committed the immediate government of the various planetary systems to powerful intelligences, or angels, who as his ministers, direct their motions with wisdom and forethought. Such an opinion is certainly not absurd in itself; and it seems to be countenanced by an ancient writer who, though not known by the name of a philosopher, knew as much of the matter as any founder of the most celebrated school.

To object to either of these hypotheses, as has been sometimes done, that it represents the government of the world as a perpetual miracle, betrays the grossest ignorance; for we might as well call the movements of the bodies of men and brutes, which are certainly produced by minds, miraculous. We do not affirm that either hypothesis is certainly true; but they are both as probable and as satisfactory as the hypothesis which attributes agency to attraction and repulsion, to a subtile ether, or to a substance which is neither a mind nor matter. Were the immediate agency of intellect to be admitted there would be no room for many of those disputes which have been agitated among philosophers, about the increase or diminution of motions in the universe; because an intelligent agent, which could begin motion as well as carry it on, might increase or diminish it as he should judge proper. If infinite agency, or something similar to it, shall be adopted, there is the same room for investigation as upon the principles of mechanism; because infinite works blindly according to steady laws imposed by a superior mind, which may be discovered by observation of their effect. As we consider this as by much the most probable hypothesis of the two, we find ourselves involved in the following question: "If a certain quantity of motion was originally communicated to the matter of the universe, how comes it to pass that the original quantity still remains? Considering the many opposite and contradictory motions which since the creation have taken place in the universe, and which have undoubtedly destroyed a great part of the original quantity, by what means has that quantity been restored?"

If this question can be solved by natural means, it must be upon the principles of Newton; for "in every case where quantities and relations of quantities are required, it is the province of mathematics to supply the information sought," and all philosophers agree that Sir Isaac's doctrine of the composition and resolution of motion, though in what respects the heavenly bodies may have no physical reality, is so mathematically just, as to be the only principle from which the quantity of motion, or the force of powers, can in any case be computed. If we choose to answer the question, by saying that the motion left is restored by the interpolation of the Deity, then we might as well have had recourse to him at first, and say that he alone is the true principle of motion throughout the creation.

Before, we are reduced to this dilemma, however, it is necessary, in the first place, to inquire whether there is or can be any real diminution of the quantity of motion throughout the universe? In this question the Cartesians take the negative side, and maintain that the Creator at the beginning impressed a certain quantity of motion on bodies, and that under such laws as that no part of it should be lost, but the same portion of motion should be constantly preferred in matter: and hence they conclude, that if any moving body strike on any other body, the former loses no more of its motion than it communicates to the latter. Sir Isaac Newton takes the contrary side, and argues in the following manner: "From the various compositions of two motions, it is manifest there is not al-
wanes the same quantity of motion in the world: for if two balls, joined together by a slender wire, revolve with an uniform motion about their common centre of gravity, and at the same time that centre be carried uniformly in a right line drawn in the plane of their circular motion, the sum of the motions of the two balls, as often as they are in a right line, drawn from their common centre of gravity, will be greater than the sum of their motions when they are in a line perpendicular to that other. Whence it appears, that motion may be both generated and lost. But, by reason of the tenacity of fluid bodies, and the friction of their parts, with the weakness of the elastic power in solid bodies, nature seems to incline much rather to the diminution than the production of motion; and in reality, motion becomes continually less and less. For bodies which are either so perfectly hard or so soft as to have no elastic power, will not rebound from each other; their impermeability will only stop their motion. And if two such bodies equal to one another be carried with equal but opposite motions, so as to meet in a void space, by the laws of motion they must rebound with equal and opposite forces. But if the obstacle is removed, they melt themselves in their primitive vigour, without the least symptom of abatement or decay.

Under the article Mechanics, it has been shown, that when motion is compounded of two powers acting obliquely upon one another, more motion is lost than the two powers taken together could spare. Thus, if the two powers $AB$ and $AC$ move a body through the diagonal of the square $AD$; supposing each of these powers to be $= 5$, the diagonal through which they pass will be $= 7$ (A) but from an inspection of the figure, it is manifest, that by the separation of the two powers, a quantity of motion $BC$, equal to the length of the other diagonal, is lost: for as far as the two acts oppose to each other, they must destroy motion. The quantity of motion produced therefore being $7$, and the quantity lost the same, the whole quantity originally existing in the two powers $AB$ and $BC$ ought to have been $= 14$, when it is only $10$. To make up for the deficiency therefore, we must search for the origin of the two powers $AB$ and $BC$, and this we shall find in the lines $Aa$, $Ac$, and $Ad$; each of which is $= 3$, altogether making $14$; whence deducting $7$ the motion lost, we have $7$ remaining for the motion produced. Let us now find out the origins of these powers, and we shall find those of $Aa$ in the lines $As$ and $Af$; the origins of $Ac$ in $Af$ and $Ag$. The sources of $Ad$ we find in the lines $Ag$ and $Ab$. Thus we have now eight fountains of the four powers which generated the two first ones; and thus we find that the power $AD = 7$, requires two of $5$ each $= 10$ for its generation; these two require four of $3\frac{1}{2}$ each for their production; and these again require eight of $2.45$ each for their production. Hence, in order to generate the two original powers $AB$ and $AC$, we see that there is required at a very few steps no less than $20$; and in like manner, to generate these eight powers, we must have recourse to $16$ others; so that the ultimate fountaine of motion increases beyond all calculation.

Whether, therefore, we reckon the ultimate source of motion to be spiritual or material, it is plain that it must be to our conceptions infinite; neither will the
Motion.

Plenchemas of nature allow us to give any other explanation than we have done: for no power whatever can lose more than its own quantity; and it seems absurd to think that the Deity would create the world in such a manner that it would ultimately become insubstantial, and that it should be necessary to unknown principle to remedy the supposed defect. On the principle we have just now laid down, however, the matter becomes exceedingly plain and obvious. The Creator at first formed two opposite powers, the action of which is varied according to the circumstances of the bodies upon which they act; and these circumstances are again varied by the action of the powers themselves in innumerable ways upon one another, and the approach of one body to another, or their receding to a greater distance. Where these powers happen to oppose each other directly, the body on which they act is at rest; when they act obliquely, it moves in the diagonal; or if the force acting upon one side is by any means increased, the body, certainly must move towards that side, as is evident from the case of the atmosphere, the prefigure of which, when removed from one side of a body, will make it move very violently towards that side; and if we could continually keep off the prefigure in this manner, the motion would assuredly be perpetual. We must not imagine that motion is destroyed because it is counteracted: for it is impossible to destroy motion by any means but by removing the cause; counteracting the effect is only a temporary obstacle, and must cease whenever the obstacle is removed. Nature, therefore, having in itself an infinite quantity of motion, produces greater or lesser motions, according to the various actions of the moving powers upon different bodies or upon one another, without a possibility of the general stock being either augmented or diminished, unless one of the moving powers was to be withdrawn by the Creator; in which case, the other would destroy the whole system in an instant. As to the nature of these great original powers, we must confess ourselves totally ignorant; nor do we perceive any data from which the nature of them can be investigated. The elements of light, air, &c. are the agents; but in what manner they act, or in what manner they received their action, can be known only to the Creator.

Perpetual Motion, in mechanics, a motion which is supplied and renewed from itself, without the intervention of any external cause; or it is an uninterrupted communication of the same degree of motion from one part of matter to another, in a circle or other curve returning into itself, so that the same momentum still returns undiminished upon the first mover.

The celebrated problem of a perpetual motion conflicts in the inventing a machine, which has the principle of its motion within itself. M. de la Hire has demonstrated the impossibility of any such machine, and finds that it amounts to this: viz. to find a body which is both heavier and lighter at the same time, or to find a body which is heavier than itself.

To find a perpetual motion or to construct an engine, &c. which shall have such a motion, is a famous problem that has employed the mathematicians of 2000 years; though none perhaps have prosecuted it with attention and earnestness equal to those of the present age.

Infinite are the schemes, designs, plans, engines, wheels, &c. to which this longed-for perpetual motion has given birth; it were as endles as impertinent to give a detail of them all.

In effect, there seems but little in nature to counterbalance all this affluence and expectation; among all the laws of matter and motion, we know of none yet which seems to furnish any principle or foundation for such an effect.

Animal Motion, that which is performed by animals at the command of the mind or will.

Though all the motions of animals, whether voluntary or involuntary, are performed by means of the muscles and nerves, yet neither these nor the subtile fluid which resides in them are to be accounted the ultimate sources of animal motion. They depend entirely upon the mind for those motions which are properly to be accounted animal. All the involuntary motions, such as those of the blood, the heart, muscles, organs sublervient to respiration and digestion, &c. are to be classed with those of vegetables; for though no vegetable have them in such perfection as animals, there are yet traces of them to be found evidently among vegetables, and that so remarkably, that some have imagined the animal and vegetable kingdoms to approach each other so nearly that they could scarce be distinguished by a philosophic eye.

Muscles.

Though the motions of animals however, depend on the action of the mind or of the will, external objects seem originally to have the command of the mind itself; for unless an animal perceive something, it will not be inclined to act. By means of the ideas once received, indeed, and retained in the memory, it acquires a self-moving power, independent of any object present at the time, which is not the case with vegetables; for however they may act from a present impulse, their motions never appear to be derived from any source which may not be accounted strictly mechanical.

According to some, motion is the cause of sensation itself; and indeed it seems very probable that the motions of that subtile fluid, called light or electricity, in our bodies always accompany our sensation; but whether this be the cause, or only the medium of sense, cannot be discovered.

Though all animals are endowed with a power of voluntary motion, yet there is a very great variety in the degrees of that power; to determine which no certain rules can be assigned; neither can we, from the situation and manner of life of animals, derive any probable reason why the motion of one should differ so very much from that of another. This difference does not arise from their size, their ferocity, their timidity, nor any other property that we can imagine. The elephant though the strongest land animal, is by no means the slowest in its motions; the horse is much swifter than the bull, though there is not much difference in their size; a greyhound much swifter than a cat, though the former be much larger, and though both live in the same manner, viz. by hunting. Among insects the same unaccountable diversity is observable. The louse and flea are both vermin, are both nearly of the same size, and both feed on the bodies of animals; yet there is no comparison between the swiftness of their motions: while the bug which is much larger than either, seems to...
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Motion.

This very remarkable circumstance seems not even to depend on the range which animals are obliged to take in order to procure food for themselves: the motion of a shell is slower than that of an earth-worm; while that of many caterpillars is much quicker than either; though we can scarcely determine which of the three has the greatest or the least extensive range for its food.

Of all animals the shell-fish move the slowest, inasmuch that some have supposed them to be entirely destitute of loco-motive powers; and muscles particularly are said to have any faculty of this kind. Every one knows that these animals can open and shut their shells at pleasure; and it cannot escape observation, that in every muscle there is a feelyy protuberance of a much redder colour than the rest. This has been thought to be a tongue or proboscis, by which the animal takes in its food; but is in reality the instrument of its motion from place to place. This protuberance is divided into two lobes, which perform the office of feet. When the river mud is inclined to remove from its flatness, it opens its shell, thrusts out this protuberance, and digs a furrow in the sand; and into this furrow, by the action of the same protuberance, the shell is made to sink in a vertical position. It is recovered out of this into the former horizontal one, by pulling back the sand with the same tentacula, lengthens the furrow, and then the animal continues its journey by a continual turning topsy-turvy. — Marine muscles perform their motions in the same manner, and by similar instruments. In general they are firmly attached to rocks or small stones by threads about two inches long, which are spun from a glutinous substance in the protuberances already mentioned; these are called, in Scotland, the beards of muscles, and are thought to be the cause of the fatal disorders which sometimes attend the eating of muscles. See MYTTLUS.

Other animals which dwell in bivalved shells, perform their motions by a kind of leg or foot; which, however, they can alter into almost any figure they please. By means of this leg they can not only sink into the mud, or rise out of it at pleasure, but can even leap up from the place where they are; and this can be done by the limpet, which people are apt to imagine one of the most sluggish animals in nature. — When this creature is about to make a spring, it tests its shell on edge, as if to diminish friction; then, stretching out the leg as far as possible, it makes it embrace a portion of the shell, and by a sudden movement, similar to that of a spring let loose, it strikes the earth with its leg, and actually leaps to a considerable distance.

The pout, or razor-fish, is said to be incapable of moving forward horizontally on the surface; but it digs a hole sometimes two feet deep in the sand, in which it can ascend or descend at pleasure. The leg, by which it performs all its movements, is fleshy, cylindrical, and pretty long; and the animal can at pleasure make it assume the form of a ball. When lying on the surface of the sand, and about to sink into it, the leg is extended from the inferior end of the shell, and makes the extremity of it take on the form of a shovel, sharp on each side, and terminating in a point. With this instrument the animal makes a hole in the sand; after which it advances the leg still farther into it, makes it assume the form of a book, and with this, as a feather, it drives the shell to descend into the hole. This operation is continued until the whole shell be covered; and when the animal wishes to regain the surface, it makes the extremity of the leg to assume the form of a ball, and makes an effort to extend its body; ball, however, prevents any farther descent, and the re-action of the muscular effort rises up the hole, which operation is continued until it reaches the surface; and it is surprising what facility these motions are accomplished by an animal seemingly so little qualified to move at all. Another particularity in this fish is, that though it lives among salt water, it abhors salt so much that when a little is thrown into its hole it instantly leaves it. But it is still more remarkable, that if you once take hold of the pout fish, and then allow it to retire into its hole, it cannot then be driven out by salt; though unless it be taken off by the hand, this will make it come to the surface as often as you please. See SOLLEN.

All other shell-fish, even those apparently the most sluggish and destitute of any apparatus for motion, are found to be furnished with such instruments as enable them to perform all these movements for which they have any occasion. Thus the scallop, a well-known animal inhabiting a bivalved shell, can both swim upon the surface of water and move upon land. When it happens to be deflected by the tide, it opens its shell to the full extent, and shutting it again with a sudden jerk, the reaction of the ground gives such an impulse to the whole, that it sometimes springs five or six inches from the ground; and by a continued repetition of this action, it gradually tumbles forward until it regains the water. Its method of failing is still more curious. Having attained the surface of the water by means unknown to us, it opens the shell, and puts one half above water, the other with the body of the animal in it, remaining below. Great numbers of them are thus frequently seen failing in company with their shells sticking up above water when the weather is fine, and the wind acting upon them as fails; but on the least alarm they instantly shut their shells, and all sink to the bottom together. See PECTEN.

The oyster has generally been supposed one of the most sluggish animals in nature, and totally incapable of voluntary motion; but from the researches of the Abbe Dicquemarre, this opinion seems to be erroneous. The oyster, like many other bivalved shell-fish, has a power of squirting water out from its body; and this property may easily be observed by putting some of them into a plate with as much sea-water as will cover them. The water is ejected with so much force, as not only to repel the approach of ordinary enemies, but to move the whole animal backwards or sideways, in a direction contrary to that in which the water was ejected. It has been also supposed, that oysters are destitute of sensation; but M. Dicquemarre has shown, that they not only possess sensation, but that they are capable of deriving knowledge from experience. When removed from such places as are entirely covered with the sea, when destitute of experience, they open their shells and die in a few days; but if they happen to escape this danger, and the water covers them again, they will not open their shells again,
The motions of the sea-urchin are perhaps more curious and complicated than those of any other animal. It inhabits a beautiful multivalved shell, divided into triangular compartments, and covered with great numbers of prickles; from which last circumstance it receives the name of sea-urchin or sea hedge-hog. The triangles are separated from one another by regular belts, and perforated by a great number of holes, from every one of which issues a fleshy horn similar to that of a snail, and capable of moving in a similar manner. The principal use of these horns seems to be to fix the animal to rocks or stones, though it likewise makes use of them in its progressive motion. By means of these horns and prickles, it is enabled to walk either on its back or its belly; but it most commonly makes use of those which are near the mouth. Occasionally it has a progressive motion by turning round like a wheel. Thus, says Mr Smellie, 4 the sea-urchin furnishes an example of an animal employing many thousand limbs in its various movements. The reader may try to conceive the number of muscles, fibres, and other apparatus which are requisite to the progressive motion of this little animal.

Those animals called sea-nastles or medusas, though extremely slow in their motions, are nevertheless evidently capable of moving at pleasure from place to place. The variety of their figure is such, that it is difficult to assign them any determinate figure whatever. In general, however, they resemble a truncated cone, the base of which is applied to the rock to which they adhere. Their colours are various, white, brown, red, or greenish: the mouth is very large; and when opened appears surrounded with feathers or other apparatus which are requisite to the progressive motion of this little animal.

Vegetable Motion. Though vegetables have not the power of moving from one place to another like animals, they are nevertheless capable of moving their different parts in such a manner as would lead us to suspect that they are actuated by a force of infiniteness. Hence many have been induced to suppose, that the animal and vegetable kingdoms are in a manner indistinguishable from one another; and that the highest degree of vegetable life can hardly be known from the lowest degree of animal life. The essential and inexpressible distinction, however, between the two, is the faculty of sensation, and locomotion in consequence of it. Were it not, indeed, for the manifestation of sense by moving from one place to another, we should not be able to tell whether vegetables were possessed of sensation or not; but whatever motions they may be possessed of, it is certain that no vegetable has the faculty of moving from one place to another. Some have endeavoured to distinguish the two kingdoms by the digestion of food; alleging that plants have no proper organs, such as a stomach, &c. for taking in and digesting their aliment. But to this it has been replied, that the whole body of a vegetable is a stomach, and absorbs its food at every pore. This, however, seems not to be a sufficient answer. All animals take in their food at intervals, and there is not a single instance of one which eats perpetually. The food is also taken into the body of the animal, and application of the parts made by means of the internal organization of the fucus; but in vegetables, their whole bodies are immersed in their food, and absorb it by the surface, as animal bodies will sometimes absorb liquids when put into them. The roots of a tree indeed will change their direction when they meet with a stone, and will turn from barren into fertile ground; but this is evidently mere mechanism, without any proof of will or sensation; for the nourishment of the root comes not from the stone, but from the earth around it: and the increase in size is not owing to any expansion of the matter which the root already contains,
Motion contains, but to the acquisition of new matter; whence the increase of size must always take place in the direction from whence the nourishment proceeds. On this principle alone we may explain the reason why the roots of a tree, after having arrived at the edge of a ditch instead of shooting out into the air, will creep down the one side, along the bottom, and up the other.

In their other movements the vegetables discover nothing like sensation or design. They will, indeed, uniformly bend towards light, or towards water; but in the one case we must attribute the phenomena to the action of the elements of light and air upon them; and in the latter the property seems to be the same with what in other cases we call attraction. Thus, if a root be uncovered, and a wet sponge placed near it in a direction different from that in which the root was proceeding, it will soon alter its position, and turn towards the sponge; and thus we may vary the direction of the root as often as we please. The effects of a plant to turn from darkness or shade into sunshine are very remarkable, as, in order to accomplish this, not only the leaves will be inclined, but even the flowers and branches themselves. When a wet sponge or vegetable is held under the leaves of a tree, they bend down in order to touch it. If a vessel of water be put within six inches of a growing cucumber, in less than 24 hours the latter will alter its direction; the branches will bend towards the water, and never alter their course until they come in contact with it. The most remarkable instance of this kind of motion, however, is, that when a pole is brought near a vine, the latter will turn towards it, and never cease extending its branches till it lays hold of the support.

The motions of the sensitive plant, and others of the same kind, have been considered as very wonderful; but it is doubtful if any of them be really more so than that of the vine just mentioned. None of these show any kind of propensity to move without an actual touch. A very slight one indeed, makes the sensitive plant contract, and the whole branch, together with the leaves, bend down towards the earth. This is so similar to some phenomena of electricity, that very few will hesitate at ascribing both to the same cause. Even the motions of the hedyraum gynus, which at first sight seem so much more surprising than those of the sensitive plant, may be explained upon the same principle. There is a specimen of this plant in the botanic garden of Edinburgh. It is a native of the East Indies, and its motions are occasioned by the fun-beams. The leaves are the only moveable parts. They are supported by long foot-stalks; and when the sun shines upon them they move briskly in every direction. Their most usual motion is upward and downward; but not unfrequently they turn almost quite round, and then the foot-stalks are evidently twisted. These motions continue only while the light and heat of the sun continues, ceasing when at night, or when the weather becomes cloudy and cold. The American plant called Dionaea muscipula, or Venus's fly-trap, is another example of very wonderful mechanism in vegetables, though even this does not argue any degree of sensation in this plant more than in others. The leaves of the dionaea are jointed, and furnished with two rows of prickles. A number of small glands upon the surface secrete a sweet juice, which entices flies to come and settle upon it; but the moment these insects touch the folic spot, the leaves fold up, and squeeze them to death between the prickles. The leaves fold up in the same manner when the plant is touched with a straw or pin.

The folding up of the leaves of certain plants in the absence of the sun's light, called their sleep, affords another very curious instance of vegetable motion. Almost all vegetables, indeed, undergo such a remarkable change in the night, that it is difficult to know exactly how many kinds do really sleep. They fold up their leaves in many different ways; but all agree in disposing of them in such a manner as to afford the best protection to the young items, flower buds, or fruit. The leaves of the tamarind-tree contract round the young fruit, in order to protect it from nocturnal cold; and those of fenna, glycinia, and many other papilionaceous plants, disposed of their leaves in the same manner. The leaves of the chickweed,克莱, acris, &c. are disposed in opposite pairs. In the nighttime they rise perpendicularly, and join so close at the top that the flowers are concealed by them. In like manner do those of the fida, or albus theophra, the ayecia, and ammohira, the folanum, and the Egyptian weath. All these are erected during the night; but those of the white lupine, in time of sleep, hang down.

The flowers of plants also have motions peculiar to themselves. Many of them during the night are closed in their calyxes. Some, particularly those of the German spurge, geranium stiratum, and common Whitlow grass, when asleep bend towards the earth; by which means the noxious effects of rain or dew are prevented. All these motions have been commonly ascribed to the sun's rays; and Mr Smellie informs us, that in some of the examples above mentioned the effects were evidently to be ascribed to heat; but plants kept in an hot-house, where the temperature of the day and night are alike, contract their leaves, and sleep in the same manner as if they were exposed to the open air; "whence it appears (says he), that the sleep of plants is owing rather to a peculiar law, than to a quicker or slower motion of the juices." He suspects, therefore, that as the sleep of plants is not owing to the mere absence of heat, it may be occasioned by the want of light; and to ascertain this he proposes an experiment of throwing upon them a strong artificial light. "If, notwithstanding this light (says he), the plants are not roused, but continue to sleep as usual, then it may be presumed that their organs, like those of animals, are not only irritable, but require the preservation of some invigorating influence which they have lost while awake, by the agitations of the air and of the sun's rays, by the act of growing, or by some other latent cause." On this, however, we must remark, that the throwing of artificial light upon plants cannot be attended with the same consequences as that of the light of the sun, unless the former were as strong as the latter, which is impossible; and even granting that we could procure an artificial light as strong as that of the sun, a difference might be occasioned by the different directions of the rays, those of the sun being very nearly parallel, while the rays of all artificial light diverge very greatly. If, therefore,
we are to make an experiment of this kind, the rays
should be rendered parallel by means of a burning
mirror. Here again we would be involved in a diffi-
culty: for the rays of the sun, act in one di-
rection; but as of necessity we must employ differ-
ent mirrors in our experiment, the light must fall upon
the plant in different directions, so that we could not rea-
sonably expect the same results as when the plants are
directly exposed to the rays of the sun.

The motion of plants, not being deducible from
sensation, as in animals, must be ascribed to that pro-
property called irritability: and this property is pos-
sessed insensibly by the parts of animals in a greater
degree than even by the most irritable vegetable. The mu-
cular fibres will contract on the application of any fi-
mulating substance, even after they are detached from
the body, to which they belonged. The heart of a frog
will continue to beat when pricked with a pin for
several hours after it is taken out of the body. The
heart of a viper, or of a turtle, beats distinctly from
20 to 30 hours after the death of these animals. When
the intestines of a dog, or any other quadruped, are
suddenly cut into different portions, all of them crawl
about like worms, and contract upon the slightest touch.
The heart, intestines, and diaphragm, are the most
irritable parts of animal bodies; and to discover whe-
ther this quality resides in all plants, experiments should
be made chiefly on leaves, flowers, buds, and the ten-
der fibres of the roots.

The motions of plants are universally ascribed by
our author to irritability, to which also we have ascri-
bced them under the article Animal. The term,
however, requires an explanation; and to give this
in an intelligible manner requires some attention. The
most obvious comparison is that of an electrified thread;
which, on the approach of any unelectrified fibres,
shows a variety of motions, equally surprising with those
of the parts of plants or the muscular fibres cut out
of the body. Could we suppose that the electricity of a
thread might be perceived after it was cut off from
the electrifying fibres, it would show as much irrita-
bility as even the muscular fibres, or portions of the
intestines of animals. We know, from the history of
the torpedo, electrical eel, &c., that there are animals
in which the electric fluid acts in such a manner as to
produce a much more powerful effect than that of gi-
ving motion to the leaves of plants. The readiness,
therefore, with which this fluid is thrown into agita-
tions when any substance in which it acts is touched, is
without doubt the irritability in question; but we have
from thence no more reason to ascribe sensation to
these irritable bodies, than to an electrified bottle when
it discharges itself, or makes a cork-ball play round it.

In a paper read before the Academy of Sciences at
Paris, by M. Brouffonet, the author inclines to con-
found irritability and sensibility together. "The dif-
ferent parts of plants (says he) enjoy the faculty of
motion; but the motions of a vegetable are very dif-
derent in their nature from those of an animal: the most
sensible, those that are produced with most rapidity in
plants, are always influenced by some stimulating cause.
Irritability, which is nothing but sensibility made ma-
nifest by motion, is a general law to which nature has
subjected all living beings; and it is this that con-

ually watches over their preservation. Being more
powerful in animals than in plants, it may be often
confounded in these with phenomena that depend
on a quite different cause. In the vegetable it is only
the organ which is exposed to the action of the stimu-
lating power that moves. Irritation in particular pla-
ces never produces that prompt combination of sen-
factions which we observe in animals; in consequence
of which certain parts are put in motion without being
directly affected, and which otherwise might have been
passive.

"The more perfect the organization in the dif-
drent parts of animals is, the more apparent are the
signs of irritability. The parts that come nearest to
those of vegetables, and in which of consequence the
organization is most imperfect, are the least irritable.
The same law holds with regard to plants; but the
result is opposite: the signs of irritability are most sen-
sible in proportion to the analogy of the parts with
those of animals; and they are imperceptible in those
that are dissimilar. This assertion is proved by what
we observe in the organs defined in vegetables to per-
petuate the species. Those parts alone seem sensible
to stimuli; the bark, leaves, stalks, and roots showing
no signs of irritability.

"The vital motions in plants are slow, and entirely
determined by circumstances, which are always re-
peated and equally diffused over all the parts. In ani-
mals, on the contrary, almost all the vital motions are
very sensible; such as the pulsations of the heart and
arteries, the dilation of the thorax, &c.; these being
absolutely necessary to the preservation of the in-
dividual, are always reproduced in a similar manner
in those of the same species, and in the same direc-
tion; and this takes place in like manner in plants. The
twining plants, for instance such as the hop, follow
continually, as they twine themselves round a pole, the
direction of the south towards the west. If vegetables
are obstructed in exercising these motions, they soon
perish; if, for example, we untwist a twining plant
which had taken its direction round a branch from the
right to the left, and place it in a contrary direction,
it withers in a short time; especially if it has not vi-
going enough to regain its natural situation. We bring
death in the same manner on an animal, if we inter-
rupt any of its vital motions. The law by which
plants are forced to move in a particular manner is
very powerful. When two twining plants, one of which
is weaker than the other, for example two plants of
woodbine, happen to encounter, they twine round each
other, the one directing itself to the right and the
other to the left: this last is always the weakest; it
is forced to take a direction contrary to that which it
would have done if it had not met with the other;
but if by any accident, these two twigs of woodbine
should come afterwards to be separated, they both re-
fuse their natural direction, that is from right to left.

"The motions essentially vital, which have in plants
the greatest affinity with those of animals, are the course
of the sap, the passage of the air in the trachea, the
different positions which the flowers of certain plants
take at certain hours of the day &c. But if we attend
to the manner in which all these motions in plants are
performed, we will find that they present a greater
number
number of modifications than the analogous motions that take place in animals. The temperature of the atmosphere, its agitation, light, &c. have great influence on the motion of plants, by accelerating or retarding the course of their fluids; and, as they cannot change their place, these variations produce in them changes more obvious and more uniform than in animals.

Our author now proceeds to inform us, that some of the motions of plants are occasioned by the rarity of the juices in plants, and others by their abundance. Of the former kind are those by which the capules of some plants suddenly burst with a spring, and throw their seeds to some distance. Of the other kind are the action of the stamina in the parietaria, the infection of the peduncles of flowers, and of the ptililla. "These motions (says he) which are particularly observed in the organs defined to the reproduction of the individual, not appearing except in circumstances that render them absolutely necessary, seem in some measure to be the effect of a particular combination: they are, however, merely mechanical; for they are always produced in the same way and in the same circumstances. Thus the rose of Jericho, and the dry fruit of several species of mossambiantum, do not open but when their veftiles are full of water.

"The sudden disengagement of fluids produces a kind of motion. To this cause we must attribute a great number of phenomena observable in the leaves of several plants, and which do not depend on irritability. The small glands in each leaf of the diosna are no sooner punctured by an insect than it instantly folds up and seizes the animal; the puncture seems to operate a disengagement of the fluid which kept the leaf expanded by filling its veftiles. This explanation is the more probable, that in the early state of the vegetation of this plant, when the small glands are hardly evolved, and when probably the juices do not run in sufficient abundance, the leaves are folded up exactly as they appear when punctured by an insect at a more advanced period. We observe a phenomenon similar to this in both species of the drosera (lentew). The mechanism here is very easily observable: the leaves are at first folded up; the juices are not yet propelled into the fine hairs with which they are covered; but after they are expanded, the presence of the fluid is manifest by a drop seen at the extremity of each hair; it is by absorbing this fluid that an insect emptyes the veftiles of the leaf, which then folds up, and refumes its first state: the promptitude of the action is proportioned to the number of hairs touched by the insect. This motion in some degree resembles that which takes place in the limb of an animal kept, in a state of flexion by a tumour in the joint; when the matter which obstructed the motion is discharged, the limb instantly refumes its former position. The phenomena that depend on the abundance of fluids are particularly evident in plants which grow in wet soils; the drosera and diosna are of this kind; and it is known by the experiments of Mefc. Du Fay and Du Hamel, that sensitive plants are particularly sensible when the sun is obscured by clouds and the air warm and moist. The influence of external causes sometimes modifies the vital motion in plants, that we would be tempted to ascribe them to volution, like those that depend entirely on that faculty in animals. If we set a pole in the ground near a twining plant, it always lays hold of the pole for support. in whatever place we put it. The same thing occurs in the tendrils of the vine; which always attach themselves to the support presented to them on whatever side it may be placed, provided they can reach it; but these motions are entirely vital: the twining plants and the tendrils direct themselves to every quarter, and consequently cannot fail of meeting with the bodies within their reach. These motions are performed as long as the parts continue to grow; but when they cease to elongate, if they have not been able to reach any body on which they can fix, they bend back upon themselves. This and other observations show how far the vital motions in plants may be modified by external causes, and how essentially they differ from those that are the effect of volution in animals.

"Some plants appear endowed with no sort of motion; some have leaves that can move in different directions; but none appear so eminently poftificd of this quality as the beecheryngspray of Linnæus.——No part of this plant shows any sign of irritability upon application of the hand: and the motion of its foliaceous leaves when the leaves are agitated by the wind.—When the sun is warm, the little leaves of the bedy-sarum are also immoveable; but when the weather is warm and moist, or when it rains, they move very freely. This motion seems indispensably necessary to the plant; for it begins as soon as the first leaves unfold, and continues even during the night; but in time it grows weaker. In our stoves it is most considerable during the first year; in the second it is not very sensible: in its native place all the leaves have a motion never observed here. The moving leaflets are most agitated while the plants are in full flower, and the process of fructification goes on. The oscillatory motion is so natural to it, that it not only remains for three or four days in the leaves of a branch that has been cut off and put in water, but is even continued though the branch be extended to the air. The leaves seem to perform the office of the heart in vegetables. When a plant is stripped of its leaves, the progress of vegetation is arrested; and such vegetables resemble those animals which have a periodic sleep, induced by a diminution of the action of the heart. Many plants hardly show any signs of motion; many seem also wholly cataleptic; which is rarely ever found in animals. The footstalks of the flowers of dracocephalum, a Virginian plant, preserve themselves in whatever position they are placed.

Muscular Motion. See Muscle.

MOTIVE, is sometimes applied to that faculty of the human mind, by which we pursue good and avoid evil. Thus Hobbes distinguishes the faculties of the mind into two forts, the cognitive and motive.

MOTTE (Anthony Houdart de la), an ingenious Frenchman, greatly distinguished by his writings in prose and verse, and by his literary comedy, very eminent for his talents, was born at Paris in 1672. He wrote with very different success; no man having been more praised or more criticized than he was: his literary para-

doses,
doxes, his singular system, in all branches of polite learning, and above all his judgment upon the ancients, which, like those of Perrault, were thought disreputable and detracting, raised him up formidable adversaries. Racine Boileau, Roufeau, and Madame Dacier, were among the number of those who made it their business to avenge antiquity on a man who, with more wit than genius or learning, afforded a kind of dictatorial authority in the province of belles letters. He became blind in the latter years of his life, and died in 1731. He wrote a great deal in epic poetry, tragedy, comedy, lyric, pastoral, and fables; besides a vast variety of discourses, critical and academical, in prose. A complete edition of all his works was published in 1754; though, as has been said of our Swift, his reputation had been better consulted by reducing them to three or four.

MOTOUALIS, a small nation of Syria, inhabiting the eait of the country of the Druzes, in the valley which separates their mountains from those of Damascus; of which the following account is given by Mr. Volney in his Travels, vol. ii. p. 48.

The characteristic division between them and the other inhabitants of Syria (says our author) is, that they, like the Persians, are of the sect of Ali, while all the Turks follow that of Omar, or Moaouia. This division, occasioned by the schism which in the 36th year of the Hejira arose among the Arabs, respecting the sufeceffors of Mahomet, is the cause of an irreconcilable hatred between the two parties. The sectaries of Omar, who consider themselves as the only orthodox, assume the title of Sunnites which has that signification, and term their adversaries Shiites, that is sectaries of Ali.” The word Motoualis has the same meaning in this dialect of Syria. The followers of Ali, dissatisfied with this name, substituted that of Adlia, which means “affairors of justice,” literally “Jufliciators;” a denomination which they have assumed in consequence of a doctrinal point they advance in opposition to the Sunnite faith. A small Arabic treatife, entitled Theological Fragments concerning the Sects and Religions of the World, has the following passage:

“Those sectaries who pretend that God acts only on principles of justice, conformable to human reason, are called Adlia or Jufliciators. God cannot (say they) command an impracticable worship, nor ordain impossible actions, nor enjoin men to perform what is beyond their ability; but wherever he requires obedience, will bellow the powers to obey. He removes the cause of evil, he allows us to reason, and imposes only what is easy, not what is difficult; he makes no man responsible for the actions of another, nor punishes him for that in which he has no part: he imputes not as a crime what himself has created in man; nor does he require him to avoid what deftiny has decreed. This would be injustice and tyranny, of which God is incapable from the perfection of his being.”

To this doctrine, which diametrically opposes the system of the Sunnites, the Motoualis add certain ceremonies which increase their mutual aversion. They curse Omar and Moaouia as rebels and usurpers; and celebrate Ali and Hophin as saints and martyrs. They begin their ablutions at the elbow, instead of the end of the finger, as is customary with the Turks; they think themselves defiled by the touch of strangers; and, contrary to the general practice of the East, neither eat nor drink out of a vessel which has been used by a person not of their sect, nor will they even fit with such at the same table.

These doctrines and customs, by separating the Motoualis from their neighbours have rendered them a distinct society. It is said they have long existed as a nation in this country, though their name has never been mentioned by any European writer before the present century; it is not even to be found in the maps of Donville: La Roque, who left their country not a hundred years ago, gives them the name of Me'ladies. Be this as it may, in latter times their wars, robberies, succeffes, and various changes of fortune, have rendered them of confidence in Syria. till about the middle of this century, they only possessed Balbek their capital, and a few places in the valley, and Anti-Lebanon, which seems to have been their original country. At that period we find them under a like government with the Druzes, that is to say, under a number of Shaiks, with one principal chief of the family of Harfouih. After the year 1750 they established themselves among the heights of Bekaa, and got footing in Lebanon, where they obtained lands belonging to the Maronites, almost as far as Baehraal. They even encompassed them so much by their ravages, as to oblige the Emir Youfuf to attack them with open force and expel them; but on the other fide, they advanced along the river even to the neighbourhood or Sour, (Tyre). In this situation, Shaik Daher had the address, in 1760, to attach them to his party. The pachas of Saide and Damascus claimed tributes, which they have neglected paying, and complained of several robberies committed on their people by the Motoualis; they were delirious of chastifying them; but this vengeance was neither certain nor easy. Daher interposed; and by becoming security for the tribute; and promising to prevent any depredations, acquired allies who were able, as it is said, to arm 10,000 horfemen, all reftored and formidable troops. Shortly after they took thofe of Sour, and made this village the principal fea-port. In 1771 they were of great service of Ali Bey and Daher againft the Ottomans. But Emir Youfuf having in their abfence armed the Druzes, and ravaged their country. He was besieging the castle of Djezin when the Motoualis, returning from Damascus, received intelligence of this invasion. At the relation of the barbarites committed by the Druzes, an advanced corps, of only 500 men, were fo enraged, that they immediately rushed forward against the enemy, determined to perifh in taking vengeance. But the fpirit and confufion they occasioned, and the difcord which reigned between the two factions of Mofaour and Youfuf so much favoured this desperate attack, that the whole army, confifting of 25,000 men, was completely overthrown.

In the following year, the affairs of Daher taking a favourable turn, the zeal of the Motoualis cooled towards him, and they finally abandoned him in the catastrophe in which he loft his life. But they have suffered for their imprudence under the administration of the pachas who succeeded him. Since the year 1777, Djezzar, mafter of Acre and Saide has incessantly
A top of the spring arbor is or barrel, which stops it in motteux gently laboured to possess it. But the
profiteers were able to heritable
sold it. At this period not more than 500 families of the Motoualis remained, who took refuge in Anti-
Lebanon, and the Lebanon of the Maronites; and
driven, as they now are from their native soil, it is probable
they will be totally annihilated, and even their
very name become extinct.

Motteux (Peter), a French gentleman, born
and educated at Rouen in Normandy. Coming over
to England on account of the persecution of the
Protestants, he became a considerable trader in London,
kept an East-India warehouse in Leadenhall-street,
and had a genteel place in the general post-office,
relating to foreign letters, being master of several
languages. He was a man of wit and humour; and
acquired so perfect a mastery of the English language,
that he not only was qualified to oblige the world with
a very good translation of Don Quixote, but also
wrote several songs, prologues, epilogues, &c. and
what was still more extraordinary, became a very eminent
commercial writer in a language to which he was
not a native. He was at last, in the year 1718, found
dead in a disorderly way, and he completed his 58th year.

Motto, in armature, a short sentence or phrase,
carried in a scroll, generally under, but sometimes over,
the arms; sometimes alluding to the bearing, sometimes
to the name of the bearer, and sometimes containing
whatever pleases the fancy of the deviser.

Moucho Motteux. See Agaricus.

Moveable, in general, denotes any thing capable
of being moved.

Moveable Feasts, are such as are not always held
on the same day of the year or month; though they
are on the same day of the week. See Feasts.

Thus, Easter is a moveable feast, being always held
on the Sunday which falls upon or next after the first
full moon following the 21st of March.

All the other moveable feasts follow Easter, i.e. they
keep their distance from it; so that they are fixed with
respect thereto.

Such are Septuagesima, Sexagesima, Ash-Wednesday,
Ascension-day, Pentecost, Trinity-Sunday, &c.
which are under their proper articles, Septuagesima,
&c.

Moveable Subject, in law, any thing that moves itself,
or can be moved; in contradistinction to immovable
or heritable subjects, as lands, houses, &c.

Movement, motion, a term frequently used in
the same sense with automaton.

The most usual movements for keeping time are
watches and clocks: the first are such as show the parts
time, and are portable in the pocket; the second,
such as publish it by sounds, and are fixed as furniture.

Movement, in its popular use among us, signifies
all the inner work of a watch, clock, or other engine,
which move, and by that motion carry on the design
of the instrument.

The movement of a clock or watch is the inside,
or that part which measures the time, strikes, &c.
exclusive of the frame, dial, plate, &c.

The parts common to both of these movements are,
the main spring, with its appended wheel, lying in the
spring-box, and in the middle thereof lying about the
spring-arbor, to which one end of it is fastened.
A top of the spring arbor is the endless screw and its
wheel; but in spring-clocks, this is a ratchet-wheel with
its click, that stops it. That which the main spring
draws, and round which the chain or firing is wrapped,
is called the fuse; this is ordinarily taper; in large
works, going with weights, it is cylindrical, and called
the barrel.

The small teeth at the bottom of the fuse or barrel, which flap it in winding up, is called the
ratchet; and that which flaps it when wound up,
and is for that end driven up by the spring, the
garde-vent. The wheels are various: the parts of a wheel are, the
hoop or rim; the teeth, the cogs, and the collet or
piece of brass folded on the arbor or spindle whereon
the wheel is rivetted. The little wheels playing in
the teeth of the larger are called pinions; and their teeth,
which are 4, 5, 6, 8, &c. are called foars; the ends of
the pinicle are called pinion, and the guttered wheel,
with iron spikes at bottom, wherein the line of ordinary
clocks runs, the pulley. We need not say anything
of the hand, screws, wedges, flaps, &c. See Wheel,
Fuse, &c.

Perpetual Movement. Many have attempted to
find a perpetual movement, but without success;
and there is reason to think, from the principles of
mechanics, that such a movement is impossible: for though,
in many cases of bodies acting upon one another,
there is a gain of absolute motion, yet the gain is
always equal in opposite directions; so that the quantity
of direct motion is never increased.

To make a perpetual movement, it appears necessary
that a certain system of bodies, of a determined
number and quantity, should move in a certain space
for ever, and in a certain way and manner; and for this
there must be a series of actions returning in a
circle, otherwise the movement will not be perpetual;
so that any action by which the absolute quantity of
force is increased, of which there are several forms,
must have its corresponding counter-action, by which
the gain is destroyed, and the quantity of force re-
turned to its first state.

Thus by these actions there will never be any gain
of direct force to overcome the friction and resistance
of the medium; so that every motion being diminished
by their resistances, they must at length languish and cease.

Moufet (Thomas), a celebrated English physician,
was born at London, and practised medicine with
great reputation. Towards the latter end of his
life he retired to the country, and died about the year
1600. This physician is known by a work which was
begun by Edward Wotton, and printed at London in
Vol. XII.
1634, folio, with the title of Theatrum Iudiciorum. A translation of it into English was published at London in 1638, folio. Martin Lister gives a very unfavourable opinion of this book: "As Moutet (says he) made use of Wotton, Gesner, &c. an excellent work might have been expected from him; and yet his Theatrum is full of confusion, and he has made as very bad use of the materials with which these authors have furnished him. He is ignorant of the subject of which he treats, and his manner of expression is altogether barbarous. Besides this, he is extremely arrogant, to say no worse; for though he has copied Aldrovandus in innumerable places, he never once mentions his name." But Ray thinks that Lister, by expressing himself in this manner, has not done justice to Moutet; and he maintains that the latter has rendered an essential service to the republic of letters.

MOUG-DEH, or CHEN-YANG; a city of Chinese Tartary, and capital of the country of the Mantchews or eastern Tartars. These people have been at great pains to ornament it with several public edifices, and to provide it with magazines of arms and storehouses. They consider it as the principal place of their nation; and since China has been under their dominion, they have embellished the same tribunals here as at Peking, excepting that called Lii-pou; these tribunals are composed of Tartars only; their determination is final; and in all their acts they use the Tartar characters and language. The city is built on an eminence: a number of rivers add much to the fertility of the surrounding country. It may be considered as a double city, of which one is inclosed within the other: the interior contains the emperor's palace, hotels of the principal mandarins, foreign courts, and the different tribunals; the exterior is inhabited by the common people, tradesmen, and all those who by their employments or professions are not obliged to lodge in the interior. The latter is almost a league in circumference; and the walls which inclose both are more than three leagues round: these walls were entirely rebuilt in 1631, and repaired several times under the reign of Kang-hi. Near the gates are two magnificent tombs of the first emperors of the reigning family, built in the Chinese manner, and surrounded by a thick wall furnished with battlements; the care of them is entrusted to several Mantchew mandarins, who at stated times are obliged to perform certain usual ceremonies; a duty which they acquit themselves of with the same marks of respect and veneration as if their masters were still living.

MOVING PLANTS. See Hedysarum, Tremella, and Mimosa.

MOULD, or MOLD, in the mechanic arts, &c. a cavity artfully cut, with design to give its form or impression to some softer matter applied therein. Moulds are implements of great use in sculpture, foundry, &c. The workmen employed in melting the mineral or metallic glebe dug out of mines, have each several moulds to receive the melted metal as it comes out of the furnace; but these are different according to the diversity of metals and works. In gold mines, they have moulds for ingots; in silver mines, for bars; in copper and lead mines, for pigs or lamons; in tin mines, for pigs and ingots; and in iron mines, for fows, chimney-backs, anvils, caldrons, pots, and other large utensils and merchandizes of iron, which are here cast, as it were, at first hand.

Moulds of founders of large works, as statues, bells, guns, and other brazen works, are of wax, supported within-side by what we call a core, and covered without-side with a cap or case. It is in the space which the wax took up, which is afterwards melted away to leave it free, that the liquid metal runs, and the work is formed; being carried thither through a great number of little canals, which cover the whole mould. See Foundery.

Moulds of moneyers are frames full of sand, wherein the plates of metal are cast that are to serve for the striking of species of gold and silver. See COINING.

A sort of concave moulds made of clay, having within them the figures and inscriptions of ancient Roman coins, are found in many parts of England, and supposed to have been used for the striking of money. Mr Baker having been favoured with a light of some of these moulds found in Shropshire, bearing the same types and inscriptions with some of the Roman coins, gave an account of them to the Royal Society. They were found in digging of sand, at a place called Ryton in Shropshire, about a mile from the Roman street road. They are all of the size of the Roman denarius, and of little more than the thickness of our halfpenny. They are made of a smooth pot or brick clay, which seems to have been first well cleaned from dirt and sand, and well beat or kneaded, to render it fit for taking a fair impression. There were a great many of them found together, and there are of them not unfrequently found in Yorkshire; but they do not seem to have been met with in any other kingdom, except that some have been said to be once found at Lyons. They have been sometimes found in great numbers joined together side by side, on one flat piece of clay, as if intended for the striking of a great number of coins at once; and both these, and all the others that have been found, seem to have been of the emperor Severus. They are sometimes found impressed on both sides, and some have the head of Severus on one side and some well known reverse of his on the other. They seem plainly to have been intended for the coinage of money, though it is not easy to say in what manner they can have been employed to that purpose, especially those which have impressions on both sides, unless it may be supposed that they coined two pieces at the same time by the help of three moulds, of which this was to be the middle one. If by disposeing these into some sort of iron frame or case, as our letter-founders do the brass moulds for casting their types, the melted metal could be easily poured into them, it would certainly be a very easy method of coining, as such moulds require little time or expense to make, and therefore might be supplied with new ones as often as they happen to break.

Thes moulds seem to have been burnt or baked sufficiently to make them hard; but not so as to render them porous like our bricks, whereby they would have lost their smooth and even surface, which in these is plainly to close, that whatever metal should be formed in them would have no appearance like the sand-holes.
Moulds of founders of small works are like the frames of coiners; it is in these frames, which are likewise filled with sand, that their several works are fashioned; into which, when the two frames, whereof the mould is composed, are rejoined, the melted brass is run. Moulds of letter-founders, are partly of steel and partly wood. The wood, properly fashioned into which, when the two frames, whereof the mould is composed, are rejoined, the melted brass is tenoned. Moulds, in the manufacture of paper, are little frames composed of several brass or iron wires, fastened together by another wire still finer. Each mould is of the bigness of the sheet of paper to be made, and has a rim or ledge of wood to which the wires are fastened. These moulds are more usually called frames or forms. See Paper-Making.

Moulds, with furnace and crucible makers, are made of wood, of the same form with the crucibles; that is, in form of a truncated cone: they have handles of wood to hold and turn them with, when being covered with the earth, the workman has a mind to round or flatten his vessel. Moulds for leaden bullets are little iron pincers, each of whose branches terminates in a hemispherical concave, which when shut form an entire sphere. In the lips or sides where the branches meet, is a little jet or hole, through which the melted lead is conveyed. Laterns, Moulds, are made of wood, for filling and driving all sorts of rockets and cartridges, &c. Glaziers' Moulds. The glaziers have two kinds of moulds, both serving to cast their lead: in the one they cast the lead into long rods or canes fit to be drawn through the vice, and the grooves formed therein; this, they sometimes call ingot-mould. In the other, they mould those little pieces of lead a line thick and two lines broad, fastened to the iron bars. These may also cast in the vice. Goldsmiths' Moulds. The goldsmiths use the bones of the cuttle-fish to make moulds for their small works; which they do by pressing the pattern between two bones, and leaving a jet or hole to convey the silver through, after the pattern has been taken out. Moulds, among masons, is a piece of hard wood or iron, hollowed within side, answerable to the contours of the mouldings or cornices, &c. to be formed. This is likewise called caliver. Moulds, among plumbers, are the tables whereon they cast their sheets of lead. These they sometimes call simply tabler. Besides which they have other real moulds, wherewith they cast pipes without folding. See each described under Plombery. Moulds, among glaziers-grinders, are wooden frames, whereon they make the tubes wherewith they fit their spectacles, telescopes, and other optical machines. These moulds are cylinders, of a length and diameter according to the use they are to be applied to, but always thicker at one end than the other, to facilitate the sliding. The tubes made on these moulds are of two kinds; the one simply of plateboard and paper; the other of thin leaves of wood joined to the plateboard. To make these tubes to draw out, only the last or innermost is formed on the mould; each tube made afterwards serving as a mould to that which is to go over it, but without taking out the mould from the first. See Grinding.

Moulds used in basket-making are very simple, consisting ordinarily of a willow or osier turned or bent into an oval circle, square, or other figure, according to the baskets, panniers, hampers, and other utensils intended. On these moulds they make, or more properly measure, all their work; and accordingly they have them of all sizes, shapes, &c. Mould, in ship-building, a thin flexible piece of timber, used by shipwrights as a pattern whereby to form the different curves of the timbers, and other compalling pieces in a ship's frame. There are two sorts of these, viz. the bend-mould and hollow-mould; the former of these determines the convexity of the timbers, and the latter their concavity on the outside, where they approach the heel, particularly towards the extremities of the vessel. The figure given to the timbers by this pattern is called their bevelling. Moulds, among tallow-chandlers, are of two kinds: the first for the common dipped candles, being the vessel wherein the melted tallow is dispofed, and the wick dipped. This is of wood, of a triangular form, and supported on one of its angles; so that it has an opening of near a foot at top: the other, used in the fabric of mould candles, is of brass, pewter, or tin. Here each candle has its several mould. See Candel. Moulds, among gold-beaters, a certain number of leaves of vellum or pieces of guts cut square, of a certain size, and laid over one another, between which they put the leaves of gold and silver which they beat on the marble with the hammer. See Gold-Leaf.

They have four kinds of moulds; two whereof are of vellum and two of gut: the smallest of those vellum consists of 40 or 50 leaves; the largest contains 100: for the others, each contain 500 leaves. The moulds have all their several casts, consisting of two pieces of parchment, confifting of the mould in their place, and prevent their being disordered in beating. Mould, in agriculture, a general name for the soft earthy substance with which the dry land is generally covered, and in which all kinds of vegetables take root and grow. It is, however, far from being an homogeneous substance; being compounded of decayed animal and vegetable matters, calcareous, argillaceous, and siliaceous earths, all mixed together in various proportions, and with the different degrees of moisture, constituting all the varieties of soil throughout the world. All kinds of mould contain some inflammable substance, which remains in them from the decayed animals and vegetables; and they are more or less black in proportion to the quantity of phlogiston they contain. The black mould yields by distillation a volatile alkali and oil. MOULDINESS, a term applied to bodies which corrupt in the air, from some hidden principle of humidity therein; and whose corruption shows itself by a certain white down or lanugo on their surface, which viewed through a microscope appears like a kind of meadow, out of which unripe herbs and flowers, some only in the bud, others full-blown, and others decayed; each having its root, stalk, and other parts. See Mucor.
MOULDING, any thing cast in a mould, or that seems to have been so, though in reality it were cut with a chisel or the axe.

Mouldings in architecture, projections beyond the naked wall, column, window, &c. the assemblage of which forms cornices, door-cases, and other decorations of Architecture. See that article.

Moulin (Charles du), a celebrated civilian, and one of the most learned men of the 16th century, was born of a considerable family at Paris in 1500, and acquired great reputation by his skill in the law. He published many works, which have been collected together, and printed in five volumes folio; and are justly considered as the most excellent works that France has produced on the subject of civil law. He died at Paris in 1566.

Moulin (Peter du), a Protestant divine, believed to be of the same family with the former, was born in 1568. He taught philosophy at Leyden; and afterwards became chaplain to the princes of Navarre. At the king of England's desire he came to England in 1615, and prepared a plan for the union of the Protestant churches. The university of Leyden offered him a professorship of divinity in 1619; but he refused it, and prefided at the synod held by the Calvinists at Alais in 1620. Some time after, being informed by Mr Drelincourt that the French king resolved to have him thrown into prison, he retired to Sedan, where the duke de Bouillon made him professor of divinity, and minister in ordinary. He was employed by the Calvinists in the most important affairs; and died at Sedan in 1628. His principal works are, 1. The anatomy of Arminianism. 2. A treatise on repentance, and the keys of the church. 3. The capuchine, or the history of those monks. 4. The buttler of faith, or a defence of the reformed churches. 5. The judge of controversies and traditions. 6. The anatomy of the mafs. 7. The novelty of Popery.

Peter du Moulin, his eldest son was chaplain to Charles II. of England, and prebendary of Canterbury, where he died in 1684, aged 84. He wrote, 1. The peace of the soul, in French. 2. Clamor regii fanginiis; which Milton, by mistake, attributed to Alexander Morus. 3. A defence of the Protestant religion, in English.

Moulins, a town of France, and capital of Bourbonnais. The houses of the Chartreux, and that of the Visitation, are magnificent. It carries on a considerable trade in cutlery ware, and is seated on the river Allier, in a pleasant fertile plain, almost in the middle of France, 30 miles south of Nevers, and 55 miles south of Clermont.

Moulton (North), a town of Devonshire on the river Moul, and the north side of South Moulton, Moulting of whose hundred it is a member, and anciently gave name to it, as the latter does now. It has two fairs, on Tuesday after May 11, and on Nov. 12.

Moulton (South) on the same stream, 182 miles from London. This, as well as the former, was anciently a royal demeane. This corporation, which once sent members to parliament in the reign of Edward I., consists of a mayor, 18 capital burgesses, a recorder, town-clerk, and 2 serjeants at law. Here is a market on Saturdays; and fairs are held the first Tuesday after May 11, and Nov. 12. Their chief manufactures are serge, shawls, and felts; and great quantities of wool brought from the country are bought up here every Saturday. In the year 1684, a merchant of London, a native of this town, built and endowed a free-school here; besides which, here is a charity-school.

Mouling, or Moulting, the falling off or change of hair, feathers, skins, horns, or other parts of animals, happening in some annually, in others only at certain stages of their life.

The generality of animals moult in the spring. The mouling of a hawk is called mewing. The mouling of a deer is the quitting of his horns in February or March. The mouling of a serpent is the putting off his skin. See EXUVIAE.

Mound, a term used for a bank or rampart, or other fence, particularly that of earth.

Mounb, in heraldry, a ball or globe with a cross upon it, such as the British kings are usually drawn with, holding it in their left hand, as they do the sceptre in the right.

Mount, an elevation of earth, called also mountain. See Mountain.

Mount Edgecumbe, a prodigious high peak, at the entrance of Cook's strait, in New Zealand, on the west side. Its height is supposed not to be much inferior to that of the peak of Teneriffe.

Mount-Sorrel, a town in Leicestershire, so named from a high mount or solid rock adjoining to the town, of a dusky red or forre-coloured stone, extremely hard. Of rough stones hewn out of this rock the town is built. It has a market on Mondays. It was noted formerly for its cattle, and is seated on the river Stour, over which there is a bridge. It is 20 miles south west of Derby, and 105 north west of North London. W. Long. 1. 9. N. Lat. 52. 45.

Mount of Piety, certain funds or establishments in Italy, where money is lent out on some small security. There were also mounds of Piety in England, raised by contribution for the benefit of people ruined by the extortions of the Jews.

Mountain (Moun), a considerable eminence of land, elevated above every thing adjoining to it, and commanding all the surrounding places: It is commonly full of inequalities, cavities more or less exposed, and strata half laid open.

This name is likewise given to a chain of mountains; as when we speak of Mount Atlas in Africa; Mount Caucasus, which begins above Colchis and ends at the Caipian sea; the Pyrenean mountains, which separate France from Italy; and the Appenine mountains, which run through the whole of Italy.

Those who have surveyed the earth in general, and studied.
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this kind is connected with the land, and advances farther into the sea than the adjoining country, it is then termed a Cape, Head, or Promontory, such as the Cape of Good Hope at the southern extremity of Africa. Mountains of the second rank are commonly more easy of access. Dr. Haller observes, that the angle formed between their base and their declivity is larger; that they have fewer springs; and that their plants are different from those of the Alps. The peasants in Switzerland, he tells us, are acquainted with the difference between these two kinds of mountains.

Those mountains, whether arranged in a group or not, the earth or stone of which is disposed in strata more or less regular, and consisting of one or more colours and substances, are produced by the substructions deposited flowly and gradually by the waters, or by soil gained at the time of great floods. We daily see little hills formed in this manner, which are always of a small height compared with those of the first order, and round in the top, or covered with soil, frequently forming a pretty flat and extensive surface. We there find earth and heaps of round pebbles like such as are known by the waters. The internal part of these mountains consists of a heap of strata almost horizontal, and containing a prodigious quantity of shells, marine bodies, and fish-bones. Although these mountains formed by strata sometimes degenerate into little hills, and even become almost flat, they always consist of an immense collection of fossils of different kinds, in great perfection, and which are pretty easily obtained from their surface. Dr. Haller observes, that there are many places in the Alps and in mountains, where two chains are prolonged contrary to the axis of the valley, and join so as to leave as much space as is necessary for the discharge of the water. In other places the mountain is continued, in a single line, to the north, and discontinued to the south, where it opens into a valley. In others, the two chains retire and form a bend on each side, the concavity of which fronts the axis; hence arise valleys almost round and completely united.

It is likewise worthy of observation, that primitive mountains which form great chains are commonly connected together; that they succeed one another for a space of several hundred leagues; and cover with their principal branches, and their various collateral ramifications, the surface of continents. Father Kircher and many others have observed, that the principal chain generally runs from south to north, and from east to west. The Cordilleras in the New world, Dr. Haller observes, extend from north to south; the Pyrenees have nearly the same direction; the Alps run from east to west; and there must be a chain of this kind in Africa, for the great rivers in that quarter of the world run to the east on the one side and to the west on the other. The chain of Thibet appears to be parallel to the Alps; and, from the great length of the road through the snows, it may be inferred that the mountains of Thibet have a very great elevation. Those mountains which, strictly speaking, are the principal roots, and the capital point of elevation and division, present very considerable mazes, both with regard to their height and size or extent; they commonly occupy and traverse the centre of continents.

Those
Mountains. Those which have a smaller elevation arise from the principal chains; they gradually diminish in proportion to their distance from their root, and at length wholly disappear either on the equator or in the plains. Others are continued along the shores of the sea; their chain is interrupted only to make room for the waters of the ocean, under the bed of which the base of these mountains extends, and it again occurs in islands, which, however, their continuation till the whole chain re-appears. The highest mountains and the greatest number of islands are generally found between or near the tropics, and in the middle of the temperate zones; while the lowest are adjacent to the poles; though this does not always hold good without exception.

M. Buache, a member of the Academy of Sciences at Paris, has laid down a system of physical geography concerning the structure of the terrestrial globe, considered with respect to the great chains of mountains which cross the continents and seas from pole to pole, and from east to west. According to this system, there is an uninterrupted series of mountains and high grounds which divide the earth into four quadrants, from which the rivers descend. These chains of mountains are continued from one continent to another under the ocean; and the islands which are observed in it, are as it were the umbrellas of the mountains. M. Buache's work is entitled Tables et Cartes de la Geographie physique. But that this system, with regard to the islands, must be erroneous, will appear evident from our article Earth.

In the Journal de Physique for May 1779, we are informed, that Dr Pallas, who has travelled through Siberia, and almost all the Russian empire in the north of Asia, thinks he has discovered the insufficiency of the principal systems hitherto proposed to account for the formation of mountains. This accurate observer has prosecuted the study of mountains by traversing immense regions, and visiting as it were the secret work shops of nature in almost the fourth part of our hemisphere. He has not truiled to the vague reports of others, but from observations which he himself had occasion to make for the space of ten years; he has, in a work entitled Observations on Mountains, explained both the direction of the northern chains, and the particular composition of each. He is thence led to make an ingenious conjecture concerning the formation of the principal groups of mountains, and concerning the irregular distribution and the figure of the whole continent. Under the article Earth an account is given of the different systems which have been formed concerning the formation and configuration of our globe. To establish a general system, it would perhaps be necessary to have travelled over the whole earth; and to have studied all the chains of mountains, their direction, and particular composition, for a long series of years. Thus very little attention is required to perceive, in the different systems mentioned under the article Earth, the influence of climate and local situation. Burnet, Whiston, and Woodward, who were acquainted only with England, where very few great chains of mountains are to be seen, where they are almost all isolated or detached, and where the soil of extensive plains is formed by horizontal and regular strata, naturally thought that these general and concentric strata were to be found all around the globe; and considered mountains as nothing but the wrecks of the great chain of these strata, either raised or swallowed up by the violence of the waters. Scheuchzer, who studied among the steep mountains of Switzerland, and rocks of granite, porphyry, Jasper, and hard stones, and who found nothing on the most elevated plains of the Alps but strata of similar substances, held recourse to the power of the Almighty, who brake these strata, and elevated their splinters into the form of mountains. Ray, Moro, and Cetone, who saw nothing all around them but burning mountains and traces of volcanic productions—derived by the constitution of the hills of Italy, which are almost all formed of lava, pizzolana, and basaltic substances, and by the origin of the Monte Nuovo, which rose up almost before their eyes, have considered great mountains as formed by a cause which undoubtedly has a secondary, but to which they have ascribed a primary and principal, influence. M. de Buffon, who delineated nature at the foot of the utmost extremity of the French Alps, and who perceived them gradually attain a greater elevation as they advanced towards the southern parts of France and towards Savoy, concluded from his theory, and in support of the same theory, that the highest mountains were near the equator; that they became lower towards the poles; and that, being produced by the flux and reflux of the sea, they were formed of the subflantity which is deposited.

We shall now lay before our readers the geographical description of the directions of the principal mountains, and of that kind of connection which subsists between them. This description differs from that of M Buache, and may be read with a map of the world before us.

M. Buache places the most elevated points of the great chain of mountains under the equatorial line; but according to the author whom we follow in this place, the fullest and most continuous lands, and perhaps likewise the most elevated, are to be found at a distance from the equator, and towards the temperate zones. If, in fact, we survey the globe's surface, we will not be able to perceive that chain of mountains, which running from east to west, and dividing the earth into two portions, ought again to meet. On the contrary, extensive plains seem to accompany the line through almost its whole extent. In Africa, the deserts of Nigritia, and those of Upper Ethiopia, are on the one side of the line; and on the other are the sandy plains of Nicoco, Caffaria, Monemugi, and Zanguebar. From the eastern shores of Africa to the Sunda islands, is a space of 1500 leagues of sea with almost no islands, except the Laccadive and Maldive islands; most part of which have little elevation, and which run from north to south. From the Molucca islands and New Guinea, to the western borders of America, the sea occupies a space of 3000 leagues. Though Chimbororco and Pichincha in America, the two highest mountains which have been measured, are near and even under the line, yet from this no conclusion can be drawn, because on one side these mountains run in a direction not parallel to the equator; the Andes or Cordilleras attain a greater elevation as they remove from the equator towards the poles; and a vast plain is found exactly under the line, between the Oroonooko and the river of the Amazons. Besides, the latter river, which
Mountain, which takes its rise in the province of Lima about the 11th degree of south latitude, after crossing the whole of South America from west to east, falls into the ocean exactly under the equator. This shows that there is a defect for the space of 72 degrees or 300 leagues. From the mouth of the river of the Amazon, to the western shores of Africa, the sea forms another plain of more than 50 degrees.

From the few certain facts and accurate observations which we have received from well informed travellers, we might almost affirm that the most elevated land on our globe is situated without the tropics in the northern and southern hemispheres. By examining the course of the great rivers, we in fact find that they are in general discharged into three great reservoirs, the one under the line, and the other two towards the poles. This, however, we do not mean to lay down as a thing universally true, for it is allowed, that, besides the two elevated belts, the whole surface of the earth is covered with innumerable mountains, either detached from one another or in a continued chain. In America, the Amazon and the river of the Amazonas run towards the line, while the river St Lawrence runs towards the 50th degree of north latitude, and the river de la Plata towards the 40th degree of south latitude. We are still too little acquainted with Africa, which is almost all contained within the tropics, to form any accurate conclusions concerning this subject. Europe and Asia, which form only one great mass, appear to be divided by a more elevated belt, which extends from the most westerly shores of France to the most easterly of China, and to the island of Sakalen or Anga-hata, following pretty nearly the 50th degree of north latitude. In the new continent, therefore, we may consider that chain where the Mifissipii, the river St Lawrence, the Ohio, and the river de los Eftrechos, take their rise, as the most elevated situation in North America; whence the Mifissipii flows towards the equator, the river St Lawrence towards the north-east, and the rest towards the north-west. In the old continent, the belt formerly mentioned, and to which we may assign about 10 degrees in breadth, may be reckoned from the 45th to the 55th degree of north latitude; for in Europe the Tagns, the Danube, the Dnieper, the Don, and the Volga, and in Asia the Indus, the Ganges, the Meran, the Mecon, the Hoang-ho, and the Yangt-tse-Kiang, descending as it were from this elevation, fall into the great reservoir between the tropics; whilst towards the north the Rhine, the Elbe, the Oder, the Vltula, the Obi, the Jenifei, the Lena, the Indigirka, and the Kowyma, are discharged into the northern reservoir.

Judging from these mountains the height of which has been calculated, and from the immense chains with which we are acquainted, we may infer that the highest mountains are to be found in this elevated belt. The Alps of Switzerland and Savoy extend through the 45th, the 46th, and the 47th degrees. Among them we find St Gothard, Furca, Bruning, Rifs, Whiggis, Scheidek, Guggels, Galanda, and lastly that branch of the Swis Alps which reaches Tirol by the name of Arlenberg and Arula. In Savoy, we meet with Mount Blanc, the Peak of Argentiere, Cornero, Great and little St Bernard, Great and Little Cenis, Coupline, Servin, and that branch of the Savoyard Alps which proceeds towards Italy through the duchy of Aosta and Montferrat. In this vast heap of elevated peaks, Mont Blanc and St Gothard are particularly distinguished. The Alps, leaving Switzerland and Savoy, and passing through Tirol and Carniola, traverse Saltzbourg, Stria, and Austria, and extend their branches through Moravia and Bohemia, as far as Poland and Prussia. Between the 47th and 48th degrees, we meet with Grimming the highest mountain of Stria, and Priel which is the highest in Austria. Between the 46th and 47th degrees, the der Bachar and the der Reinchnicken, form two remarkable chains. The upper one, which traverses the counties of Trenchin, Arrava, Scipua, and the Kreyna, separates Upper Hungary from Silefia, Little Poland, and Red Russia; the inferior one traverses Upper Croatia, Bosnia, Servia, and Transylvania, separates Upper Hungary from Turkey in Europe, and meets the upper chain behind Moldavia, on the confines of Little Tartary. In these mountains are situated the rich mines of Schrémnitz.

To form a general idea of the great height of this Alpine belt, it is necessary only to remark, that the greatest depth of the wells at Schrémnitz is 200 toises; and yet it appears from the barometrical calculations of the learned M. Noda, that the greatest depth of these mines is 286 toises higher than the city of Vienna. The granito-argillous mountains of Schrémnitz, and of the whole of this metallic district, are inferior, however, to the Carpathian mountains. Mount Kri-vany in the county of Arrava, and the Carpathian mountains between Red Russia and the Kreyna, appear by their great elevation to rule over the whole of the upper Alpine chain. In the inferior chain we likewise meet with mountains of an extraordinary height; among others, Mount Medednik, which gives its name to a chain extending far into Bosnia; and Mount Hemus, celebrated even among the ancients. In short, this extensive chain reaches into Asia, and is there crowned with another chain no less famous, which, following exactly the 50th degree of latitude, runs through the whole of Asia. This chain of mountains is described by Dr Pallas in the work abovementioned; and we shall now trace its course in company with this intelligent observer.

This author places the head of the mountains of Oural, between the sources of the Taik and the Bie-laia, about the 53d degree of latitude, and the 47th of longitude. Here the European Alps, after having traversed Europe and sent of various branches which we shall afterwards examine, lose their name, which is changed into that of the Uralic or Uralian mountains, and begin their course in Asia. This lofty chain, which separates Great Bulgaria from the deserts of Ichimika, proceeds through the country of the Eleuths, follows the course of the river Iriss, approaches the lake Telekaia, and afterwards forms a part of the same system of mountains with the Altai chain. There they give rise to the Oby, the Irris, and the Jenifei, which begin their course about the 50th degree of north latitude, and fall into the Frozen Ocean.

The Altai chain, after having embraced and united all the rivers which supply the Jenifei, is continued under
Mountain, under the name of Sainoy, without the smallest interruption, as far as the Baikal lake. The extension of the chain to the south forms that immense and elevated plain which is lost in Chinefe Turquie, which may be compared with the only plain in Quito, and which is called Gali or Chamo. The Altai afterwards interposing between the source of the Tchalkei and of the rivers which supply the Amur or Sagalene, rises towards the Lena, approaches the city Jaluck beyond the 60th degree of latitude, runs from that to the sea of Kamtschatka, turns round the Ochockoi and Penfink gulphs, joins the great marine chain of the Kurile islands near Japan, and forms the deep shores of Kamtschatka, between the 55th and 60th degrees of latitude. Such is the direct course of the high mountains confuting the belt which, we imagine, is to be found in the northern hemisphere, and which, after becoming lower, passing under the sea, and forming by means of its elevated peaks that archipelago which derives its name from its fortunate situation. Bhering, again rife and enter North America, on the western side, about the Straits of Anian. After running in the same parallel, and giving rife to the Ohio, the Riviere-Longue, the river St Lawrence, and the Mississipi, they are loft in Canada. From the eastern shores of America to the western shores of Europe, we find a vast interruption. Perhaps the chain was at first continued completely round the globe; but extraordinary revolutions, by separating the old and new continents, may have occasioned this division, and left nothing but the Axores and some detached points as a monument of what formerly existed, till we come to the British isles.

Before we proceed to inquire whether a belt of a similar elevation exists in the southern hemisphere, we may remark those branches and ramifications which the great northern Alpine belt sends forth both towards the equator and the antarctic pole. Those new chains, which gradually become lower as they approach the boundary towards which they tend, appear a sufficient proof that the equator is not the most elevated part of the earth.

The European Alps produce three principal chains, which run towards the equator, and some smaller ones running towards the pole. The first southern chain is sent out through Dauphine; traverses Viva-rais, Lyonnois, Auvergne, Cevennes, and Languedoc; and, after joining the Pyrenees, enters Spain. There it divides into two or three ramifications, one of which runs through Navarre, Bifcay, Arragon, Cañilfe, Marche, and Sierra Morena and extends into Portugal. The other, after traversing Andalusia and the kingdom of Grenada, and then forming a number of serras, again makes its appearance, beyond the Straits of Gibraltar, in Africa, and coasts along its northern shores under the name of Mount Atlas.—The second principal chain of the Alps passes out through Savoy and Piedmont; spreads its roughnesses over the flates of Genoa and Parma; forms the belt of the Apennines; and after frequently changing its name, and dividing Italy into two parts, terminates in the kingdom of Naples and in Sicily, producing volcanoes in every part of its course. The third chain is sent off from Hungary, and forms innumerable mountains over all Turkey in Europe, as far as the Morea and the Archipelago at the bottom of the Mediterranean sea. The northern branches, though smaller at first, are no less clearly defined; and some of them even extend their ramifications as far as the Frozen Ocean. An Alpine branch, issueing from Savoy thro' the country of Gex, proceeds through Franche-Comte, Sunegow, Alfece, the Palatinate, and Veterania.—Another issue from the territory of Salzburg, passes along Bohemia, enters Poland, and sends off a ramifications into Prufia towards the deserts of Waldow, and after having passed through Russia is lost in the government of Archangel.

The Asiatic Alps send forth in like manner several branches both to the south and north. The Ouralic mountains, between the sources of the Bielaia and the Jaik, produce three principal branches; the first of which, including the Caspian Sea in one of its divisions, enters Circellia through the government of Atracan, and, passing through Georgia under the name of Cancofu, sends a vast number of ramifications to the Caspian Sea and the mountains Tschilder, Ararat, Taurus, Argès, and many others in the three Arabias; while the other division, passing between the Caspian Sea and the lake Aral, penetrates through Chorafan into Persia. The second branch, taking a more easterly direction, leaves the country of the Eleuths; reaches Little Bucharia; and forms the ramparts of Gog and Magog, and the celebrated mountains formerly known by the name of Caf, which M. Bailly has made the seat of the war between the Dives and the Peris*. It traverses the kingdoms of Casgar and Turkistan, enters through that of Lahor into the Mogul territory, and, after giving rife to the elevated defert of Chamoo forms the western peninsula of India. While these two branches run towards the south, the third branch of the Ouralic chain rife towards the north, following almost the 70th degree of longitude, and forms a natural boundary between Europe and Asia; without, however, bounding the immense empire of Russia. This chain, after coming opposite to Nova Zembia, divides into two considerable branches. The one, running to the north-east, passes along the Arctic shores; the other, proceeding towards the north-west, meets the northern European chain, traverses Scandinavia in the shape of a horse-shoe, covers the low-lands of Finland with rocks; and, as is observed by Dr Pallas, appears to be continued from the North Cape of Norway through the marine chain of Spitzbergen, flattering islands and shelves perhaps throughout the northern ocean, that, passing through the pole, it may join the northern and eastern points of Asia and North America.

The Ouralic, which in the country of the Mongols becomes the Altai chain, proceeds towards the equator. After forming the mountains and caverns wherein, as we are told, the ashes of the Mongol emperors of the race of Ghengis-Kan are deposited, together with the vast plain of Chamo, confliting of arid sands, and the frightful rocks and precipices of Thibet, which form the mysterious and defert retreats of the Grand Lama, it crosses the rivers Ava and Menan; contains in its subdivisions the kingdoms of Ava, Pegu, Laos, Tonquin, Cochinchina, and Siam; supports the peninsula of Malacca; and overflows the Indian ocean with the isles of Sonda, the Moluccas, and the Philippines. From the borders of the Baikal lake and of the province of Selin-
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Mountain, highest mountain which has been measured either in Europe, Asia, or Africa. The altitude of the Alps of Switzerland has been ascertained by the following philosophers; We shall content ourselves with mentioning the most remarkable of the mountains covered with snow, which in Switzerland are called Gletschers or Glaciers. St Gotthard, according to Scheuchzer, is 1850 toises; and Lignon, near the lake of Como, north east, is, according to Pini, 1486 toises in height. M. Pafumot, engineer to the king of the French, justly observes, that the heights assigned by Mikhaili to the mountains of Switzerland appear rather to be ideal computations than founded on observations. An opinion of them may be formed from the following: According to this author, Mount Pilate or Frankmont, in the district of Lucerne, is 1403 toises in height; Mount Cenis, 1445; Rauhhsok, 1760; the Nolle ridge of Tüilsberg, 2001; Ghemi, 2421; Grimselberg, is the canton of Berne, 2550; Comera, part of Loukmanier, 2654; Fourke, 2699; Schrekhorn, 2724; and St Gothard, at its moat elevated point, 2750. Mikhaili likewise reckons 20 other mountains, the height of which excess 2000 toises. The reader may consult the Table comparative des hauteurs des principaux montagnes, by M. Pafumot (Journal de Physique, September 1783.)

Throughout the globe we will perhaps meet with higher mountains than those of Peru, which go by the name of Cordilleras or las Andes. According to the observations of the academicians sent to South America in 1735 by the Spanish and French courts to measure a degree of the meridian and to ascertain the true figure of the earth, the principal summits of these extraordinary mountains, which are situated near Quito, and which are constantly covered with snow though they lie under the equator, have the following geometrical elevations above the level of the sea; Quito-Capilcate, 1707 toises; El-Corafon, 2470 (c); Cota-catche, 2570; Ek-Atlas, 2730; and Noyambre-ocru, under the line, 3030. All the other mountains have been or still are, volcanoes. The following is an enumeration of them, together with their several heights: Pichincha 2430; Cargaviejo, 2450; Sinchonilagon or Sinchonilagon, 2570; Sangra, 2680; Illimika 2717; Cotopazi, 2950; Antifana, 3020; Cogambeorcon, situated under the line, 3030; Chimborazo or Chimboraco, 3220. The last mentioned mountain, which forms part of the Cordilleras in Peru, is one of the largest and probably the highest in the world. It is seen at sea from the gulf of Guayaquil, which is more than 60 leagues distant.

Other very elevated mountains are Mount Sinai in Japan; Mount Capeanus in Asia; the southern peak of the Pyrenees; the peak of Tenerife in one of the Canary islands, which according to M. Bouguer is 2100 toises (according to later observations, made by M. M. de Verduin, de Borda, and Pingre, French academicians, in 1754, the peak of Tyde; more commonly known by the name of the peak of Teneriffe, is only 1904 toises perpendicular height above the level of the sea.) Mount Gibeil or Etna in Sicily is 1672 toises; St George's peak in the Azores; Adam's peak in Ceylon; the mountains of the Moon; Mount Athos, Olympus, Taurus, and Emaus: Mount Cenis in the Alps on the road from France to Italy, is 1460 toises; the Great and Little Atlas, and many others, on the top of which we feel, even in the middle of summer, a more piercing cold than that of the feverish frosts of our climates. After this, it cannot appear wonderful that the vapours which reach to great heights are there congealed; and that the summits of these mountains, even in the warmest climates, are constantly covered with snow, while the inhabitants of the plain enjoy a temperate atmosphere, or are subject to extreme heat. The height of those mountains, added to their being placed on the most elevated parts of the globe, is the chief cause of the phenomena peculiar to them. In that part of Asia which is separated by the chain of mountains called the Ghawr, there are two very different states at one and the same time. While it is winter on the Malabar coast, for instance, the Coromandel coast, which has the same degree of elevation, and in some places is only 20 leagues distant, enjoys an agreeable spring or the temperature of autumn.

The traveller in the Alps generally experiences, even in summer, the four seasons at the same time. In the Andes we meet with a change of temperature so less curious; for as we descend from their summits to their bases, we experience all the varieties of heat and cold which are felt in every climate of the earth, at whatever season (p). There are many other mountainous countries in which we pass at once from a serene sky to dreadful weather.
Mountains have a great influence on the climate of the countries to which they belong, by modifying the course of certain winds, by forming barriers to the clouds, by reflecting the sun’s rays, and by serving as elevated conductors to the electricity of the atmosphere. It was formerly said by travellers, that on the peak of Teneriffe they found that brandy lost its strength; that spirit of wine became almost infipid; that pepper, ginger, and salt, had little or no taste when applied to the tongue; but, it was alleged, that Canary wines still retained their flavor on that mountain. These stories appeared too marvellous not to require new experiments; and M. de Lamanon and Monges, who visited this peak in 1785, tell us, that the flavor and taste of liquors appeared to have sustained no loss at that height: (See the experiments made on the Pic du Midi in the Pyrenees by M. Darce, in the Journal de Physique for November 1776; and a journey to the peak of Teneriffe, in the fame Journal for August 1785.) At the foot, and sometimes at the middle, of those lofty mountains, the tops of which are always covered with snow, we frequently find springs which begin to run in May and dry up in September. When the sun approaches near enough to the tropic to warm the summits of these mountains, the snow with which they are covered melts, filtrates through their interior part, and issues forth at their base. The only trees which grow on mountains of this kind are firs, pines, and other resinous trees; and the grass becomes shorter towards their summit.

Mountains were not formed to be an useless load upon the earth, but evidently answer very important purposes; and we cannot enough admire their form and that kind of harmony which is discernible in their arrangement. Some of them, vomiting out fire or smoke, lava, and sulphur, indicate that they in some measure answer the purpose of a chimney to something within the earth, which, if confined, would burst it in pieces: (See Volcano.) Of this kind are Mount Hecla in Iceland, Mount Etna in Sicily, Mount Vesuvius in the kingdom of Naples, Pichincha and Cotopaxi in America, &c. Others, the summits of which reach into the clouds, attract and absorb the vapours of the sea, &c. which float in the air. It is observed by M. l’Abbé Palafion, that storms are most frequent at the foot of those high mountains which form extensive chains. Their enormous masses, which seem to support the heavens on their shoulders, arrest and fix the different meteoras as they are formed. The clouds, in like manner, driven by the winds from different points of the horizon, meet with impenetrable barriers, are there accumulated in great quantity, and remain suspended on these bulwarks of the globe’s surface, till the agitation of the atmosphere succeeding the calm, produces storms, which are so much the more terrible that they cannot expand and be dispersed but with great difficulty. They are commonly repelled from the mountains; and are then observed to spread over whole countries, to diffuse with peals of thunder, and to fall down in destructive hail-showers fatal to the harvest and to the whole produce of the fields. This scourge is peculiarly dreadful during the feasons of spring and summer, when a sufficient quantity of snow remains on the mountains to cool the atmosphere.

Some chains of mountains have openings; in others they are wanting: of the former kind are the straits of Thermopylae, the Cufip ane straits, the pas of the Cordilleras, &c.

The spaces which separate the tops of mountains are so many basons defined for the reception of the condensed mists, and of the clouds precipitated into rain. The bowels of mountains appear to be great and inexhaustible reservoirs, and to contain subterraneous canals and lateral openings formed by the hand of nature, that the several species of animals may be supplied with drink, that the earth may be fertilized, and that nourishment may be afforded for the growth of vegetables. The streams and rivers descend from the ridges of mountains, the declivities of which form so many inclined plains: Thus we find the Alps give rise to the Rhine, the Danube, the Rhone, and the Po. With regard to the wonderful structure, by means of which so many advantages are obtained, see the articles Earth, Springs, &c.

Mountains of the first order form vast solitudes and horrid deserts, where the habitations of men are not to be seen, and their footsteps are seldom to be traced. By their grandeur, their elevation, the variety of their postitions, the sublime and awful exhibition of wonders which they contain, they elevate the mind and fire the imagination of the observer. But these majestic eminences have other advantages which deserve our attention. They form the common retreat of a multitude of wild beasts, which are subservient to our use; there the bear, the lynx, the ermine, the martain, the fox, and many other animals, the skins of which we employ for furs, take up their abode; and thither the eagle and the vulture resort in safety. Mountains likewise afford nourishment to rein-deer, buffaloes, fallow-deer, roe-deer, and chamois; and they are visited by birds of passage which, under the guidance of instinct, follow the shortest road to the place of their destination. They produce medicinal plants, which almost never grow elsewhere. In Switzerland they are also covered with deep forests, which, by the great height of the trees, announce their antiquity. They afford both timber and fuel, and supply the inhabitants with abundance of excellent pasture for their beastial during the whole summer. The most precious stones, both for brilliancy and hardness, acquire their forms and colours in the fissures of the rocks: the internal rents of mountains are filled and in a manner cemented by different metallic substances; while the grottos are furnished with numerous congeulations, shining

we reach the summits of the mountains, which present to our view all the horrors of winter as they are felt in the polar regions. But below this height, as the density of the air becomes greater in consequence of being constantly pressed upon by a great superincumbent weight, the sun’s heat increases, so that those who inhabit the plains at the foot of the mountain are exposed to all the inconveniences of the torrid zone.
Mountains. shining crystals, and substances of an extraordinary nature and figure. In short, every thing conspires to shew, that the existence of mountains is absolutely necessary; and that in order to acquire a proper knowledge of them, they must be considered in many different points of view. Their position, their elevation, the extent of their base, their figure, their various external windings, their internal structure; in a word, every thing relating to the theory of the globe, and to the different temperatures of the atmosphere, must engage the observer's attention; and by studying and carefully examining the general constitution of mountains, the particular facts which they present to our view, their influence, their action on the atmosphere, the different substances of which they are composed, together with the arrangement and mixture of these substances, we may at length discover the true mechanism of the earth. The reader may consult the "Essai Sur l'étude des Montagnes; Journal de M. l'Abbé kosier, November 1773.

The difficulty and danger of ascending to the tops of mountains proceeds not from the thinnest of the air, as has been commonly reported; but the reason is, that they rise with such a rugged and precipitate ascent, that they are utterly inaccessible. In some places they appear like a great wall of 600 or 700 feet high; in others, there stick out enormous rocks, that hang upon the brow of the steep, and every moment threaten destruction to the traveller below.

In this manner almost all the tops of the highest mountains are bare and pointed; and this naturally proceeds from their being continually assailed by thunders and tempests. All the earthy substances with which they might have been once covered, have for ages been washed away from their summits; and nothing is left remaining but immense rocks, which no tempest has hitherto been able to destroy.

Nevertheless, time is every day and every hour making depredations; and huge fragments are seen tumbling down the precipice, either loosened from the summit by the frost or rains, or struck down by lightning. Nothing can exhibit a more terrible picture than one of these enormous rocks, commonly larger than an house, falling from its height with a noise louder than thunder, and rolling down the side of the mountain. Dr Plot tells us of one in particular, which being loosened from its bed, tumbled down the precipice, and was partly shattered into a thousand pieces. Notwithstanding, one of the largest fragments of the same, still preserved its motion, travelled over the plain below, crossed a rivulet in the middle, and at last stopped on the other side of the bank! These fragments, as was said, are often struck off by lightning and sometimes undermined by rains; but the most usual manner in which they are disintegrated from the mountain is by frost: the rains infusing between the interstices of the mountain, continue there until there comes a frost; and then, when converted into ice, the water swells with an irresistible force, and produces the same effect as gun-powder, splitting the most solid rocks, and thus shattering the summits of the mountain.

But not rocks alone, but whole mountains are, by various causes, disintegrated from each other. We see, in many parts of the Alps, amazing clouds, the fides of which so exactly correspond with the opposite, that no doubt can be entertained of their having been once joined together: At Cajeta in Italy, a mountain was split in this manner by an earthquake; and there is a passage opened through it, that appears as if elaborately done by the industry of man. In the Andes these breaches are frequently seen. That at Thermopylae in Greece has been long famous. The mountain of the Troglodytes in Arabia has thus a passage through it; and that in Savoy, which nature began and which Victor Amadeus completed, is an instance of the same kind.

We have accounts of some of these disruptions immediately after their happening. "In the month of June, in the year 1714, a part of the mountain of Diableret, in the district of Valais in France, suddenly fell down, between two and three o'clock in the afternoon, the weather being very calm and serene. It was of a conical figure, and destroyed 55 cottages in the fall. Fifteen persons, together with about 100 beasts, were also crushed beneath its ruins, which covered an extent of a good league square. The dust it occasioned instantly covered all the neighbourhood in darkness. The heaps of rubbish were more than 300 feet high. They stopped the current of a river that ran along the plain, which now is formed into several new and deep lakes. There appeared, through the whole of this rubbish, none of those substances that seemed to indicate that this disruption had been made by means of subterraneous fires. Most probably, the base of this rocky mountain was rotted and decayed; and thus fell, without any extraneous violence." In the same manner, in the year 1618, the town of Pleurs in Savoy was buried beneath a rocky mountain, at the foot of which it was situated.

These accidents, and many more that might be enumerated of the same kind, have been produced by various causes: by earthquakes, as in the mountains of Cajeta; or by being decayed at the bottom, as at Diableret. But the most general way is, by the foundation of one part of the mountain being hollowed by waters, and, thus wanting a support, breaking from the other. Thus it generally has been found in the great chains in the Alps, and thus it almost always is known in those disruptions of hills which are known by the name of landslips. These are nothing more than the sliding down of an higher piece of ground, disintegrated from its situation by subterraneous inundations, and settling itself upon the plain below.

There is not an appearance in all nature that so much astonishes our ancestors as these landslips. In fact, to behold a large upland, with its houses, its corn, and cattle, at once loosened from its place, and floating as it were upon the subjacent water; to behold it quitting its ancient situation, and travelling forward like a ship, in quest of new adventures; this is certainly one of the most extraordinary appearances that can be imagined; and, to a people ignorant of the powers of nature, might well be considered as a prodigy. Accordingly, we find all our old historians mentioning it as an omen of approaching calamities. In this more enlightened age, however, its cause is very well known; and, instead of exciting ominous apprehensions in the populace, it only gives rise to
some very ridiculous law-suits among them, about whose the property shall be; whether the land which has thus flipt, shall belong to the original possessor or to him upon whose grounds it has encroached and settled. What has been the determination of the judges is not so well known; but the circumstances of the flips themselves have been minutely enough and exactly described.

In the lands of Slatberg in the kingdom of Ireland, there flipt a declivity gradually ascending for near half a mile. In the year 1719, and on the roth of March, the inhabitants perceived a crack on its side, somewhat like a furrow made with a plough, which they imputed to the effects of lightning, as there had been thunder the night before. However, on the evening of the same day, they were surprized to hear a hideous confused noise issuing all round from the side of the hill; and their curiosity being raised, they returned to the place. There, to their amazement, they found the earth, for near five acres all in gentle motion, and sliding down the hill upon the subjacent plain. This motion continued the remaining part of the day and the whole night; nor did the noise cease during the whole time; proceeding probably from the attrition of the ground beneath. The day following, however, this strange journey down the hill ceased entirely; and above an acre of the meadow below was found covered with what before composed a part of the declivity.

However, these slips, when a whole mountain's side seems to defend, happen but very rarely. There are some of another kind, however, much more common; and, as they are always sudden, much more dangerous. These are snow-slips, well known, and greatly dreaded by travellers. It often happens, when snow has long been accumulated on the tops and on the sides of mountains, it is borne down the precipice either by means of tempest or its own melting. At first, when loosened, the volume in motion is but small; but it gathers as it continues to roll; and by the time it has reached the habitable parts of the mountain, it is generally grown of enormous bulk. Wherever it rolls, it levels all things in its way, or buries them in unavoidable destruction. Instead of rolling, it sometimes is found to slide along from the top; yet even thus it is generally as fatal as before. Nevertheless, we have had an instance or two slips, of a small family in Germany that lived for above a fortnight beneath one of these snow-slips. Although they were buried during that whole time in utter darkness, and under a bed of some hundred feet deep, yet they were luckily taken out alive, the weight of the snow being supported by a beam that kept up the roof, and nourishment supplied them by the milk of a fhe-goat that was buried under the same ruin.

Attraction of Mountains. This is a late discovery, and a very considerable confirmation of Sir Isaac Newton's theory of universal gravity. According to the Newtonian system, an attractive power is not only exerted between those large masses of matter which constitute the sun and planets, but likewise between all comparatively smaller bodies, and even between the smallest particles of which they are composed. Agreeably to this hypothesis, a heavy body, which ought to gravitate or tend toward the centre of the earth, in a direction perpendicular to its surface, supposing the said surface to be perfectly even and spherical, ought likewise, though in a less degree, to be attracted and tend toward a mountain placed on the earth's surface; so that a plumb line, for instance, of a quadrant hanging in the neighbourhood of such a mountain, ought to be drawn from a perpendicular situation, in consequence of the attractive power of the quantity of matter of which it is composed acting in a direction different from that exerted by the whole mass of matter in the earth, and with a proportionably inferior degree of force.

Though Sir Isaac Newton had long ago hinted at an experiment of this kind, and had remarked, that "a mountain of an hemispherical figure, three miles high and six broad, would not, by its attraction, draw the plumb-line two minutes out of the perpendicular (f); yet no attempt to ascertain this matter by actual experiment was made till about the year 1738; when the French academicians, particularly Messrs. Bouger and Condamine, who were sent to Peru to measure a degree under the equator, attempted to discover the attractive power of Chimbora<;o, a mountain in the province of Quito. According to their observations, which were however made under circumstances by no means favourable to an accurate solution of so nice and difficult a problem, the mountain Chimbora<;o, exerted an attraction equal to eight seconds. Though this experiment was not perhaps sufficient to prove satisfactorily even the reality of an attraction, much less the precise quantity of it; yet it does not appear that any steps had been since taken to repeat it.

Through the munificence of his Britannic majesty, the royal society were enabled to undertake the execution of this delicate and important experiment: the astronomer-royal was chosen to conduct it. After various inquiries, the mountain Schehallien, situated nearly in the centre of Scotland, was pitched upon as the most proper for the purpose that could be found in Britain. The observations were made by taking the meridian zenith distances of different fixed stars, near the zenith, by means of a zenith sector of ten feet radius; first on the south, and afterwards on the north side of the hill, the greatest length of which extended in a east and west direction.

It is evident, that if the mass of matter in the hill exerted any sensible attraction, it would cause the plumb-line of the sector, through which an observer viewed a star in the meridian, to deviate from its perpendicular situation, and would attract it contrarywise at the two stations, thereby doubling the effect. On the south side the plummet would be drawn to the northward, by the attractive power of the hill placed to the northward of it: and on the north side a contrary and equal deflection of the plumb-line would take

(f) By a very easy calculation it is found that such a mountain would attract the plumb-line 1' 18" from the perpendicular.
take place, in consequence of the attraction of the hill, now to the southward of it. The apparent zenith distances of the stars would be affected contrarywise; those being increased at the one station which were diminished at the other; and the correspondent quantities of the deflection of the plumb-line would give the observer the sum of the contrary attractions of the hill, acting on the plummets at the two stations; the half of which will of course indicate the attractive power of the hill.

The various operations requisite for this experiment lasted about four months; and from them it appears, that the sum of the two contrary attractions of the mountain Schehallien, in the two temporary observations which were successively fixed half-way up the hill (where the effect of its attraction would be greatest), was equal to 11. From a rough computation, founded on the known law of gravitation, and on an assumption that the density of the hill is equal to the mean density of the earth, it appears that the attraction of the hill should amount to about the double of this quantity. From hence it was inferred, that the density of the hill is only about half the mean density of the earth. It does not appear, however, that the mountain Schehallien has ever been a volcano, or is hollow; as it is extremely solid and dense, and seemingly composed of an entire rock.

The inference drawn from these experiments may be reduced to the following:

1. It appears, that the mountain Schehallien exerts a sensible attraction; therefore, from the rules of philosophizing, we are to conclude, that every mountain, and indeed every particle of the earth, is endowed with the same property, in proportion to its quantity of matter.

2. The law of the variation of this force, in the inverse ratio of the squares of the distances, as laid down by Sir Isaac Newton, is also confirmed by this experiment. For if the force of attraction of the hill had been only that of the earth as the matter in the hill to that of the earth, and had not been greatly increased by the near approach to its centre, the attraction thereof must have been wholly insensible. But now, by only supposing the mean density of the earth to be double to that of the hill, which seems very probable from other considerations, the attraction of the hill will be reconciled to the general law of the variation of attraction in the inverse duplicate ratio of the distances, as deduced by Sir Isaac Newton from the comparison of the motion of the heavenly bodies with the force of gravity at the surface of the earth; and the analogy of nature will be preserved.

3. We may now, therefore, be allowed to admit this law, and to acknowledge, that the mean density of the earth is at least double of that at the surface; and consequently that the density of the internal parts of the earth is much greater than near the surface. Hence also, the whole quantity of matter in the earth will be at least as great again as if it had been all composed of matter of the same density with that at the surface; or will be about four or five times as great as if it were all composed of water. This conclusion, Mr. Maikelyre adds, is totally contrary to the hypothesis of some naturalists, who suppose the earth to be only a great hollow shell of matter; supporting itself from the property of an arch, with an immense vacancy in the midst of it. But, were that the case, the attraction of mountains, and even smaller inequalities in the earth's surface, would be very great, contrary to experiment, and would affect the measures of the degree of the meridian much more than we find they do; and the variation of gravity, in different latitudes, in going from the equator to the poles, as found by pendulums, would not be nearly so regular as it has been found by experiment to be.

4. As mountains are by these experiments found capable of producing sensible deflections of the plumb-lines of astronomical instruments; it becomes a matter of great importance, in the mensuration of degrees in the meridian, either to choose places where the irregular attractions of the elevated parts may be small; or where, by their situation, they may compendiate or counteract the effects of each other.

For measuring the heights of mountains, see the article Barometer.

Burning Mountains. See ETNA, HECLA, VESUVIUS, and Volcano.

Marble Mountains. Of these there are great numbers in Egypt, from which, though immense quantities have been carried off for the multitude of great works erected by the ancient Egyptians; yet, in the opinion of Mr. Bruce who passed by them in his journey to Abyssinia, there is still such an abundant supply, that it would be sufficient to build Rome, Athens, Corinth, Syracuse, Memphis, Alexandria, and a dozen more of such cities.

The first mountain of this kind mentioned by Mr. Bruce is one opposite to Ternowey, consisting partly of green marble, partly of granite, with a red bluish up on a grey ground, and square oblong spots. Here he saw a monitory obelisk of marble, very nearly square, broken at the end, and nearly 30 feet long and 19 feet in the face. Throughout the plain there were scattered small pieces of jasper, with green, white, and red spots, called in Italy diaspro fanguiii; and all the mountains upon that side seemed to consist of the same materials. Here also were quantities of small pieces of granite of various kinds, as also porphyry, which had been carried down by a torrent, probably from the ancient quarries. These pieces were white mixed with black spots, and red with green veins and black spots. All the other mountains on the right hand were of red marble, but no great beauty; those on the opposite side being green marble, probably of the serpentine kind. This, he says, was one of the most extraordinary sights he ever saw. The former mountains were of a considerable height, without a tree, shrub, or blade of grass upon them; and this looked exactly as if it had been covered over with Havanannah and Brazil snuff. Proceeding farther on, he entered another defile with mountains of green marble on every side. The highest he saw appeared to be composed of serpentine marble; having a large vein of green jasper spotted with red running through about one-third of its thickness. It was extremely hard; so that it did not yield to the blows of a hammer, though it was evident that it had formerly been quarried; and there were channels for bringing water, which terminated
of Mount. Mountain.

nated in this quarry of jasper; "a proof (says Mr. Bruce) that water was one of the means used in cutting those hard stones,"

On these mountains, our author observes, that "the porphyry shows itself by a fine purple fand without any gleam upon it, though the colour is very agreeable to the eye. It is mixed with the white fand and fixed marble of the plains. Green and unvariegated marble is also found in the same mountain with the porphyry. The marble is brittle for some inches where the two veins meet; but the porphyry is as hard as in other places. The granite appears like a dirty brown fone covered with sand; but this is only the change made upon it by the fun and weather; for on breaking it, the colour appears to be green with black spots, and a reddish fand on the surface. The reddish colour appears to be impaired by exposure to the atmosphere; but is recovered upon polishing it anew. It is in greater quantity than the porphyry, and nearer to the Red Sea. The granite is next to the porphyry, but never made of red marble with white veins, which our author has seen at Rome and likewise in Britain. The common green, called ferpenite, looks as if it were covered with Brazil fult. Along with this green he saw two samples of the beautiful kind called Jasella; one of them with the yellowish cast of Quaker-colour; the other of that bluish cast called dove colour; and these two seemed to divide the mountains with the ferpenite. Here also he saw the vein of Jasper; but had not time to determine whether it was the fame with that called bloody-Jasper or blood-ftone or not.

The marble of greatest value, however, is that called Verde Antico, which is of a dark-green colour with white spots. It is found, like the Jasper, in the mountains of the plain green ferpenite, and is not disoverable by the duff or any particular colour upon it. "First (says Mr. Bruce) there is a blue fak's flone exceedingly even and smooth in the grain, folid, and without fparks and colour. When broken it is fomething lighter than a flate, and more beautiful than most kinds of marble; it is like the lava of volcanoes when polished. After lifting this we come to the beds of verde antico; and here the quarrying is very obvious; for it has been uncovered in patches not above 20 feet fquare. Then, in another part the green flone has been removed and another pit wroght." In other places of the plain he faw pieces of African marble, but no rocks or mountains, of it. He fuppofe it to be found in the heart of fome other coloured marble, and in firata like the Jasper and verde antico; and, as he fuppofe, in the mountains of Labella marble, efpially of the yelloweft fand. This vaf flone of marble is placed on a ridge, whence there is a defcent to the cafl and weft, fo that it could be conveyed either to the Nile or the Red Sea. The level ground and hard fixed gravel are proper for the heaviest carriages; fo that any weight whatever might eafily be conveyed to the place of embarkation. In the more diftant mountains also he observed the fame care taken to facilitate the carriage: for the defiles between those mountains he fuppofes not to be natural but artifi-
of any consequence. "They seem (says he) to have been executed at idle hours by travellers, who were satisfied with cutting the unpollished rock with any pointed instrument, adding to their names and the date of their journeys some rude figures, which bespeak the hand of a people but little skilled in the arts. When such inscriptions are executed with the design of transmitting to posterity the memory of such events as might afford instructive lessons, greater care is generally taken in the preparation of the stones, and the inscriptions are engraved with more regularity."

When M. Niebuhr arrived at last at the mountain to which the sheik had promised to conduct him, he did not find there any inscriptions; but, on climbing up to the top, he found nothing there but an Egyptian cemetery, the stones of which were covered with hieroglyphics. The tomb stones are from five to seven feet in length, some standing on end and others lying flat; and "the more carefully they are examined (says he), the more certainly do they appear to be sepulchral stones, having epitaphs inscribed on them. In the middle of the stones is a building of which only the walls now remain; and within it, likewise, a great many of the sepulchral stones. At one end of the building seems to have been a small chamber, of which the roof still remains. It is supported upon square pillars; and these, as well as the walls of the chamber, are covered with hieroglyphic inscriptions. Thro' the whole building are various bulws executed in the manner of the ancient Egyptians. The sepulchral stones and the bulls are of hard and fine-grained sand-stone." M. Niebuhr is of opinion that this cemetery was not the work of the Egyptians themselves, but of some colony which came from Egypt, and had adopted the manners and customs of the people. He supposes that it might have been built by the Arabs who had conquered Egypt under the shepherd kings and adopted the Egyptian manners during their residence there. As it must have belonged to an opulent city, however, he owns that there is a great difficulty in accounting for the existence of such a city in the midst of a desert.

The translator of Volney's travels abridges these inscriptions to the pilgrims which visit Mount Sinai. But to this, as well as to every other conjecture, there is this objection, that whether the inscriptions be well executed or not, whether they contain matters of importance or not, they ought to have been written in a language which somebody could understand; but from the copies that have been taken of them by Dr. Porro, and others, it does not appear that they could be explained either by him or any other person.

When Dr. Clayton, bishop of Clogher, visited this part of the world about the year 1723, he expressed the greatest desire to have the matter concerning this written mountain or mountains ascertained, and even made an offer of L. 500 Sterling to any literary person who would undertake the journey and endeavour to decipher the inscriptions; but no such person has appeared, and the existence of the mountains is testified only by the superior of a convent at Cairo, who gave that mentioned in the beginning of this article. Until that part of the world, therefore, become more accessible to travellers, there is but little hope that we can come to any certainty in the matter. M. Niebuhr plainly, from his own account, had not influence enough with the Arabs to show him anything as they refused to conduct him even to the summit of Mount Sinai.

White Mountains. See New Hampshire.

Mountains of the Moon, a chain of mountains in Africa, extending themselves between Abysinia and Monomotapa, and receiving the above denomination from their great height. They were styled by the ancients the mountains of God, on account of their being greatly subject to thunder and lightning. Mountains of Forty-days; a mountain of Judia, situated in the plain of Jericho to the north of that city. According to the Abbe Marisi's description, the summit of it is covered neither with shrubs, turf, nor earth: it consists of a solid mass of white marble, the surface of which is become yellow by the injuries of the air. "The path by which you ascend to it (says our author) fills one with terror, as it runs through a winding course between two abysses, which the eye dures fearfully behold. This path is at first pretty broad, but as length becomes so confined, that one can with difficulty place both feet upon it at the same time. When we had ascended a little higher, we found an Arab stretched out on the path, who made us pay a certain toll for our passage. Here the traveller requires courage. One of the parapets of the path being broke, we clung to the part which remained until we had reached a small grotto, situated very commodiously as it gave us an opportunity of recovering our breath. When we had rested ourselves a little, we pursued our course, which became still more dangerous. Suspended almost from the rock, and having before our eyes all the horror of the precipice, we could advance only by dragging one foot after the other; so that had the smallest fragment given way under us, we should have been hurried to the bottom of this frightful abyss.

"Proceeding a little farther, we found a second grotto, the entrance of which was about nine feet in breadth. It would be of considerable size were not about two-thirds of it filled up by part of the roof, which had tumbled down. This grotto conduits to another, which we had the curiosity to enter, but we were almost stifled by the great number of bats which were fluttering up and down in it. Being desirous of retreating almost as soon as we had entered they flew in such numbers around us that they in a manner covered our whole bodies; but they luckily made a pottage for themselves, and suffered us to breathe with freedom. By the glistening light which reached this grotto, we perceived that the bottom of it was covered to the height of a hand-breadth with the excrements of these animals; and we remarked some niches in the sides of it, which gave us reason to conclude, that it had once served as a sepulchre to the ancient anchoresses. This is the more probable, as the other grotto appears by the remains of an altar and of some Greek paintings to have been formerly a church. In the right corner there is a large cistern, the plaster of which retains its original solidity, though broken
MOURNING, among the ancients, was expressed various ways.

Amongst the Jews, on the death of their relations or intimate friends, grief or mourning was signified by weeping, tearing their clothes, figthing, their breasts, or tearing them with their nails, pulling or cutting off their hair and beards, walking softly, i.e. barefoot, lying upon the ground, falling, or casting upon the ground. They kept themselves close shut up in their houses, covered their faces, and abstained from all work, even reading the law, and saying their usual prayers. They neither dressed themselves nor made their beds, nor shaved themselves, nor cut their nails, nor went into the bath, nor saluted any body: so that fullness seems to have been an indication of sorrow; and diriments, of diriments. The time of mourning among the Jews was generally seven days: tho' this was lengthened or shortened according to circumstances; but 30 days were thought sufficient upon the feverest occasions. The different periods of the time of mourning required different degrees of grief, and different tokens of it.

The Greeks, on no other death of friends, showed their sorrow by excluding themselves from all gaiety, entertainments, games, public solemnities, the enjoyment of wine, and the delights of music. They sat in gloomy and solitary places, stripped themselves of all external ornaments, put on a coarse black stuff by way of mourning, tore their hair, shaved their heads, rolled themselves in the dust and mire, sprinkled ashes on their heads, smote their breasts with their palms, tore their faces, and frequently cried out with a lamentable voice and dwelling tone, reiterating the interjection, &c.; hence funeral lamentations were called Elegies. If they appeared in public during the time of mourning, they had a veil thrown over their faces and heads. During the funeral procession, certain persons called Scyphists marched before, and sang melancholy strains called Epitaphium. These vocal mourners sung thrice during the procession round the pile and round the grave. Flutes were also used to heighten the solemnity. At the funerals of soldiery, their fellow-soldiers who attended, as a testimony of their affliction, held their shields, their spears, and the rest of their armour, inverted.

As to the tokens of private grief among the Romans, they were the same as those already observed as customary amongst the Greeks. Black or dark-brown were the colour of the mourning habits worn by the men; they were also common to the women. The mourning of the emperors at first was black. In the time of Augustus, the women wore white veils, and the rest of their dress black. From the time of Domitian they wore nothing but white habits, without any ornaments of gold, jewels, or pearls. The men let their hair and beards grow, and wore no wreaths of flowers on their heads while the days of mourning continued. The longest time of mourning was ten months; this was Numa's establishment, and took in his whole year. For a widow to marry during this time was infamous. Mourning was not used for children who died under three years of age. From this age to ten they mourned as many months as the child was years old. A remarkable victory or other happy event, occasioned the shortening of the time of mourning.
MOUSE

MOUSE, in zoology. See Mus.

MOUSE-EAR, in botany. See Hieracium.

MOUSE-TAIL, See Myoxus.

Dor-Mous. See Myoxus.

Shre'u-Mous., See Sorex.

MOUSEL, the name of an East Indian tree, with white tubular flowers, which fall off every day in great plenty. They are of a sweet agreeable smell and the Gentoos are very fond of wearing them, flinging and hanging them about their necks and arms. The fruit is a pale red-cherry, of the shape and size of our white heart-cherry, but the fruit-stalk is not quite so long. This fruit has a f hone in it containing a bitter oily kernel. The Indians rub with this oil any part that is infested by a scorpion or bitten by a centipede, which it soon cures. The crows are very fond of the fruit.

MOUSEL, or Moule, a large city of Turkey in Asia, and capital of a Beglerbeye, stands on the west banks of the Tigris, in the latitude, according to Mr. Ives's observation, of 36°. It is surrounded with stone-walls, but has many of its streets lying walled. Taverniers speak of it as a ruined place, with only two blind markets and two night-fires.
MOUTH, in anatomy, a part of the face, containing the lips, the gums, the inside of the cheeks, the palate, the salivary glands, the os hyoides, the uvula, and the tonsils, which see under the article Anatomy.

Mr Derham observes, that the mouth in the several species of animals is nicely adapted to the uses of such a part, and well fixed and shaped for the formation of speech, the gathering and receiving of food, the catching of prey, &c. In some creatures it is wide and large, in others little and narrow; in some it is formed with a deep incisure into the head, for the better catching and holding of prey, and more easy comminution of hard, large, and troublesome food; and in others with a shorter incisure, for the gathering and holding of herbaceous food. In birds it is mostly shaped for piercing the air: hard and horny, to supply the want of teeth; hooked, in the rapacious kind, to catch and hold their prey; long and flender in those that have their food to grope for in moorish places; and broad and long in those that search for it in the mud. Nor is the mouth itself remarkable in insects; in some it is foreparted, to catch, hold, and tear the prey; in others aculeated, to pierce and wound animals, and suck their blood; in others, strongly rigid, with jaws and teeth, to gnaw and scrape out their food, carry burdens, perforate the earth, nail the hard-est wood, and even flome themselves, for houfes and nets for their young.

MOUVANS (Paul Richard), surnamed the Brave, a Protestant officer, was born at Caffelain: in Provence, of a respectable family, and made a considerable figure in the civil wars of France during the 16th century. His brother, who was likewise a Protestant, having been killed in a popular tumult excited by the Romish party at Draguignan, took up arms to avenge his death; and, having assembled 2000 men, committed great devastations in Provence. Being pursued by the Count de Tende at the head of 6000 men, and finding himself too weak to keep the field, he took post in a convent strongly fortified by nature, and there resolved to defend himself to the last extremity. That the war might be terminated amicably, the Count de Tende proposed an interview; to which Mouvans agreed, on condition that his brother's murderers should be punished, and that those who had taken up arms with him should not be molested. These terms being accepted, he dismissed his troops, referring only a guard of 50 men for the security of his person. This precaution was not unnecessary; for the parliament of Aix had received orders from court to punish him capitally for being concerned in the conspiracy of Amboise. The baron de la Garde made an attempt to apprehend him, but he was worshiped and repulsed with considerable loss. Mouvans at length resolved to retire to Geneva, where his life would not be in danger; and there he lived for some time in tranquility, nobly rejecting the splendid offers made him by the duke of Guise if he would join the Catholic party. He returned to France at the recommencement of the troubles, in consequence of the warfare of Vaffy in 1568, and continued to distinguish himself in the Protestant armies. His conduct at Siferon, where he commanded together with Captain Senas when that city was besieged by the Count de Sommerive, is particularly deserving of admiration. After sustaining an assault of seven hours, in which the besiegers were repelled with considerable loss, Mouvans, perceiving that he was too weak to wait a second, determined to abandon the city, and left it during the night with his troops and those of the inhabitants who chose to accompany him, by a path which the enemy had neglected to guard. The number of the inhabitants amounted to 4000 of every age and sex, men, women, children, and mothers with their infants at their breast. This body, in which there was not 1000 men fit to bear arms, directed their course towards Grenoble. Musketeers were placed in the front and rear, while the defenceless and unarmed occupied the centre. To add to the difficulty of the march, they were frequently obliged to go out of the way, and to cross steep and rugged
MOY [438] MUC

rugged mountains, in order to avoid the ambuscades which the enemy had laid for them on the road.

They stopped some days to refresh themselves in the valleys of Angrone and Pragclas, where they were cordially received and supplied with provisions by the Vaudois. After a march of 21 or 22 days, and being exposed to the greatest fatigue and famine, the wretched fugitives at length arrived at Grenoble. The baron des Adrets sent them under an escort to Lyons, where they remained till the treaty of pacification. In 1568 Mouvans was defeated at Mignane in Perigord, and lost his life in the engagement. Upon this occasion he commanded, together with Peter Gourde, the advanced guard of the Protestant army. It is alleged, that in despair he dashed out his brains against a tree.

MOWEE, one of the Sandwich islands discovered by Captain Cook, is 162 miles in circumference. A low, illusiss divides it into two circular peninsulas, of which the eastern is double the size of the western. The mountains in both rise to an exceeding great height, and may be seen at the distance of more than 30 leagues. The northern shores, like those of Owyhee, afford no foundings, and the country presents the same appearance of verdure and fertility. Near the well point of the smaller peninsula is a spacious bay, with a sandy beach shaded with cocoa-nut trees. The country behind has a west:

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MUCK [ 439 ]

M. "prifoner."

intoxicated with opium, and then has prevailed time immemorial in Batavia. To run the mixture is entirely mucus. If the matter cannot be ration, we have also reason to believe that it is a certain precipitation in neither, it is a certain a muck, in the original sense of the word, is to get line lixivium; and let him add pure water to both.

The addition of water to either of these compounds decomposes it. The mucus thus separated either twines in the mixture or forms large flocculi in it; whereas the pus falls to the bottom, and forms, on agitation, an uniform turbid mixture.

1. Pus and mucus are both soluble in the vitriolic acid, though in very different proportions, pus being by far least soluble.

2. The addition of water to either of these compounds decomposes it. The mucus thus separated either twines in the mixture or forms large flocculi in it; whereas the pus falls to the bottom, and forms, on agitation, an uniform turbid mixture.

3. Pus is diffusible through a diluted vitriolic acid, though mucus is not. The same also occurs with water, or with a solution of feu-faut.

4. Nitrous acid dissolves both pus and mucus. Water added to the solution of pus produces a precipitate, and the fluid above becomes clear and green, while water and the solution of mucus form a turbid dirty-coloured fluid.

5. Alkaline lixivium dissolves, though sometimes with difficulty, mucus, and generally pus.

6. Water precipitates pus from such a mixture, but does not mucus.

7. Where alkaline lixivium does not dissolve pus, it still distinguishes it from mucus, as it then prevents its diffusion through water.

8. Coagulable lymph is neither soluble in concentrated nor diluted vitriolic acid.

9. Water produces no change on a solution of furm in alkaline lixivium, until after long standing, and then only a very slight sediment appears.

10. Corrosive sublimate coagulates mucus, but does not pus.

From the above experiments it appears, that strong vitriolic acid and water, diluted vitriolic acid, and caustic alkaline lixivium and water, will serve to distinguish pus from mucus; that the vitriolic acid can separate it from coagulable lymph, and alkaline lixivium from ferum.

Hence, when a person has any expectorated matter, the decomposition of which he wishes to ascertain, let him dissolve it in vitriolic acid, and in caustic alkaline lixivium; and let him add pure water to both solutions. If there be a fair precipitation in each, he may be assured that some pus is present. But if there be a precipitation in neither, it is a certain test that the mixture is entirely mucus. If the matter cannot be made to diffuse in alkaline lixivium by time and trial, we have also reason to believe that it is pus.

MUCK, or RUNNING A MUCK, is a practice that has prevailed time immemorial in Batavia. To run a muck, in the original sense of the word, is to get intoxicated with opium, and then rush through the streets with a drawn weapon, and kill any one that comes in the way, till the party is himself either killed or taken prisoner. If the officer takes one of these amokki or muharuki (as they have been called by an easy corrup-

MUDIGANA. See MURENA.

MUFFEL, in chemistry, a vessel much used in some metallurgic operations. In figure it represents an oblong arch or vault, the hinder part of which is cloven by a semicircular plane, and the lower part or floor of which is a rectangular plane. It is a little oven that is placed horizontally in a fayy and enameling furnaces, so that its open side corresponds with the door of the fire-place of the furnace. Under this arched oven small cups or crucibles are placed; and the substances contained are thus exposed to heat without contact of fuel, smoke, or ashes.

MUFTI, the chief of the ecclesiastical order, or priate of the muftiulame religion. The authority of the mufti is very great in the Ottoman empire; for even the sultan himself, if he would preserve any appearance of religion, cannot, without hearing his opinion, put any person to death, or to much as inflict any corporal punishment. In all actions, especially criminal ones, his opinion is required, by giving him a writing in which the case is stated under feigned names; which he subscribes with the words, fie [sall, or Shall not be, punished. Such outward honor is paid to the mufti, that the grand signior himself rises up to him, and advances seven steps to meet him when he comes into his presence. He alone has the honour of killing the sultan's left shoulder, whilst the prime vicer kills only the hem of his garment. When the grand signior addresses any writing to the mufti, he gives him the following titles: To the edal, the editt of the wise, instructed in all knowledge, the most excellent of excellent, abounding from things unlawful, the spring of virtue and of true science, heir of the prophetic doctrines, refuser of the problems of faith, reveler of the orthodox articles, stay of the treasures of truth, the light to the doubtful allegories, strengthened with the grace of the supreme legislator of mankind, may the Most High God perpetuate thy virtues! The election of the mufti is solely in the grand signior, who presents him with a seat of rich fables, &c. If he is convicted of treason, or any great crime, he is put into a mortar kept for that purpose in the Seven Towers at Constantinople, and pounded to death.

MUGGLETONIANS, a religious sect which arose in England about the year 1657; fo denounced from their leader Ludowick Muggleton, a journeyman tailor, who, with his associate Reeves, set up for great prophets, pretending, as it is said, to have an absolute power of saving and damning whom they pleased; and giving out that they were the two last witnesses of God that should appear before the end of the world.

MUGIL, the mullet; in ichthyology, a genus of fishes belonging to the order of abdominales. The lips are membranaceous, the inferior one being curved inwards; they have no teeth; the branchiosteg membrane has seven crooked rays; the opercula smooth and round; and the body is of a whitish colour. There are two species, distinguished by the number of rays in the back-fin.

The mullet is joyfully ranked by Aristotle among the fishes littorae; or those that prefer the shores to the
full sea; they are found in great plenty on several of the sandy coasts of Britain, and haunt in particular those small bays that have influxes of fresh water. They come in great shoals, and keep rooting like hogs in the sand or mud, leaving their traces in form of large round holes. They are very cunning; and when surrounded with a net, the whole shoal frequently escapes by leaping over it; for when one takes the lead, the others are sure to follow. This circumstance is observed by Oppian; who also informs us, that if these fishes fail to get over at the first leap, they never attempt a second, but lie without motion as if they refrained themselves to their fate. Mr Pennant says he is uncertain whether this last observation holds good or not; however, Oppian had good opportunity of examining those fishes, as they sometimes swarm on the coasts of the Mediterranean. Near Martegues, in the south of France, abundance of mullets are taken in weares made of reeds placed in the shallows. Of the males, which are there called alciants, and of the roes of females, which are called botaris, is made botargo. The materials are taken out entire, covered with salt for four or five hours, then pressed a little between two boards or flones, washed, and at last dried in the sun for 13 or 14 days.

This fish was sometimes made the instrument of a horrible punishment for unfortunate gallants. It was used both at Athens and Rome; but it is very doubtful whether it was a legal punishment or not. By Horace it is mentioned in the following lines:

Diffinita tunica fugiendum est, ac pede nude.
Nec numinum perante, aut Putea, aut dennece fanna.

Sat. l. lib. l. 133.

The mullet is an excellent fish for the table, but at present not a fashionable one. The albuia * is caught in great quantities about the Bahamas islands at the time they go in shoals to spawn; and is there esteemed very good eating.

MUGWORT, in botany; a species of Artemisia. An infusion of this plant in white wine, or a bath made of it, has been always esteemed an emmenagogue, and useful in difficult parturition. The leaves, when young and tender, are frequently made use of by the Highlanders of Scotland as a pot herb. The country people in Sweden drink a decoction of them for the ague.

MUID, a large measure in use among the French, for things dry. The mid is no real vessel used as a measure, but an estimation of several other measures; as the septier, mille, minot, buffel, &c.

Muid, is also one of the nine caiks, or regular vessels used in France, to put wine and other liquors in. The mid of wine is divided into two demi-muids, four quarter muids, and eight half quarter muids containing 367 pinte.

MULATTO, a name given to those who are begotten by a negro man on a white woman, or by a white man on a negro woman.

MULBERRY, in botany. See Morus.

Mulbe or Cyder, a name given by the people of Devonshire, and some other parts of England, to a sort of Cyder rendered very palatable by an admixture of mulberry juice in the making: they choose for the purpose the ripest and blackest mulberries, and pressing out their juice and mixing it with a full-bodied cyder at the time of the grinding and pressing, give just so much of it as adds a perceptible flavour. It is very worthy the attention of people who live in other countries, where strong and good cyder is made, that this renders it a sort of wine much more agreeable than any other English liquor, and might be brought into general use, to the great advantage of the dealer. The colour of this liquor resembles that of the bright red wine, and the flavour of the mulberry never goes off. Phil. Trans. No 133.

MULCT, a fine of money laid upon a man who has committed some fault or misdemeanour.

MULE, in zoology, a mongrel kind of quadruped, usually generated between an as and a mare, and sometimes between a horse and a she-as; but the signification of the word is commonly extended to every kind of animal produced by a mixture of two different species. There are two kinds of these animals; one from the he-as and mare, the other from the horse and the she-as. We call them indifferently mules, but the Romans distinguished them by proper appellations. The first kind are the best and most esteemed: as being larger, stronger, and having less flesh than the as in their disposition. The largest and stoutest ases, and the fairest and finest mares, are chosen in those countries where these creatures are most in use; as in Spain, Italy, and Flanders. In the last especially, they succeed in having very fatly mules from the size of their mares, some of them 16 and some 17 hands high, which are very serviceable as fummer-mules in the army. But since the Low Countries are no longer under the dominion of Spain, they breed fewer mules. These creatures are very much commended for their being stronger, fairer footed, going easier, being more cheaply maintained, and lasting longer than horses. They are commonly of a black-brown, or quite black, with that shining lift along the back and crest the shoulders which distinguishes ases. In former times they were much more common in Britain than at present; being often brought over in the days of Popery by the Italian prelates. They continued longest in the service of millers; and are yet in use among them in some places, on account of the great loads they carry on their back. As they are capable of being trained for riding, bearing burdens, and for draught, there is no doubt that they might be usefully employed in many different services. But they are commonly found to be vicious, stubborn, and obdurate to a proverb; which whether it occurs or is produced by the ill usage they meet with, is a point not easily settled. Whatever may be the case of ases, it is allowed that mules are larger, fatter, and more serviceable in mild than in warm climates. In the British American colonies, both on the continent and in the islands, but especially in the latter, they are much used and esteemed; so that they are frequently sent to them from England, suffer less in the passage, and die much felder than horses, and commonly yield, when they arrive, no incon siderable profit.

It has commonly been asserted, that animals produced by the mixture of two heterogeneous species are incapable of generating, and thus perpetuating the monstrous breed; but this, we are informed by M. Buffon, is now discovered to be a mistake. Aristotle, says he, tells us, that the mule engenders with the mare, and that the junction produces an animal which the Greeks call binus, or ginosus. He likewise...
MULES.

Mule. 

wife remarks, that the filly mule easily conceives, but seldom brings the fetus to perfection. But the most remarkable and well attested instance of this fact, is mentioned in a latter read by M. d'Alembert before the academy of sciences, which informed him, that a mule in the island of St Domingo had brought forth a foal. The fact was attested by persons of the most unquestionable veracity; and other instances, though not so well authenticated, are adduced by our author. We may therefore, continue M. Buffon, consider it as an established fact, that the mule can generate and the foal produce. Like other animals, they have a female liquor, and all the organs necessary to generation. But mongrel animals are always less fertile and more tardy than those of a pure species. Besides, mules have never produced in cold climates, seldom in warm regions, and still more seldom in temperate countries. Hence their barrenness, without being absolute, may be regarded as positive; since their productions are so rare, that a few examples can be only collected.

The translator of Buffon's works, in a note on the passage above quoted, has given a remarkable and well authenticated instance of the prolific powers of a female mule in the north of Scotland. Having heard that a mule belonging to Mr David Tullo farmer in Auchtertyre, in the county of Forfar, had some years ago brought forth a foal, he transmitted a few queries to be put to Mr Tullo; and requested that his answers might be legally attested before a magistrate. This request was cheerfully complied with; and the following is an exact copy of the queries, answers, and attestations.

Interrogatories to be put to Mr Tullo tenant in Auchtertyre, parish of Newtyle, and county of Forfar, with his answers thereto.

1st. Had you ever a filly mule? At what period? Is it true that the mule had a foal? and what time was she covered; and when did she foal?—Answered by Mr Tullo; that he bought a filly mule about 20 years ago; that she was constantly in season for a horse; that, about some years thereafter, he gave her a horse; and that she thereafter gave him a foal, about the 10th of June. The mule's price was L. 45. 5s. Sterling.

2nd. What was the colour of the foal? Was there anything particular in its figure?—Answer: The foal was exactly the colour of its mother, inclined to black, with a very large head, big ears, and small tail; and the declarant thinks, had its head been weighed when foaled, it would have weighed nearly as much as its body.

3rd. How long was the animal allowed to live?—Answer: The next day after the foal foaled, it was sent, with its mother, to the Loch of Lunde, in order to let the foal die, as the declarant could not want the mule's work, and the mother feemed not fond of the foal! That it was accordingly left, and the next day came to Auchtertyre, about two miles distance, over a hill, with the cattle of Auchtertyre, that had been grazing near to that place, and was drowned in a ditch the day following.

4th. Was its skin preferred, or the head, or any other bones of the skeleton? Could any part thereof be still found? Answered: Neither the skin nor any part of the skeleton was preserved, nor can be now had; though the declarant has often regretted the not preserving the foal, as its mother always performed any work that a horse of 15l. value could do.

5th. Was the mother still alive? What was her age?—Answer: The mother died about eight years ago, of an epidemic cold that was raging among the horses in this country: the mule had little or no milk after foaling, and the foal got some cows milk: And this is all that he remembers of the matter. DAVID TULLO.

Auchtertyre. 4th Feb. 1780. We James Small tenant in Burmouth, and Robert Ramsay tenant in Newtyle, hereby certify, that we have often seen the mule above described; and we know that the mule, as is narrated by David Tullo.

JAMES SMALL. ROB. RAMSAY.

Ballantyne-bougie, 4th Feb. 1780. The within interrogatories were put to David Tullo tenant in Auchtertyre, about the mule he had, and the foal he produced; to which he gave the answers subjoined to each query, and signed them; as did James Small and Robert Ramsay, attesting the truth thereof, in presence of GEORGE WATSON, J.P.

The original attestation is in the possession of the translator; and he lately transmitted notarial or authenticated copies of it to the count de Buffon, and to Thomas Pennant, Esq; of Downing, in Flintshire.

Mules, among gardeners, denote a sort of vegetable monsters produced by putting the farina sedum of one species of plant into the pistil or utricle of another.

The carnation and sweet-william being somewhat alike in their parts, particularly their flowers, the farina of the one will impregnate the other, and the seed so enlivened will produce a plant differing from either. An instance of this we first had in Mr Fairchild's garden at Hoxton; where a plant is seen neither sweet-william nor carnation, but resembling both equally; this was raised, not by seed, but by a carnation that had been impregnated by the farina of the sweet-william. Thee couplings being not unlike those of the mare with the ass, which produce the mule, the same name is given them; and they are, like the others, incapable of multiplying their species.

This furnishes a hint for altering the property and taste of any fruit, by impregnating one tree with the farina of another of the same class; e.g. a codlin with a pear-main, which will occasion the codlin so impregnated to laft a longer time than usual, and to be of a sharper taste. Or if the winter-fruits be fecundated with the dust of the summer kinds, they will ripen before their usual time. And from this accidental coupling of the farina of one with another, it may possibly be, that an orchard where there is variety of apples, even the fruit gathered from the same tree differ in their flavour, and in the season of maturity. It is also from the same accidental coupling that the numberless varieties of fruits and flowers raised every day from seed proceed.

Wild or Foul Mules. See Equus, p. 712.

MULHAUSEN, an imperial and Hanseatic town of Germany in Upper Saxony, and in Thuringia, under the protection of the elector of Saxony; seated in

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MULHAUSEN, a considerable town of Germany, in Alsatia, and capital of a republic in alliance with the Swiss. It is populous, well built, and adorned with handsome public structures; seated in a pleasant fertile country, on an island formed by the river Ill, 15 miles north west of Bale, and 20 east of Belfort. E. Long. 7. 24. N. Lat. 47. 48.

MULLER, in law, signifies the lawful issue born in wedlock, though begotten before. The mulier is preferred to an elder brother born out of wedlock, though begotten before. The mulier is preferenced by a woman, if after that he marries her, the issue is mulier, son, or concave in a sphere or oval, or concave in a sphere or oval.

MULLER, one of the Western Islands of Scotland, about 25 miles long, and as much in breadth. It is in general rocky and barren, not producing a sufficient quantity of corn for the inhabitants; but a great number of cattle are annually exported, which with the fishings and a considerable quantity of kelp are the principal articles of commerce. It is deeply indented with bays and creeks, forming in several parts good natural harbours. There are no villages except Tobermory, near the northern point of the island, where a fishing station has been lately erected. The island was originally part of the dominions of the Lords of the Isles; but in after-times it became part of the possessions of the ancient and valiant family of Macleans, who still retain one-half. The other is the litigated property of the duke of Argyle, whose ancestor policed himself of it in 1674, on account of a debt: but after the courts of law had made an adjudication in his favour, he was obliged to support their decree by force of arms. The ruins of several ancient castles are seen on this island.

Mull of Cintyre. See CANTYRE.

Mull of Galloway. See GALLOWAY.

MULLEIN. See VERBASCUM.

MULLER or REGIAMONTANUS (John), a celebrated astronomer of the 15th century, was born at Koningshoven in Franconia in 1436, and acquired great reputation by publishing an abridgment of Ptolemy's Almagest, which had been begun by Purbach. He went to Rome to perfect himself in the Greek tongue, and to see the Cardinal Baffaron; but finding some faults in the Latin translations of George de Trebizond, that translator's son affiliated him in a second journey he made to Rome in 1476, where Pope Sextus IV. had provided for him the archbishopric of Ratisbon, and had sent for him to reform the calendar. Others say he died of the plague.

Muller (John) a noted engraver, who flourished about the year 1600, and had been bred under Henry Goltzius, whose style he closely imitated. The facility with which he handled the graver (for he worked with that instrument only) cannot be sufficiently expressed; his works must be seen, to convey a proper idea of it to the mind. His engravings are valuable, as productions of a very extraordinary nature; exclusive of which they have a prodigious share of merit. Among his most estimable performances may be mentioned, 1. The hand writing on the wall, a middling sized plate lengthwise, from his own composition. 2. The adoration of the wise men, the frame, from the same. Fine impressions of both these prints are very rare. 3. The resurrection of Lazarus, a large plate lengthwise, from Abraham Bloemart. He engraved also several much esteemed portraits.

Muller, or Mullar, denotes a plane flat and even at bottom, but round at top; used for grinding of matters on a marble. The apothecaries use mullers to prepare many of their tinctuous powders; and painters for their colours, either dry or in oil.

Muller is an instrument used by the glass-grinders; being a piece of wood, to one end whereof is cemented the glass to be ground, whether convex in a base or concave in a sphere or bowl. The muller is ordinarily about six inches long, turned round; the cement they use is composed of ashes and pitch. See GRINDING.

MULLERAS, a town of Germany, in the circle of Upper Saxony, and marquisate of Brandenburg, seated 38 miles south of Berlin, upon a canal which joins the Oder and the Spree. This canal is 15 miles in length, 10 yards in breadth, and seven feet in depth. It was eight years in making, and since that time the cities of Hamburg and Breslau have carried on great trade by water. E. Long. 14. 50. N. Lat. 52. 21.

MULLET, in ichthology. See MUGIL.

Muller, or Mullet, in heraldry, a bearing in form of the rowel of a spear, which it originally represented.

MULLINGAR, a borough or manor in the county of Westmeath, and province of Leinster, in Ireland, 30 miles from Dublin. It is the shire town of that county, and has a barracks for two troops of horse. It returns two members to parliament; patron the earl of Granard. This is a port town. N. Lat. 53. 50. W. Long. 7. 50. Within a few miles of it are the ruins of a church, and also thore of a castle. It is situated on the river Feyle. It holds a great wool fair, and is a place of good trade. In 1227, the priory of St Mary, formerly known by the name of The House of God of Mullingar, was founded here by Ralph de Petit bishop of Meath, for regular canons of the order of St Augustin. A Dominican friary was also founded here in 1237 by the family of Nugent; some ruins of which still remain. In 1622, the friars of Multifarnham began to erect a house here for friars of the order of St Francis, but it was never completed. Fairs are held here 6th April, 4th and 5th July, 29th August, and 11th November.

MULLUS, in Ichthyology, a genus of fishes belonging to the order of Thoracisci. See Plate CCCXV. This fish was highly esteemed by the Romans, and bore an exceedingly high price. The capricious epicures of Horace's days valued it in proportion to its size; not that the larger were more delicious, but that they were more difficult to be got. The price that was given for one in the time of Juvenal...
MULTUS, in Scots law, a certain stipulated quantity of meal given as payment to the proprietor or tackerman of a mill for grinding the corn; and all corn ground on farms thirled to the mill is obliged to pay multure whether the corn be ground at that mill or elsewhere.

MULTUS, a river of Barbary in Africa, which rises in the mountains of Atlas, and divides the empire of Morocco from that of Algiers, and then falls into the Mediterranean, to the westward of Martinique.

MUM, a kind of malt-liquor much drank in Germany, and chiefly brought from Brunswick, which is the place of most note for making it. The process of brewing mum, as recorded in the town-house of that city, is as follows. Take 63 gallons of water that has been boiled till one-third part is consumed, and brew it with seven bushels of wheaten malt, one bushel of oat-meal, and one bushel of ground beans. When it is tanned, the hoghead must not be filled too full at first; as soon as it begins to work, put into it three pounds of the inner rind of the tops of fir and beech, three handfuls of carduus benedictus, a handful or two of the flower of rofa folis: and burnet, betony, marjoram, avens, pensyroyal, and wild thyme, of each an handful and an half; of elder flower, two handfuls or more; seeds of cardamum bruised, 30 ounces; barberries bruised, one ounce: when the liquor has worked a while, put the herbs and seeds into the vessel; and, after they are added, let it work over as little as possible; then fill it up: lastly, when it is flopped, put into the hoghead ten new-laid eggs unbroken; flop it up close, and use it at two years end. The English brewers, instead of the inner rind of fir, use cardamum, ginger, and salafra; and also add clocampane, madder, and red sanders.

MUMIA. See PISABAULTUM.

MUMMIUS (L.), a Roman consul sent against the Achaeans, whom he conquered B. C. 147. He destroyed Corinth, Thebes, and Chalcis, by order of the senate, and obtained the surname of Achaeicus from his victories. He did not enrich himself with the spoils of the enemy, but returned home without any increase of fortune. He was consequently distinguished by the value of the paintings and works of the most celebrated artists of Greece which were found in the plunder of Corinth, that he said to those who conveyed them to Rome, that if they left them or injured them, they should make others in their stead.

MUMMY, a body embalmed or dried, in the manner used by the ancient Egyptians; or the composition with which it is embalmed. There are two kinds of bodies denominated mummiis. The first are only carcasses dried by the heat of the sun, and by that means kept from putrefaction: these are frequently found in the sands of Libya. Some imagine, that these are the bodies of deceived people buried there on purpose to keep them entire without embalming: others think they are the carcasses of travellers who have been overwhelmed by the clouds of sand raised by the hurricanes frequent in those deserts. The second kind of mummies are bodies taken out of the catacombs near Cairo, in which the Egyptians deposited their dead after embalming. See EMBAULMING.
We have two different substances preferred for medicinal use under the name of *mummy,* though both in some degree of the same origin. The one is the dried and preferred flesh of human bodies, embalmed with myrrh and spices; the other is the liquor running from such mummies, when nearly prepared, or when affected by great heat or damp. The latter is sometimes in a liquid, sometimes of a solid form, as it is preferred in vials well stopped, or suffered to dry and harden in the air. The first kind of mummy is brought to us in large pieces, to the smell agreeable; while the other is so cheap, that it will yield a scent of myrrh and aromatic virtues, or human bodies preserved without the use of Granada. seated on the declivity of a hill, at the bottom of which runs a river. *W. Long.* 4. 13. N. Lat. 48. 15.

This city was anciently famous for a victory gained by Caesar over the two sons of Pompey, who had collected an army in Spain after the defeat of their father at Pharsalia. See [History of] Rome.

The Pompeys posted their army advantageously on a rising ground, where one side was defended by the city of Munda, and the other by a small river which watered the plain, and by a marsh; so that the enemy could not attack them but in front. Caesar likewise drew up his troops with great art, and having advanced a little way from his camp, ordered them to halt, expecting the enemy would abandon the advantageous post, and come to meet him. But as they did not stir, Caesar made as if he intended to fortify himself in that post; which induced the young general, who looked upon this as a sign of fear, to advance into the plain, and attack the enemy before they could secure themselves with any works. Pompey’s army was by far the most numerous; for it consisted of 13 legions, 6000 horse, and an incredible number of auxiliaries, among whom were all the forces of Bocchus king of Mauritania, commanded by his two sons, both youths of great valour and bravery. Caesar had 80 cohorts, three legions, to wit, the third, the fifth, and the tenth, and a body of 8000 horse. As the enemy drew near, Caesar betrayed a great deal of uneasiness and concern, as if he were doubtful of the success, knowing he was to engage men no way inferior in valour and experience to his own, and commanded by officers who had on many occasions given signal proofs of their bravery and conduct. Cneius, the elder of the two brothers, was generally looked upon as an able commander; and Labienus, who had revolted, esteemed scarce inferior to himself.

However, the dictator, desirous to put an end to the civil war, either by his own death or that of his rivals, gave the signal for the battle, and fell upon the enemy with his usual vigour and resolution. At the first onset, which was dreadful, the auxiliaries on both sides betook themselves to flight, leaving the Romans to decide their quarrel by themselves. Then the legionaries engaged with a fury hardly to be expressed; Caesar’s men being encouraged by the hopes of putting an end to all their labours by this battle, and those of Pompey exerting themselves out of necessity and despair, since most of them expected no quarter, as having been formerly pardoned. Never was victory more obstinately disputed. Caesar’s men, who had been always used to conquer, found themselves so vigorously charged by the enemy’s legionaries, that they began to give ground; and though they did not turn their backs, yet it was manifest that shame alone kept them in their posts. All authors agree, that Caesar had never been in so great danger; and he himself, when he came back to his camp, told his friends, that he had often fought for victory, but this was the first time he had ever fought for life. Thinking himself abandon-
ed by fortune, which had hitherto favoured him, he had some thoughts of flaying himself with his own sword, and by a voluntary death preventing the disgrace of a defeat; but returning to himself, and concluding it would be more to his reputation to fall by the enemy's hand at the head of his troops, than, in a fit of despair, by his own, he dismounted from his horse, and matching a buckler from one of his legionaries, he threw himself like a man in despair into the midst of the enemy; crying out to his men, Are you not ashamed to deliver your general into the hands of boys? At these words, the soldiers of the tenth legion, animated by the example of their general, fell upon the enemy with fresh vigour, and made a dreadful havoc of them. But in spite of their utmost efforts, Pompey's men still kept their ground, and though greatly fatigued, returned to the charge with equal vigour. Then the Cœlarians began to despair of victory; and the dictator, running through the ranks of his disheartened legionaries, had much ado to keep them together. The battle had already lasted from the rising to the setting of the sun, without any considerable advantage on either side.

At length a mere accident decided the dispute in favour of the dictator. Bogud, a petty, king of Mauritania, had joined Cæsar soon after his arrival in Spain, with some squadrons of Numidian horse; but, in the very beginning of the battle, being terrified at the shouting of the soldiers, intermingled with groans, and the clashing of their arms, he had abandoned his post, and retired with the auxiliaries under his command to a rising ground at a small distance from the enemy's camp. There he continued the whole day an idle spectator of the battle that was fought in the plain. But towards the evening, partly out of compassion for his friend Cæsar, he resolved to fall upon Pompey's camp; and accordingly flew thither with all the forces he had with him. Labienus, apprised of his design, hastened after him to the defence of the camp; which Cæsar observing, cried to his legionaries, Courage, fellow-soldiers! the victory at length is ours; Labienus lives. This artifice had the desired effect: Cæsar's men, believing that Labienus was truly fled, made a loud effort, and charged the wing he commanded so briskly, that after a short and obstinate dispute they put them to flight.

Though the enemy's left wing was thus entirely defeated, the right wing, where the elder Pompey commanded, still kept their ground for some time. Pompey dismounting from his horse fought on foot like a private man in the first line, till most of his legionaries being killed, he was forced to save himself by flight from falling into the enemy's hands. Part of his troops fled back to their camp, and part took shelter in the city of Munda. The camp was immediately attacked, and taken sword in hand; and as for the city, Cæsar, without loss of time, drew a line of circumvallation round it. This victory was gained on the 16th of the kalends of April, i.e. according to our way of counting, on the 17th day of March, when the Dionysian festival, or the Liberalia, were celebrated at Rome; the very day, as Plutarch observes, in which Pompey the Great, four years before, had set out for the war. In this action Pompey lost 30,000 men; among whom were the famous Labienus, Attius Varus, and 3000 Roman knights. Seventeen officers of distinction were taken, and all the enemy's eagles and ensigns, together with Pompey's standards, which he had assumed as governor of Spain. On Cæsar's side only 1000 men were killed and 500 wounded.

MUNDIC, of Marcus. See Marcus.

MUNDINGOES, the name of a people who live on the sides of the river Gambia in Africa, and who are of a jet black colour, strong, and well made. They have a priest set over every year from one of the Cape de Verde islands to christen and marry.

MUNDUS PATES, the open world. In Roman antiquity, a solemnity performed in a small temple, of a round form like the world, dedicated to Divus and the rest of the infernal gods. This temple was opened but three times in the year, viz. the 24th of August, the 4th of October, and the 7th of November. During these days, the Romans believed hell was open; on those days therefore they never offered battle, killed soldiers, put out to sea, or married.

MUNICH, a town of Germany, capital of the whole duchy of Bavaria, and the residence of the elector. It stands on the Iper, 70 miles south of Ratibon and 214 miles west of Vienna, being one of the most pleasant and populous cities of Germany for its bigness. The number of the inhabitants is said to be about 40,000. Having been built at first on a spot of ground belonging to a convent, it had from thence in German the name of Munchen, i.e. Münchstäd, and a monk for its arms. The elector's palace here is a very grand structure, consisting of several courts, furnished and adorned in the most magnificent manner, with tapestry, gilding, sculpture, statues, and paintings. It contains an amazing collection of jewels, antiquities, and curiosities. The great hall is 118 feet long and 52 broad; and the stair-case leading to it, from top to bottom, of Marble and gold. In the hall of antiquities are 354 busts and statues of Jasper and porphyry, brats and marble. In this palace also is a library, containing a vast collection of books, and many valuable manuscripts, in most languages, ancient and modern; and a chamber of rarities, among which is the picture of a brave or affidim, who is said to have committed 345 murders with his own hand, and to have been accomplice in or privy to 400 more. The treasury in the chapel contains also a vast number of pictures, precious stones, medals, vessels of gold and silver, &c. Among other curiosities, here is a cherry-stone with 140 heads distinctly engraved upon it. The gardens of the palace are also very fine, and it is said a secret passage leads from it to all the churches and convents in the town. There is a great number of other fine buildings in this city, public and private, particularly the riding-house, town-house, opera-room, the Jesuits' college, the large edifice for tournaments, the churches, convents, &c. Its manufactures are those of silk, particularly velvet, wooden cloths, and tapestry; and it has two annual fairs, at which great quantities of salt, wine, &c. are sold. The streets are broad and regular; and most of the houses well built, and painted on the outside. The market place is extremely beautiful. Not far from Munich are four other palaces, with fine gardens, belonging to the elector, e.g. those of Stuhlheim, Nymphenburg, Dachau, and Starnberg. The first and last
MUNICH (Count de), was the favourite of the Czarina Anna, and was concerned in all the events of her reign. Being appointed general of her armies, he gained great advantages over the Crim Tartars, beat the Turks, A.D. 1739, in an engagement near Chocim, and took that city together with Jaffi the capital of Moldavia. He was afterwards prime minister to the Czar Ivan VI., but in a short time after he was accused of employing the power which his office conferred on him to gratify his own ambition and private resentment. The Empress Elisabeth brought him to trial, and he was condemned to lose his life A.D. 1742. This sentence was mitigated to banishment into Siberia, whither many of the victims of his power had been exiled. He was recalled by Peter III. A.D. 1762, and declared field-marshall. Upon the death of this prince, the Empress Catharine II. appointed him director-general of the ports of the Baltic. He died on the 8th of October 1767, at the age of 84.

MUNICIPAL, in the Roman civil law, an epithet which signified invested with the rights and privileges of Roman citizens. See MUNICIPIUM.

Municipal, among us, is applied to the laws that obtain in any particular city or province. And those are called municipal officers who are elected to defend the interests of cities, to maintain their rights and privileges, and to preserve order and harmony among the citizens; such as mayors, sheriffs, consuls, &c.

MUNICIPES, an appellation given by the Romans to the inhabitants of the municipal cities. See MUNICIPIUM.

MUNICIPIUM, in Roman antiquity, a corporation, a body of freemen, or enfranchised city or town, where the inhabitants enjoyed their own laws and customs, and at the same time were honoured with the privileges of Roman citizens; but then this privilege generally reached no farther than the bare title. Some indeed, by particular merit, obtained the liberty of votes, which occasioned that distinction of munici pium sine suffragio, and munici pium cum suffragio — The inhabitants of the municipium sine suffragio were called simply Romans, but those of the municipium cum suffragio were called ci vites Romanis.

The difference between proper citizens of Rome and the inhabitants of the municipia may be thus expressed. The proper citizens of Rome were, 1. Registered in the census; 2. Had the right of suffrage and of bearing honours; 3. Were assembled in the people; 4. Served in the legions; 5. Used the Roman laws and religion; 6. Were called Quiris et populus Romanus. Whereas the municipals enjoyed the three first of these privileges but were denied the last. MUNITION, the provisions with which a place is furnished in order for defence, or which follows a camp for its subsistence.

Munsters, are those that have store on board in order to supply a fleet of men of war at sea. In an engagement, all the munition-ships and victuallers attending the fleet take their station in the rear of all the rest, they are not to engage in the fight, but to attend to such directions as are sent them by the admiral.

MUNSTER (Sebastion), a learned writer, was born at Ingleheim, and became a Cordelier; but having embraced Luther's sentiments, he quitted that order in 1529, and retired to Heidelberg, and afterwards to Basle, where he taught with reputation. He was a man of great candour, and void of ambition; and was so well skilful in geography, the mathematics, and the Hebrew tongue, that he was furnished the Ezras and the Strabo of Germany. His Latin translation of the bible is esteemed. He was the first who wrote a Chaldee grammar and lexicon; he also published a treatise on chorography, and several other works. He died of the plague at Basle in 1552, aged 63.

MUNSTER, in Latin Munomia, and in Irish Mun, the most easterly province of Ireland; bounded on the north by Leinster and Connaught, and on the east, west, and south by the ocean. It contains the counties Cork, Clare, Kerry, Limerick, Tipperary, and Waterford; and 3,289,932 Irish plantation acres, 740 parishes, 66 baronies, and 26 boroughs. It is about 125 miles long, and 120 broad: and its principal town is Cork. Its ancient name was Munibhan; and in latter ages it was divided into Desmond or south Munster, Ormond or east Munster, and Thomond or north Munster. It lies between 51. 15. and 53. 0. N. Lat. and 7. 10. to 10. 30. W. Long.

MUNSTER, a territory of Germany, in the circle of Westphalia; bounded on the north by Emden and Oldenburg, on the fourth by the counties of Mark and duchy of Weftphalia, on the west by the county of Bentheim and the United provinces, and on the east by the bishoprics of Osnaburg and Paderborn together with the county of Ravensberg. It is the largest of all the Westphalian bishoprics, being in length about 80 miles, and in breadth from 20 to 60. It is divided into 13 bailiwicks; and though in general but a barren country, has some fruitful plains, with woods, and quarries of stone. The inhabitants, excepting a few of the nobility and gentry, are all Roman Catholics; though Lutheranism had once a considerable footing here. The bishop, who is generally also elector of Cologne, has a revenue from hence of about 70,000 pounds, and can maintain 8000 men. In consequence of an unjust eulom, unknown in the rest of the empire, he is heir to all strangers who die in the country without children. In the matricula he is rated at 50 foot and 118 horse; or 832 florins monthly in lieu of them. His chapter consists of 40 canons, who are all noble.

MUNSTER, a city of Germany, capital of a bishopric of the same name and of all Westphalia, stands at the conflux of the river Aa with the Em, in E. Long. 7. 49. N. Lat. 52. 0. It is of a circular form, large, and well fortified both by nature and art. It has a fine citadel called the Brille, erected by a bishop named Berraud van Galen in order to awe the burghers. The dean and chapter now elect the bishop; but till the beginning of the 15th century he was nominated by the emperor. This city has been rendered famous by three remarkable transactions. 1. By the peace concluded here 1648, which put an end to a war of 30 years, occasioned by the perfecting spirit of bigotry and papists, who chose rather to plunge their country into all the calamities of war than allow liberty of conscience to the Protestants. By this peace, however,
Manychia ever, they contended, much against their inclination to grant them a toleration. 2. By the disorders and disturbances occasioned here in 1553, by a parcel of enthusiasts, headed by a tailor called John of Leyden from the place of his birth, who turned out the magistrates, and took possession of the city, where they perpetrated the most horrid villanies and cruelties. 3. For the noble, though unsuccessful, efforts it made in defence of its liberties against the tyranny and usurpation of the above-mentioned turbulent and bloody-minded bishop, Bernard van Galen. In this city are a great number of convents and other religious houses, many of them lately piles, and surrounded with beautiful gardens.

MUNYCHIA, or Manychus Porus (anc. geog.), a village and port of Athens, nearer to the city, than, and fortified in the same manner with the Piraeus, to the east of which it lay, or between it and the promontory Sunium, at the mouth of the Ilissus. Strabo says it was an eminence in form of a peninsular, at the foot of which stood three harbours, anciently encompassed with a wall, taking within its extent the Piraeus and other harbours, full of docks, with the temple of Diana, Manychion; taking its name from Manychus, the founder of the temple. Manychus, an anniversary solemnity observed at Athens in honour of Diana, on the 16th of the month Manychion. Cakes were offered on the occasion called MUNYCHION.

MUNYCHION, the tenth month of the Athenian year, containing 29 days, and answering to the latter part of our March and the beginning of April. It was so called from the festival Manychion, which was observed in this month. See Month and MUNYCHIA.

MUPHTGI. See MUFF。

MURÆNA, or Eel, in ichthyology; a genus of fishes, belonging to the order of apodes. The head is smooth; there are ten rays in the membrane of the gills; the eyes are covered with a common skin: and the body is cylindrical and slimy. There are seven species, distinguished by their fins, tails, &c. The most remarkable are,

1. The anguilla, or common eel, is very frequent in most fresh waters, ponds, ditches, and rivers: according to Mr Pennant, it is the most universal of fish; yet is scarce ever found in the Danube, though very common in the lakes and rivers of Upper Austria.

The eel is very singular in many things relating to its natural history, and in some respects borders on the nature of the reptile tribe. It is known to quit its element, and during night to wander along the meadows, not only in order to change its habitation but also for the sake of prey, feeding on fish, as it passes along. During winter it beds itself deep in the mud, and continues in a hibernation, during which it is known to quit the mud, and continues in a hibernation, during which it is known to quit the mud, and continues in a hibernation, during which it is known to quit the mud, and continues in a hibernation, during which it is known to quit

Eels are extremely voracious, and destructive to the fry of others. No fish lives so long out of water as the eel; and it is so extremely tenacious of life, that its parts will move a considerable time after they are flayed and cut to pieces. They vary much in their colour, from a fomber brown to a light olive green; and those which are called pilchard eels have their bellies white, and a remarkable clearness throughout. Besides these, there is a variety of this fish known in the river Thames by the name of grigs, and about Oxford by that of grigs or golt. These are scarce ever seen near Oxford in the winter; but appear in spring, and bite readily at the hook, which common eels in that neighbourhood will not. They have a larger head, a blunter nose, thicker skin, and fewer, than the common eel; neither are they so much esteemed, nor do they often exceed three or four pounds in weight.—Common eels grow to a large size, sometimes weighing 15 or 20 pounds; but that is extremely rare. Mr Dale indeed, in the Phi opological Transactions, and some others, bring instances of eels much exceeding that size; but Mr Pennant suspects them to have been congers, since the enormous fish they describe have all been taken at the mouths of the Thames or Medway. The Romans believed eels cheap, probably on account of their likeness to snakes. On the contrary, the luxurious Sybarites were so fond of these fish, as to exempt from tribute of every kind persons who sold them.

There is scarce any animal the generation of which has puzzled the learned more than this. Ariosto first broached an opinion that eels were of no sex, nor did propagate their species like other animals, but were unequivocally gendered of the mud; and as wild and aburd a system as this is, there have not been wanting many, even in these latter and more enlightened times, who have given into it. But there is now no room to doubt that all animals are produced by the copulation of parents like themselves; and the several sexes may be discovered on a comparison of the parts, and of the young. Dr Plot, and many others, have given accounts of whole droves of them leaving one ditch or pond to go to another.

Though the learned world at this time generally allows that eels are produced like other animals' by parents of their own kind, yet there remain many doubts about the manner in which the generation is performed. Some allow the eels to be, like the generality of other animals, of different sexes in the different individual's; and others affirm that they are all hermaphrodites, each having the parts of generation of both sexes. Rondeletius affirms that they are of both sexes; and Mr Allen, who has given a very curious paper concerning them in the Philosophical Transactions, is of the same opinion; and both say, that the parts of the sexes may be discovered on a careful inspection; and some are found to be males, and others females; but those parts are, in both sexes they say, buried in a large quantity of fat; and they are of opinion, that hence proceeded the mistake of Ariosto and his followers, who, not being able to find those parts, concluded that they did not exist at all. Among those who allow the eel to be produced, like other animals, from animal-parents which have the sexes, some are of opinion that they are viviparous, and;
and others that they are oripitous; but Mr. Chart-Teed seems to have determined this controversy by observing, that if the aperture under the belly of the eel, which looks red in the month of May, be cut open at that time, the young eels will be seen to come forth alive after the operation. Mr. Lewen-hore, says, that he found an uterus in every eel he examined; and therefore concludes that they are hermaphrodites; and he supposes that they have no male parts of generation like those of other animals; but that the office of these is performed by a liquor analogous to the male seed of animals, which is contained in certain glands, situated in the inside of the uterus itself.

Eels have sometimes been met with in recent ponds, made at such a distance from any other water that we cannot reasonably suppose them to have migrated thither over land. But in these cases there is reason to believe, that the ponds have been supplied with them by the aquatic fowls of prey, in the same manner as vegetation is spread by many of the land-birds, either by being dropped, as they carry them, to feed on their young, or by passing quick through their bodies, as is the case with herons.

2. The conger, or conger-eel, grows to a vast size. Dr. Borrach informs us, that they are sometimes taken near Mount’s bay of 100 lb. weight; and Mr. Pennant affures us, that he has heard of some taken near Scarborough that were 10 feet and a half long, and 18 inches in circumference in the thickest part. They differ from the common eel in the following particulars: 1. Their colour in general is more dark. 2. Their eyes much larger in proportion. 3. The irides of a bright silvery colour. 4. The lower jaw is rather shorter than the upper. 5. The infide-line is broad, whitish, and marked with a row of small spots. 6. The edges of the dorsal and anal fins are black. 7. They have more bones than the common eel, especially along the back quite to the head. 8. They grow to a much larger size.

Congers are extremely voracious, preying on other fish, and on crabs at the time they have lost their shell, and are in a soft state. They and eels in general are also particularly fond of carcasses of any kind, being frequently found lodged in such as are accidentally taken up.

The conger eels probably generate like the fresh-water species. Innumerable quantities of what are supposed to be their fry come up the Severn about the month of April, preceding the shads, which it is conjectured migrate into that river to feed on them; they are called eelers. They swarm during their season, and are taken in a kind of sieve made of hair-cloth fixed to a long pole; the fisherman standing on the edge of the water during the tide, puts in his net as far as he can reach, and drawing it out again, takes multitudes at every sweep, and will take as many during one tide as will fill a bannel. They are dried, and reckoned very delicate.

These fish are an article of commerce in Cornwall; numbers are taken on that coast, and exported to Spain and Portugal, particularly to Barcelona. Some are taken by a single hook and line, but (because that way is tedious, and does not answer the expense of time and labour) they are chiefly caught by baits, which are strong lines 500 feet long, with 60 hooks, each eight feet distance, baited with pick-licks or mud-balls; the baits are fixed to the ground by a stone fastened to them: sometimes such a number of these are tied together as to reach a mile. The fishermen are very fearful of a large conger, lest it should endanger their legs by clinging round them: they therefore kill them as soon as possible by striking them on the navel. They are afterwards cured in this manner: They are flit, and hung on a frame till they dry, having a considerable quantity of salt, which it is necessary should exude before they are fit for use. It is remarkable that a conger of 100 weight will walk by drying to 24 lb.; the people therefore prefer the smallest, possibly because they are soonest cured. During the proceeds there is a considerable fetch; and it is said that in the fishing villages the poultry are fed with the maggots that drop from the fish. The Portuguese and Spaniards use those dried eels after they have been ground into a powder, to thicken and give a relish to their soups. They are sold for about 40 brilliantings the quintal, which weighs 125 lb. A fishery of congers, says Mr. Pennant, would be of great advantage to the inhabitants of the Hebrides. Perhaps they would at first undertake it with repugnancy, from their abhorred aversion to the eel kind.

3. The firen, or mud niguana, a singular animal, first observed by Dr. Garden of Charlestown, and afterwards described by Mr. Ellis in the Philosophical Transactions for 1766. It has gills, fins, and two feet; and is in length from 31 to 40 inches. It is an inhabitant of South Carolina, where it is found in swampy and muddy places, by the sides of pools, and under the trunks of old trees that hang over the water, and feeds on serpents. The feet appear like little arms and hands, each furnished with four fingers, and each finger with a claw. "The head is something like an eel, but more compressed; the eyes are small and placed as those of the eel are. This smallness of the eye befits suits an animal that lives so much in mud. The nostrils are very plainly to be distinguished: these, with the gills, and remarkable length of the lungs, show it to be a true amphibious animal." The mouth is small in proportion to the length of the body, but its palate and infide of the lower jaw are well provided with many rows of pointed teeth; with this provision of nature, added to the sharp exterior bony edges of both the upper and under jaw, the animal seems capable of biting and grinding the hardest kind of food. The skin, which is black and full of small scales, resembles shagreen. These scales are of different sizes and shapes, according to their situation; but all appear sunk into its gelatinous surface; those along the back and belly are of an oblong oval form, and close set together; in the other parts they are round, and more distinct. Both the parts are mottled with small white spots, and have two distinct lines composed of small white streaks continued along from the feet to the tail. The fin of the tail has no rays, and is no more than an adipose membrane like that of the eel.

Dr. Garden, in a letter to Mr. Ellis, mentions a remarkable property of this animal, which is, that his servant endeavouring to kill one of them by dashing it
it against the stones, it broke into three or four pieces. Linnaeus, from the descriptions sent him, made it a new genus named Syren, of a new order Meantes, of the class amphibia. But from this class both the order Meantes and that of Montier have been lately expunged; and Gmelin has reduced the syren to a species of the present genus. Its place here, however, seems still of doubtful propriety; as Gmelin himself acknowledges in the Preface to his edition of the Systema Nature. For Camper, having lately had an opportunity to dissect the syren, has discovered, that on each side of the head it is furnished with three true gills, separated from each other by membranes having tooth-like appendages; that the mouth is armed with strong and firmly planted teeth; that the heart has only one ventricle; and that the abdomen is filled with very long and capacious intestines. From all these circumstances, he concludes, that this animal ought to be considered as a fith of the order Branchiopodei—while in other respects it is more nearly allied to the genus Murana, of the order Apodes; although it differs materially from the other species of that genus, by having only three notched bones in the gills, and from the pectoral fins being each divided into four finger-like appendages.

Mural, something belonging to a wall; which the Latins call murus, Mural-Crown, among the ancient Romans. See Crown.

Mural-Arch, is a wall, or walled arch, placed exactly in the plane of the meridian, i.e., upon the meridian line, for the fixing of a large quadrant, sextant, or other instrument, to observe the meridian altitudes, &c. of the heavenly bodies.

Tycho Brahe was the first who used a mural arch in his observations; after him Hevelius, Mr Flamsteed, De la Hire, &c. used the same means. See Astronomy.

Muralt (N—de), a native of Switzerland, travelled through a great part of Europe with the views of a philosopher. He published a collection of Lettres sur les Franños et sur les Anglais, 12mo, 2 vols. 1726, which met with great success, though they are written in a vague and superficial manner. Some other works which he published are below mediocrity. He died about the year 1750.

Murent (Emanuel), a much admired landscape painter, was born at Amsterdam in 1622. He had the happiness to be a disciple of Philip van Wouwermans, from whom he acquired that warmth and brilliancy of colouring, and that exquisite pencil, which have rendered him deservedly eminent. His subjects were views in Holland, villages, towns, cities, ruins of houses, and decayed castles; all of them exactly sketched after nature, and so exquisitely finished, that every minute part of a building was perfectly decipherable, and even every particular stone or brick might be counted by the assistance of a convex glass. But this demanded so much patience and time; that it was impossible for him to paint many pictures, and on that account they are exceedingly scarce, and sold for high prices as much place them out of the reach of all ordinary purchasers. He died in 1705.


Vol. XII. labria Citra, at the springs of the Sybaris, midway between the Sinus Tarentinus to the east, and the Tau-

can sea to the west. Supposed to have arisen from the ruins of Syphium, a town of the Bruttii mentioned by Livy.

Muratori (Lewis Anthony), a learned and celebrated Italian writer, born at Vignoles, in the territory of Bologna, in 1672. He early discovered an extreme fondness for the learned languages and sciences; and this was seconded by an excellent education. After having completed his first studies, he embraced the state of an ecclesiastic; and applied himself to polite literature, philosophy, theology, civil law, antiquities, and other sciences; by which means he became in a manner universally learned. He was scarcely 22 years of age when he was made librarian of the Ambrosian library at Milan. In 1700 the duke of Modena, his sovereign recalled him, and made him his librarian, and keeper of the archives of his duchy. Muratori discharged this double employment during the rest of his life, and had no other benefit than the provostship of Santa Maria del Pomposa. He acquired the esteem of the learned throughout Europe, who had recourse to him for the lights they wanted. He became an associate to the Academies of the Arcades of Rome, Della Crusca, and Colombaia of Florence, the Academy of Etruria at Corona, the Royal Society of London, and of the Imperial Academy of Olmutz; and died in 1750. He wrote a great number of learned works; the principal of which are—

Murcita, the pagan goddess of idyls. The name is taken from murus or murculus, an oblong word, signifying a dull, slothful, or lazy person. The statues of this goddess were always covered with dust and moss, to express her idleness and negligence. She had a temple in Rome at the foot of the Aventine mount.

Murcia, a kingdom in Spain, bounded on the north by the Castile, on the east by the kingdom of Valencia, on the west by Andalusia and Granada, and on the south by the Mediterranean Sea. It is about 62 miles in length, and 58 in breadth; and its principal river is Segura. The soil is dry, because it seldom rains, and therefore it produces little corn or wine; but there is plenty of oranges, citrons, lemons, olives, almonds, mulberries, rice, pulses, and sugar. It has also a great deal of silk. It was taken from the Moors in 1265. The air is very healthful.

Murcia, a large handomme, and populous town of Spain, capital of a kingdom of the same name. It is a bishop's see, and contains six parishes. The cathedral is a most superb edifice, with the turrets of the steeples so contrived that a man may ride up to the top,
MURDER, or MURDER, the act of killing another with violence and injustice. The word comes from the Saxon mordran “death,” which some will have to signify a violent death; whence the barbarous Latin mordrum and mordrum.

Among the number of popular errors, is the notion which has obtained, that the dead body would bleed in the presence or upon the touch of the murderer.

The crime of murder is punished with death in almost all nations.

Murder, or Murder, in law, is thus defined or rather described, by Sir Edward Coke: “When a person, of sound memory or discretion, unlawfully killeth any reasonable creature in being, and under the king’s peace, with malware aforethought, either express or implied.” The best way of examining the nature of this crime will be by considering the several branches of this definition.

1. It must be committed by a person of sound memory and discretion; for lunatics or infants are incapable of committing any crime; unless in such cases where they throw a conciousness of doing wrong, and of course a discretion or discernment between good and evil.

2. Next, it happens when a person of such sound discretion unlawfully killeth. The unlawfulness arises from the killing without warrant or excuse; and there must also be an actual killing to constitute murder; for a bare assault, with intent to kill, is only a great misdemeanor, though formerly it was held to be murder. The killing may be by poisoning, striking, starving, drowning, and a thousand other forms of death, by which human nature may be overcome. Of these the most detestable is all poison; because it can of all others be the least prevented, either by manhood or forethought. And therefore, by the stat. 2 Hen. VIII. c. 9., it was made treason, and a more grievous and lingering kind of death was inflicted on it than the common law allowed; namely, boiling to death; but this act did not live long, being repelled by Edw. VI. c. 12.

3. There was also by the ancient common law, one species of killing held to be murder, which may be dubious at this day, as there hath not been an instance wherein it hath been held to be murder for many ages past, viz. bearing false witness against another, with an express premeditated design to take away his life, so as the innocent person be condemned and executed. The Gothic laws punished in this case both the judge, the witnese, and the protactor; and, among the Romans, the lex Cornelia de faccaris, punished the false witnese with death, as being guilty of a species of affasination. And there is no doubt but this is equally murder in foro consciente as killing with a sword; though the modern law (to avoid the danger of deterring witnesses from giving evidence upon capital prosecutions, if it must be at the peril of their own lives) has not yet punished it as such. If a man, however, does such an act, of which the probable consequence may be and eventually is, death; such killing may be murder, although no stroke be struck by himself, and no killing may be primarily intended: as was the case of the unnatural son who exposed his sick father to the air against his will, by reason whereof he died; and of the harlot, who laid her child under leaves in an orchard, where a kite struck it and killed it. So too, if a man hath a beast that is tamed to do mischief; and he, knowing it, suffers it to go abroad, and it kills a man; even this is manslaughter in the owner; but if he had purposely turned it loose, though barely to frighten people and make what is called sport, it is with us (as in the Jewish law) as much murder as if he had incited a bear or a dog to worry them.

If a physician or surgeon gives his patient a potion or platter to cure him, which, contrary to expectation kills him, this is neither murder nor manslaughter, but misadventure; and he shall not be punished criminally, however liable he might formerly have been to a civil action for neglect or ignorance; but it hath been held, that if it be not a regular physician or surgeon who administers the medicine, or performs the operation, it is manslaughter at the least. Yet Sir Matthew Hale very justly questions the law of this determination; since physic and salves were in use before licensed physicians and surgeons; wherefore he treats this doctrine as apocryphal, and fitted only to gratify and flatter licentiates and doctors in physic; though it may be of use to make people cautious and wary how they meddle too much in so dangerous an employment. In order also to make the killing murder, it is requisite that the party die within a year and a day after the stroke received, or cause of death administered; in the computation of which the whole day upon which the hurt was done shall be reckoned the first.

3. Farther: The person killed must be “a reasonable creature in being, and under the king’s peace,” at the time of the killing. Therefore to kill an alien, a Jew, or an outlaw, who are all under the king’s peace or protection, is as much murder as to kill the most regular-born Englishman; except he be an alien enemy, in time of war. To kill a child in its mother’s womb, is now no murder, but a great misprision: but if the child be born alive, and dieth by reason of the potion or bruises it received in the womb, it seems, by the better opinion, to be murder in such as administered or gave them. As to the murder of bastard children, see Bastard.

4. Lastly, the killing must be committed “with male cereafothught,” to make it the crime of murder. This is the grand criterion which now distinguishes murder from other killing; and this malice prepara maliitia praecognitata, is not so properly fithe or malevolence to the deceased in particular, as any evil design in general; the dictate of a wicked, depraved, and malignant heart; un disposition a faire un mal choie; and it may be either express, or implied, in law. Express malice is when one, with a sedate deliberate mind and formed design, doth kill another: which formed design is evidenced by external circumstances discovering that inward intention; as lying in wait, antecedent menaces, former grudges, and concerted schemes to do him some bodily-harm. This takes in the case of deliberate dueling, where both parties meet avowedly with an intend to murder: thinking it their duty, as gentlemen, and claiming it as their right, to wanton with
Murder, with their own lives and those of their fellow-creatures; without any warrant or authority from any power either divine or human, but in direct contradiction to the laws both of God and man: and therefore the law has justly fixed the crime and punishment of murder on them, and on their seconds also. Yet it requires such a degree of pugilistic valour to combat the dread of even unmerited contempt, arising from the false notions of honour too generally received in Europe, that the strongest prohibitions and penalties of the law will never be entirely effectual to eradicate this unhappy custom, till a method be found out of compelling the original aggressor to make some other satisfaction to the affronted party, which the world shall esteem equally reputable as that which is now given at the hazard of the life and fortune, as well of the person insulted, as of him who hath given the insult. Also, if ever upon a sudden provoked one beats another, in a cruel and unusual manner, so that he dies, though he did not intend his death, yet he is guilty of murder by express malice; i.e. by an express evil design, the genuine sine of malitia. As when a park-keeper tied a boy that was feeding wood to a horse's tail, and dragged him along the park; when a jailer corrected his tenant with an iron bar, and a schoolmaster dashed on his scholar's belly, so that each of the sufferers died; these were justly held to be murders, because the correction being excessive, and such as could not proceed but from a bad heart, it was equivalent to a deliberate act of slaughter. Neither shall he be guilty of a lefs crime who kills another in consequence of such a wilful act as shows him to be an enemy to all mankind in general; as going deliberately, and with an intent to do mischief, upon a horse used to strike, or coolly discharging a gun among a multitude of people. So if a man resolves to kill the next man he meets, and does kill him, it is murder, although he knew him not; for this is universal malice. And if two or more come together to do an unlawful act against the king's peace, of which the probable consequence might be bloodshed; as to beat a man, to commit a riot, or to rob a park, and one of them kills a man; it is murder in them all, because of the unlawful act, the malitia praecognitae, or evil intended beforehand.

Also in many cases where no malice is expressed, the law will imply it: as, where a man wilfully poisons another, in such a deliberate act the law presumes malice, though no particular enmity can be proved. And if a man kills another suddenly, without any or without a considerable provocation, the law implies malice; for no person, unless of an abandoned heart, would be guilty of such an act upon a flight or no apparent cause. No assault before, by words of gaffes only, is a sufficient provocation, so as to excuse or extenuate such acts of violence as manifestly endanger the life of another. But if the person so provoked had unfortunately killed the other, by beating him in such a manner as showed only an intent to chastise and not to kill him, the law so far considers the provocation of contumelious behaviour, as to adjudge it ony manslaughter, and not murder. In like manner, if one kills an officer of justice, either civil or criminal, in the execution of his duty, or any of his auxiliaries endeavouring to preserve the peace, or any private person foreseeing to suppress an affray or apprehend a felon, knowing his authority or the intention with which he interposes, the law will imply malice, and the killer shall be guilty of murder. And if one intends to do another felony, and undesignedly kills a man, this is also murder. Thus if one shoots at A, and misses him, but kills B, this is murder; because of the previous felonious intent, which the law transfers from one to the other. The same is the case, where one lays poison for A, and B, against whom the prisoner had no malicious intent, takes it, and it kills him, this is likewise murder. So also if one gives a woman with child a medicine to procure abortion, and it operates so violently as to kill the woman, this is murder in the person who gave it. It were endless to go through all the cases of homicide, which have been adjudged, either expressly or impliedly, malicious; these therefore may suffice as a specimen; and we may take it for a general rule, that all homicide is malicious, and of course amounts to murder, unless where justified by the command or permission of the law; excused on a principle of accident or self-prevention; or alleviated into manslaughter, by being either the involuntary consequence of some act, not strictly lawful, or (if voluntary) occasioned by some sudden and sufficiently violent provocation. And all these circumstances of justification, excuse, or alleviation, it is incumbent upon the prisoner to make out, to the satisfaction of the court and jury: the latter of whom are to decide whether the circumstances alleged are proved to have actually existed; the former, how far they extend to take away or mitigate the guilt. For all homicide is presumed to be malicious, until the contrary appeareth upon evidence.

The punishment of murder, and that of manslaughter, were formerly one and the same; both having the benefit of clergy: so that none but unlearned persons, who knew the guilt of it, were put to death for this enormous crime. But now, by several statutes, the benefit of clergy is taken away from murderers through malice prelence, their abettors, procurers, and connivers. In atrocious cases it was frequently usual for the court to direct the murderer, after execution, to be hung upon a gibbet in chains near the place where the fact was committed; but this was no part of the legal judgment; and the like is still sometimes practised in the case of notorious thieves. This, being quite contrary to the express command of the Mosaic law, seems to have been borrowed from the civil law; which, besides the terror of the example, gives also another reason for this practice, viz. that it is a comfortable sight to the relations and friends of the deceased. But now, in England, it is enacted by statute 25 Geo. II. c. 37, that the judge, before whom any person is found guilty of wilful murder, shall pronounce sentence immediately after conviction, unless he gives cause to postpon it; and shall in passimg sentence direct him to be executed on the next day but one (unless the same shall be Sunday, and then on the Monday following), and that his body be delivered to the surgeons to be dissected and anatomized; and that the judge may direct his body to be afterwards hung in chains, but in nowife to be buried without diffension. And, during the short but awful interval between sentence and execution, the prisoner...
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MURDERERS shall be kept alone, and furnished with only bread and water. But a power is allowed to the judge, upon good and sufficient cause, to reprieve the execution, and relax the other restraints of this act. See farther, PARADIGM, and PETI TEAON.

MURDERERS, or Murdering Piers, in a ship, are small pieces of ordinance, either of brass or iron, which have chambers put in at their breeches. They are used at the bulk-heads of the fore-castle, half-deck, or steerage, in order to clear the deck, on the ship's being boarded by an enemy.

MURENA. See MUREN.

MURENGERS, two officers of great antiquity in the city of Chelten, annually chosen out of the aldermen, to see that the walls are kept in repair, and to receive a certain toll and custom for the maintenance thereof.

MURET (Mark Anthony Francis), in Latin Muretus, was born at Muret, near Limoges, in 1526. He acquired a perfect knowledge of the Greek and Latin tongues without any instructor, and became one of the most learned men of his time. After having taught some time in Provence, he was made a professor at Paris in the same college with Turrebus and Buchanan. In 1554 he went into Italy; and in 1563 was professor of law, philosophy, and history, at Rome, where he died in 1585. His principal works are, 1. Excellent notes on Terence, Horace, Catullus, Tacitus, Cicero, Sallut, Arifotle, Xemophon, &c. 2. Orations. 3. Varie, Lebon, Poemata, Hymni Sacri. 4. Difputationes in Lib. I. Pendiculorum, de Origine Juris, &c. 5. Epitole, Juvenilia Carmina, &c. Most of Muret's works have been printed in the Venice edition of 1737, in 5 vols 8vo.

MUREX, in zoology, a genus of infects belonging to the order of vermns thactaca. This animal is of the shell-kind: the shell consists of one spiral valve, rough, with membraneous furrows; and the aperture terminates in an entire canal, either straight, or somewhat aequiformal. There are 60 species, particularly distinguished by peculiarities in their shells, &c.

From a species of murex was obtained the famous Tyrian dye so much valued by the ancients. This, however, has long been superseded by the use of the cochineal. One of the shells producing the dye was a kind of buccinum; but the finest, or Tyrian purple, was got from the murex. These species of shells are found in various parts of the Mediterranean. Immense heaps of them are to be seen about Tarentum to this day, evincing one place where this precious liquor was extracted. See Plate CCCXXI.

In the accounts of a Spanish philosopher it is mentioned, that on the coasts of Guayaquil and Gaitalina in Peru the murex is also found. The shell which contains it adheres to the rocks that are washed by the sea: it is of the size of a large walnut. The liquor may be extracted two ways; some kill the animal after they have drawn it out of the shell; then perf it with a knife from head to tail; separate from the body the part where the liquor is collected, and throw away the rest. When this operation, after being repeated on several snails, has afforded a certain quantity of fluid, the thread intended to be dyed is dipped in it, and the process is finished. The colour, which is at first of the whiteness of milk, becomes afterwards green, and is not purple till the thread is dry.

Those who disapprove of this method, draw the fish partly out of the shell, and, squeezing it, make it yield a fluid which serves for dying: they repeat this operation four times at different intervals, but always with less success. If they continue it, the fish dies. No colour at present known, says the Abbé Raynal, can be compared to this, either as to lustre, liveliness, or duration. It succeeds better on cotton than wool, linen, or silk.

Murex, a caltrar or iron instrument, with sharp points projecting in every direction, used by the Romans as a defence against the enemy's horse. It was so called, probably, because the points bore some resemblance to the spines and tubercles with which the shell of the fish murex is surronded.

MURG, or Murgis (anc. geog.), the last town of Bética, next the Tarraconensis: the Urce of Ptolem. Now Murcia, a port-town of Granada, on the Mediterranean. W. Long. 1° 50'. N. Lat. 37° 6'.

MURIA, a very early inclination to painting. He was instructed by his uncle John de Calillo, an artist of some note, whose subjects were fairs and markets; in which style Murillo painted several pictures while he continued with that matter; but his principal knowledge in the art was derived from Velasquez, who directed his studies, and frequently retouched his designs. Many writers affirm, that he studied at Rome, and improved himself excessively in that city. But Velasquez, a Spanish author, affirms that he never was in Italy; but arrived at the excellence he possessed by copying the works of Titian, Rubens, and--Vandyck, which were at Madrid, and the Eucida; and also by studying after the antique statues, which are in the Royal collections. However, he became an excellent painter, and was employed by the king of Spain to execute several historial pictures, which raised his reputation through every province of his own country. Those paintings being afterwards sent to Rome as a present to the pope, the Italians were so much pleased with his performances, that they called him a second Paul Vero-ne. In Spain he desinged and finished several grand altar-pieces, for the churches and convents at Madrid, Seville, Cordova, Cadiz, and Granada; and some of his compositions are in the churches of Flanders. But notwithstanding his genius, taste, and abilities, qualified him to execute subjects of history with general applause; yet his favourite subjects were beggar-boys, as large as life, in different actions and amusements; which he usually designed after nature, and gave them a strong and good expression. His original pictures of those subjects have true merit, and are much esteemed, many of them being admired into the most capital collections of the English nobility; but of these, there are abundance of copies, which, to the dishonour of the artift, are sold as originals to indig:entious purchasers. He died in 1685.

MURREN, or Garle, a contagious disea: among cattle. The symptoms are, a hanging down and
MURAY, a county of Scotland, extending by the coast from the river Spey on the east to Beaula on the west, which is the boundary of the province of Ross. It sends two members to parliament, and is an earldom in a branch of the Stuart family.

According to the account of the reverend Mr Shaw minister of Elgin, in answer to some queries of Mr Pennant, the country produces wheat, barley, oats, rye, peas, and beans. Of these, in plentiful years, upwards of 20,000 bolls are exported, beside serving the county itself and some of the Highland counties. Some hemp is also cultivated, and a great deal of flax; of which linen is made, not only for home-consumption, but a considerable quantity of large-yarn is exported. Great quantities of potatoes are also cultivated. Several hundreds of black cattle are also exported from the Highlands of Murray, but few or none from the Low-lands.—Peculiar to this province is a kind of wood, called red fcaugb, or fallow; which is no less beautiful than mahogany. It is much more firm and tough than mahogany, and resembles the lighter-coloured kind of that wood. It receives a fine polish, but is very scarce, growing on rocks. But there are great forefts of firs and birches, which our author thinks are the remains of the Sylva Caledonia. Here also is found a remarkable root, called by the natives carmelie; it grows in heaths and birch-woods to the bigness of a large nut; and sometimes there are four or five roots joined together by fibres. It has a green stalk and small red flowers. Dido speaking of the Caledonians, says, Curtum cibi genus parent ad omnem, quem si cepantis quantum est unus, habe magnitudinem, minimum e fiere aut forte felimet. Caesar also tells us of a root called chara, which his soldiers mixed with milk and made into bread when in want of provision, which greatly relieved them. This root, Mr Shaw thinks, is the same with the carmelie or sweet root of Murray. He informs us, that he hath often seen it dried, and kept for journeys through hills where no provision was to be had: he has likewise seen it pounded and infused; the liquor makes a more agreeable and wholesome liquor than mead. It grows in such plenty, that a cart-load of it can easily be gathered.

Murray is intersected by the rivers Spey, Loffey, Findern, Nairn, Nefs, and Beaula. The river of Spey, rising on the borders of Lochaber, is more than 60 Scots, or 100 English miles long; but too rapid to be navigable. Upon this river great floats of fir and birch-wood are carried down to the Frith; the float is guided by a man sitting on a corvach. This vesse1 is of an oval shape, about four feet long and three feet broad; a small keel from head to stern; a few ribs cross the keel, and a ring of pliable wood round the lip of it; the whole covered with the rough hide of an ox or horse. The rower sits on a transverse seat in the middle, and holds in his hand a rope, the end of which is tied to the float, and with the other hand he manages a paddle, keeps the float in deep water, and brings it to shore when he pleases. In this province also is Loch Nefs, remarkable for its never freezing. There are many other lakes in this country, of which one called Dundelkock is remarkable in that it is never covered with ice before the month of January; but after that time one night’s strong fruit covers it all over. On the east side of Loch Nefs, a large lake above the loch, is the water-fall of Foher, where the river Feeb-len falls over a steep rock about 80 feet high; and a thick fog rises from the place where it falls, occasioned by the violent dashing of the water. There is a considerable salmon-fishery on the rivers Spey, Findern, Nefs, and Beaula, which serves the towns and country, besides exporting to the value of 12,000 annually.

There are many natural caves in the hills of this country, which formerly were the receptacles of thieves and robbers and now afford shelter to hunters and shepherds in stormy weather. The most remarkable mountain is Carneg.in Strathfarr. In its loft is found a particular kind of bones well known to the lapidaries. They are of blue, green, yellow, and amber colours; some so large as to make snuff-boxes, or small cups; some of hexagonal or pentagonal figures, and tapering to a point at each end. The mountain of Benalar, in Badenoch, is by Mr Shaw reckoned to be the highest land in Scotland, as waters flowing from it fall into the sea at Dundee, Inverlochy, and Garmoch in Murray.

MURHINE, or Murrinh, Murrin, in antiquity an appellation given to a delicate sort of ware brought from the east, whereof cups and vases were made, which added not a little to the splendour of the Roman banquets.

Critics are divided concerning the matter of the potula, or vaia murrhina, murrina, or murrea. Some will have it to have been the same ware with the British porcelain or china-ware.

The generality hold them to have been made of some precious kind of stone, which was found chiefly, as Pliny tells us, in Parthia, but more especially in Carmania. Arrian tells us, that there was a great quantity of them made at Diospolis in Egypt. This he calls another sort of murrhina work; and it is evident, from all accounts that the murrhina of Diospolis was a sort of glafs-ware made in imitation of the porcelain or murrhine of India. There is some difference in the accounts given by Pliny and Martial of the murrhina vaia. The first author says, that they would not bear hot liquors, but that only cold ones were drank out of them. The latter, on the other hand, tells us, that they bore hot liquors very well. If we credit Pliny’s account, their porcelain was much inferior to the Britih in this particular. Some conjecture them to have been of agate, others of onyx, others of coral. Baromius, doubtefully, was farthest out of the way, when he took them to be made of myrrh, congealed and hardened. Some have supposed these vessels to be made of crystal; but this is contrary to the account of all the ancients. The Greeks had the words spelaees for crystal, and eijuses for myrrh, very common among them; and therefore, if these vessels had been made of either...
of these substances, they would in some places have called them smyrna or crystallina. On the contrary, the most correct among them call them murrhina or morrha. The cups made of crystal; which were also in use at these times, were called crystallina, and these murrhina or murrha, by way of keeping up the distinction; and Martial tells us, that the stones were made of was spotted or variegated, calling them pocula maculata murrha. And Statius mentions the crystalline and murrhine cups in the same sentence, but as different things, not the same. Arrian mentions also the stape papyraceus, which his interpreters confuse as an error of the copies, and would alter into myrrha, the name of the gum myrrh.

Pompey is recorded as the first who brought these murrhine vessels out of the east, which he exhibited in his triumph, and dedicated to Jupiter Capitolinus. But private persons were not long without them. So fond, in fact, did the Roman gentry grow of them, that a cup which held three festaries was sold for 70 talents. T. Petronius, before his death, to spite Nero (or as Pliny expressly states, ut menam ejus uncheeret, to disinherit his table), broke a bason, trulla murrhina, valued at 300 talents, on which that emperor had set his heart.

MUS, in zoology: A genus of quadrupeds belonging to the order of Gliridae; the characters of which are these: The upper foreteeth are wedge-shaped; there are three grinders, sometimes, (though rarely) only two, on each side of the jaws; and the clavicles or collar-bones are complete. In the new edition of the Systema Naturae, by Dr. Gmelin, the numerous species of this genus have been distributed into different groups or divisions, distinguished by some particular character common to the individuals of each. —

The first division consists of:

I. Myocastores, or Beaver-rats, the individuals of which have the tail flattened laterally at the end.

1. The cyopus, or webbed beaver-rat, has a thick hairy tail of a moderate length, and the hind feet webbed. It is an inhabitant of Chili, where it frequents the water. It has a strong resemblance, both in colour and shape, to the otter; but is allied to the murine tribes by the number and arrangement of its teeth.

2. The zibethicus, or musk cat, with a long sharp-pointed tail, and the feet not webbed. This has been already described under the article Castor, of which it was ranked as a species in the former editions of Linnaeus. In fact, it does resemble the beaver in the form of the body and flat scaly tail, as well as in its manners and economy. In size, however, and length of tail, it comes nearer to the brown rat; but in its general appearance, and in the short hairy ears, it resembles the water-rat.

II. Murus, or Rats and Mice; having round tails, some naked and some hairy.

1. The piloris, or musk cavy, with a naked tail blunt at the end, and covered with scales. There are two varieties: one with the body of an uniform whitish colour; the other with the upper parts tawny, and the under parts white. The former inhabits Ceylon, and the latter the West Indies. They are nearly of the size of a rabbit: they both burrow in the ground; sometimes infest houses like the rat; and have a strong flavour of musk.

2. The curaco has a naked tail, long, scaly, and somewhat blunt; the body is of a brown grey colour, and the hind feet are very slightly webbed. It inhabits the eastern parts of Siberia, and probably China. —

Tartary and the northern provinces of China; surrouning like the rabbit, near the banks of rivers. — It swims remarkably well, and even infests houses. The body and head are six inches in length, and the tail four and a half.

3. The americanus, or American rat, has a long naked, and scaly tail; the head is long-shaped with a narrow pointed nose, the upper jaw being much longer than the lower; the ears are large and naked. It is larger than the black, and smaller than the brown rat; its colour is of a deep brown, inclining to ash on the belly, and the fur is coarse and harsh. It is probably this species which is said (Kalm's Trav. ii. 48,) to live among the fomes and clefts of rocks, in the blue mountains of Virginia, at a distance from the peopled part of the country, which comes out only at night, and makes a terrible noise.

4. The decumanus, or brown rat, has a long, naked, scaly tail; the upper parts of the body are of a light brown, mixed with a tawny and ash colour, the lower parts dirty white. The head and body measure about nine inches; and the length of the tail, which consists of 200 rings, is seven and a half. The whiskers are larger than the head; and the eyes are large, black, and prominent. The fore-feet have four toes, with a small claw in place of the fifth or thumb. It inhabits India and Persia, and has only been known in Europe in the present century. They dwell in burrows which they dig in the banks of rivers; and frequent towns, aqueducts, drains, and houses, stables, barns, gardens, fields, and houses. They swim and dive with great dexterity; feed on vegetables, grain, fruits, and even destroy poultry; and are hunted eagerly by cats, dogs, and ferrets. They lay up stores of acorns, beech-mast, and other provisions in their holes; in which the males remain during winter, except in fine weather, without hibernating; but the females and their young live mottly in barns and out-houses in that season. They often emigrate from one place to another in great companies. The female produces three times in the year, having 12 or 15, even 18 or 19, at a litter. The bite of this creature is not only fever but dangerous, the wound being immediately attended with great swelling, and is a long time in healing. These animals are so bold as to turn upon those who pursue them, and fasten on the flank or hand of such as offer to strike them. This species is supposed to be the mus caficus of Aelian, which he says was nearly as large as the ichneumon and made periodic visits in vast multitudes to the countries which border on the Caspian, swimming boldly over the rivers, holding by each others tails.

5. The rattus, black or common rat, has an almost naked scaly tail, which is very small, has 350 distinct rings, and is eight inches long. The head and body measure seven inches in length: the upper parts are a deep black grey, and the under parts ash-coloured. There are four toes, and a small claw in place of the fifth, on each fore foot, and five on the hind feet. This species inhabits India, Persia, and Europe except its most northern parts; from hence it has been carried to
of the lever or jaw, they have not much force. But the weasel bites cruelly with the whole jaw; and instead of letting go its hold, sucks the blood from the wounded part, so that the rat is always killed.

The rat was first introduced into America by the Europeans in 1544, and is now the pest of all that continent. In the neighbourhood of the lower parts of the river Volga, there is a small variety of this species found in the deserts, which does not weigh above five or seven drams.

6. The musculus, or common mouse, has a very long, feithy, and almost naked tail; the fore feet have each four toes; the hind feet five, the fifth or thumb having no claw; the hand and body measure three inches and a half in length; the upper parts are tawny, and the lower parts whitish or ash-coloured. This little animal, which inhabits all parts of the world, lives almost entirely in hovves, and follows mankind for the sake of their provisions. It feeds on almost everything, such as grain, bread, cheese, butter, oil, and every kind of food used by mankind, and drinks little; it is of mild and gentle manners, exceedingly timid, and very quick in all its motions. The mouse never issues from his hole but in quest of food, and runs in again upon the least alarm. It does not, like the rat, from house to house, unless forced, and is not near so destructive. It is capable also of being tamed to a certain degree, though not so perfectly as other animals. It has many enemies, from whom it can escape only by its agility and minuteness. Owls, birds of prey, cats, weasels, hedge-hogs, and even rats make war upon the mice, so that they are destroyed by millions; yet the species still subsists by its amazing fecundity. They bring forth at all seasons, and several times in the year; the litter generally consists of five or six; and in less than 15 days the young disperse, and are able to provide for themselves. Aristotle tells us, that having shut up a pregnant mouse in a vessel, along with plenty of grain, he found in a short time after 120 mice, all sprung from the same mother.

Several varieties of mice as to colour are found, some being altogether black, some yellowish, some spotted with white, some of a white colour with ash-coloured spots, and the most beautiful of all, and the least common, are entirely white, with red eyes; but as these agree in every other circumstance, it is unnecessary to describe them more at large.

7. The sylvaticus, or long-tailed field-mouse, is Fig. 6 larger than the common mouse, measuring from the end of the nose to the seting on of the tail four inches and an half, the tail four inches; the upper parts of the body are of a yellowish brown; the breast is yellow, and the belly white: the tail is covered with short hair. The fore feet have four toes each: the hind feet five. These animals are found in fields, gardens, and shrubberies. In some places they are called bean-mice, from the havoc they make among beans when first sown. They feed also on nuts, acorns, and grain, of which they amass quantities, not proportioned to their wants, but to the capacity of the place where it is deposited, insomuch that a single animal will collect more than a bushel. Thus they provide for other animals as well as themselves: the hog comes in for a share, and the great damage done
The fields by these creatures, in rooting up the ground, is chiefly owing to their search after the concealed hoards of the field-mice. M. Buffon informs us, that he has often seen great damage done to the plantations by the field-mice. They carry off the new fawn acorns; by following the fursow of the plough, they dig up one after another, not leaving a single feed. This happens chiefly in those seasons when the acorns are scarce; not finding a sufficient quantity in the woods, they come in quest of them in the cultivated fields, and often carry off such quantities that they corrupt in their magazines. These creatures according to the same author, do more mischief in a nursery of trees than all the birds and other animals put together. The only way to prevent this damage is to lay traps at ten paces asunder, through the extent of the town field. No other apparatus is necessary than a roasted wall-nut placed under a flat stone, supported by a fick. The animals come to eat the wal-nut which they prefer to acorns; and as it is fixed to the fick, whenever they touch it, the stone falls down and crushes them to death. The same expedient M. Buffon also made use of with success against the short-tailed field-mouse, which also destroys acorns. In this way he found that upwards of 100 were taken each day, from a piece of ground confining only of about 40 French appents. From the 15th of November to the 4th of December, above 2000 were caught in this manner. Their numbers gradually diminished till the frost became severe, which is the time they retire into their holes to feed on their magazines. In autumn they are more numerous; for if provisions fail during the winter they devour one another. The long-tailed mice eat also the short-tailed species, and even thrushes, blackbirds, &c. which they find entangled in snares. They first eat the brain, and then the rest of the body. M. Buffon once kept a dozen of these mice in a cage, and furnished them with food every morning at eight o'clock. One day they were neglected for about a quarter of an hour, when one of their number was eaten up by the rest; next day another suffered the same fate; and in a few days only one remained; all the others had been killed, and partly devoured; and even the survivor himself had his feet and tail mutilated. These animals are very prolific, producing more than once a year, and being nine or ten at a birth. They generally make the nest for their young very near the surface and often in a thick tuft of grass. During winter they frequent barns, stables, and outhouses.

8. The mefforius, harvest mouse, or less long-tailed field-mouse, is a very small species, or perhaps rather a variety of the former; and inhabits Hampshire, where it is very numerous, particularly during harvest. They form their nest above the ground, between the straw of the standing corn, and sometimes in thistles; it is of a round shape, and composed of the blades of corn. They bring about eight young ones at a time. These never enter houses; but are often carried, in the sheaves of corn, into ricks; and 100 of them have frequently been found in a single rick on pulling it down to be hove. Thote that are not thus carried away in the sheaves, shelter themselves during winter under ground and burrow deep, forming a warm bed for themselves of dead grass. They are the smallest of the British quadrupeds; the length from nose to tail is only two inches and a half; the tail two inches, and the weight one sixtieth of an ounce. They are more slender than the other long-tailed field-mouse; and their back of a fuller red, inclining to the colour of a dormouse.

9. The agrarius, or rufius mouse, is about three inches long, and scarcely weighs half an ounce; the tail is only about half the length of the body and head; the upper part of the body is of a yellowish colour, with a dark line along the back; the belly and the legs are white; the head is oblong, with a sharp nose, and small ears lined with fur; the hind legs have each a dusky circle just above the foot. It inhabits Russia, and is found in Siberia, rarely in Germany. This species is migratory; and wanders about often in vast multitudes, doing immense injury to the corn: It burrows in the ground, forming a long gallery just below the surface, and a little elevated, leading to a larger chamber, in which considerable quantities of grain and seeds are stored up for winter provision.

10. The minutus, or minute mouse, has the upper parts of the body of a deep tawny or ferruginous colour, and the under parts whitish. It is about half the size of the common mouse, the tail being scarcely two inches long; the female is smaller than the male, and less elegant in her colours; the nose is somewhat sharper; the face is dusky, with some whitiness at the corners of the mouth; the ears are small, and almost laid in the fur; the feet are grey. This species inhabits Russia; where it is found in the corn-fields and in barns, and is plentiful in birch-woods; it seems to wander about without any fixed places for its nest; and much greater numbers of males are found than of females.

11. The vagus, or wandering mouse, is between two and three inches long; the colour of the upper parts of the body is a pale ash, waved with black, and having a black line along the middle of the back; the ears are large, oval, naked, and plaited. The legs are very slender, and the whitish, having some toes and a conical excrecence before; and five behind. All armed with long claws: the tail is longer than the body, very slender, prehensile at the end, of an ash colour above and whitish below; the head is oblong with a blunt nose reddish at the tip, having yellow fore-teeth, and only two grinders on each side in the upper-jaw. The female has eight teats. This species inhabits the deserts of Tartary and Siberia, as high as the Ural, Irtish, Obij, and Jenish. It is frequent in the birch woods, and lives in fissures of rocks, under stones, and in hollows of trees; feeding chiefly on seeds, and likewise on small animals of the same genus. It wanders about in great flocks, migrating from one place to another in the night; hibernates during winter, and is of a very chilly nature, so as even to become torpid and fall asleep, in a round form in the cold nights of the month of June. It has carnivorous inclinations.

12. The betulius, or beech-mouse has a conical resemblance to the wandering mouse, but is somewhat smaller. The upper parts of the body are tawny, with a black line along the back, the under parts whitish or pale ash-colour, the nose is sharper;
with a red tip; the ears are small, oval, plaited, brown, and bril-ly at the ends; the limbs are very slender, with long and very separable toes; the tail is slender and much longer than the body. This species inhabits the birch woods in the defect plains of Ithim and Baraba, and between the Oby and Jen-nei. It lives solitary, frequenting the hollows of decayed trees. It runs up trees readily, and falls on their branches with its tail; and by means of its slender fingers or toes, it can clamber even to a very smooth surface. It is a very tender animal, soon growing torpid in cold weather; and its voice is very weak.

13. The pumilio, or dwarf-mouse, is of a brownish ash colour, with the forehead and nape of the neck more than four inches, and having four black lines along the back meeting at the tail. It is scarcely two inches long, the tail is about two-thirds of the length of the body, and the whole animal, even when steeped many months in spirits, hardly weighs four scruples. The body is somewhat flattened; the regions of the eyes, the ears, and the nose, are of a paler colour than the rest of the body; all the feet have five toes, the thumb or inner toe of the fore foot being very small, but diffusely furnished with a claw; the legs and feet are strongly made; the tail is almost naked, and of a pale ash-colour. This species, which was first described by Dr. Sparrman, inhabits the forests of Stittcamma near Lagen river, 200 hours journey from the Cape of Good Hope.

14. The faxatilis, or rock mouse, is about four inches long, and weighs nearly nine grains; the tail is hairy, an inch and a half in length, of a brown colour above, and white beneath; the head is oblong, with a longish nose, and oval downy ears, brown at the edges; the limbs are strong; and the tail is thinly covered with hair; the upper parts of the body are of a brown colour, slightly mixed with yellowish or grey; the sides are rather inclined to the latter colour; the belly is of a light ash or whitish; the feet and legs are blackish; the snout is dusky, and surrounded with a slender white ring. This species is a very abundant of the eastern parts of Siberia beyond lake Baikal, and of the defects of Mongol Tartary.—It burrows in the fissures of rocks, forming a winding oblique passage, which afterwards branches out into several others pointing downwards, and ending in a chamber, in which is a bed or nest of soft herbs. It feeds chiefly on the seeds of the alfahgras.

15. The amphibious, or water-rat, with a long tail; the upper parts of the body being covered with black hair mixed with yellowish, and the under parts ash-coloured; the ears scarcely appear above the fur; the feet have three toes on each, and the rudiments of a fourth. This species of which there are several varieties, differing in the toes and in the colour, inhabits the whole of Europe, the northern parts of Asia as far as the icy sea, and North America.—They dwell chiefly near waters, forming burrows in their shallow banks; about ponds and wet ditches; likewise in marshy places, meadows, and gardens; feeding on roots, herbs, and shrubs; and on frogs, craw-fish, insects, small fish, and the fry of larger ones. They swim and dive with great facility, and live much in the water. They are very fierce, and bite bitterly. The flesh of these animals is reckoned very delicate by some of the more savage inhabitants of the Russian empire; and is eaten by the French along with that of the otter during lent. The female is smaller than the male, and has a greater yellowness of colour; the has eight teats, four of which are placed on the breast and four on the belly. They procreate about the end of winter, at which time they smell strongly of musk, and produce as far as eight young ones in the month of April.

16. The alliarius, or garlic mouse, has a short tail; the ears rather large, and somewhat hairy; the body ash-coloured on its upper parts, and whitish underneath. The head and body measure somewhat more than four inches, the tail scarcely an inch and a half. This species inhabits Siberia, about the rivers Jenisei, Kan, Lena, and Angara; and feeds on the roots of garlic, of which it lays up large stores in subterranean burrows.

17. The rutilus, or red mouse, has a short tail; the ears are longer than the fur, which is tawny red on the back, light grey and yellow on the sides, and whitish on the belly. The head and body measure about four inches, and the tail one.—This species inhabits Siberia, from the Oby as far as Kamtschatka, and within the Arctic circle. It lives in holes and in hollows of trees; feeding on grain, and sometimes on animals of the same genus. It comes often into houses and barns, eating almost of every thing which comes in its way, but it is particularly fond of flesh. It is very lively, and runs about even on the snow the whole winter.

18. The arvalis, or meadow-mouse, is from three to six inches long, the female being much longer than the male, and the tail is little more than an inch: the head is large, with a blunt nose, short ears almost hid in the fur, and prominent eyes; the upper parts of the body are of a mixed ferruginous and black colour; the belly is deep ash, and the legs and feet dusky; the tail is terminated by a small tuft of hair. There is a variety which is almost black.—This species inhabits all Europe, Siberia, Hircania, and Newfoundland; dwelling in bushy places, corn-fields, meadows, and gardens, chiefly near waters; living on grain, nuts, acorns, and walnuts, which it collects into subterranean burrows: but it appears to prefer corn to every other food. When the grain is ripe, they assemble from all quarters, and often do great damage by cutting the stalks of corn in order to come at the ears. They follow the reapers, and eat up all the fallen and neglected grain. When the gleanings are devoured, they flock to the new-sown fields, and destroy the crop of the ensuing year. In winter most of them retire into the woods, where they feed upon filberts, acorns, and the seeds of trees. In particular years they appear in numbers so immense, that they would destroy every thing if they continued long; but they always kill and eat one another during a scarcity of provisions. They besides are devoured by the long-tailed fieldmice, by foxes, wild cats, and weasels. These creatures are often carried home in the feather of corn, and 100 of them have been found in hounding a rich. In such cases it is been observed, that the dogs devoured all the mice of this sort they could find, rejecting the common kind; and, on the contrary, the cats would touch none but the last. The female produces a number of young ones in the month of April.
several times a year, and brings from eight to twelve
young at a birth: it has a strong affection for them;
one was seduced into a wire-trap by placing its
broad in it, was so intent on fostering them, that it
appeared quite regardless of its captivity. In New-
foundland, these mice are very destructive to gar-
dens; but seldom do much damage in this way in
Britain.

19. The socialis, or social mouse, with a very short
tender tail, and naked, rounded, and very short ears;
the fore-feet have each three toes and the rudiments of
a fourth; the upper parts of the body are light-grey;
the sides, shoulders, and belly, are white. The head
and body are somewhat more than three inches long,
the tail half an inch. This species inhabits the sandy
shores between the Volga and Ural, near the Caspian
sea, and in the mountains of Hircania.—They live, in
pairs, or in families, confining of a male and a female
with their young ones; and of these families vast
numbers live together, the whole country being covered
with little hills of earth thrown out of their burrows.
They feed mostly on tulip roots; and are preyed on
by weasels, polecats, crows, and otters. They swarm
chiefly in springs, and rarely appear in autumn, at
which season it is supposed they migrate, or take shel-
fing among the bushes.

20. The ecominos, or economic mice, in its
general form, resembles the meadow-mouse; but the
body is rather longer and the belly larger. The ears
are naked and hid in the fur; the colour is tawny;
and the fore-feet have each three toes with the rud-
iments of a fourth. The head and body measure four
inches and a quarter, the tail somewhat more than an
inch. This species inhabits Siberia, from the river
Ural, southwards, in Kamtschatka, and under the
Arctic circle. They are called by Dr Pallas 'mures
ecomini,' from their curious way of living. They
dwell mostly in damp soils, forming burrows, with
many chambers and numerous entrances, immediately
under the turf. In these they lay up magazines of
various vegetable food, chiefly bulbous roots; which
they spread out in funny days to dry, and never touch
them but in winter, living all summer on berries and
other vegetables. The Kamtschatkans hold these ani-
mals in great regard, and never destroy their hoards;
they take away only part, and leave some caviare or
other substanee to support them in its stead. This
species sometimes emigrates in vast multitudes, keep-
ing a straight course, like the lemmus, even over ri-
vew; and are much infested on their march by birds,
fish, wild hogs, foxes, and other wild beasts. They
begin their March from about the river Pengin in
spring, and about the middle of July reach Ochet-
flka and Judomia, at a vast distance; and return in Oc-
tober. The Kamtschatkans are much alarmed at
their migrations which portend rainy weather and a
bad change; and when they find them lying weak and
spent with fatigue after crossing a river, give them
every affittance in their power. The Tichetik are
not so much attached to this animal, and make use
both of their winter stores and of their carcasses as food.

21. The gregarius, or gregarious mouse, has a short
tail; the ears are longer than the fur; the fore-feet
have each three toes and the rudiments of a fourth;
the fur is dark ash-coloured on the upper parts, and
whitish below. This species is left than the economic
mouse, and longer than the social; the female being
five inches long and the male four. It inhabits the
eastern parts of Siberia, where it dwells in arid places,
forming burrows with numerous openings directly un-
der the sod; these lead to chambers in which it lays
up large stores of roots, especially those of the Lilium
pompomii and garlic. It eats fitting up.

22. The laniger, or woolly mouse, with woolly fur
of an ash-colour, inhabits Peru and the north parts of
Chili. It burrows in the earth, is very docile and
cleanly, and is easily tamed; it lives on bulbous roots,
especially onions; the female breeds twice a year,
and brings five or six young ones at each litter. It is
about six inches long, with a short nose, and small
sharpl-pointed ears; the fur is very long and exceed-
ingly fine, almost like the threads of a spider's 
web, and was formerly employed as the very finest species
of wool by the Peruvians.

23. The lagurus or rambling mouse, has hardly any
tail; the ears are shorter than the fur; the fore-feet
have each three toes, and the rudiments of a fourth;
the upper parts of the body are ash-coloured mixed
with dusky, and having a black line along the back.
The head is long, with rough and swelling lips; the
limbs are short and slender; and the length of the body
and head is between three and four inches. This
species inhabits the deserts between the Volga and
K Jens; but do much damage in this way in up large
number of regions; and is called by them 'Kengin,' or
having a black line across the back.

24. The lagurus, or ruticola, has a short
fore-feet, and a round black tail, with a tuft of
short hairs at the lower end. It is very
active, and feeds chiefly on bulbous roots, and
on dried roots; it makes a hole in the ground,
and hides its provisions. It was first described
by Dr Pallas in his 'Systema Naturae,' vol. ii.

25. The Lemmus, or lemming, has a very short
tail; the ears are shorter than the fur; the fore-feet
have each five toes; the fur is furrinous,
varied with grey, yellow, and dusky, having a whitish
collar round the neck, and a dark line along the back.
The head and body are somewhat more than three
inches long, the tail scarcely one inch. It inhabits
the northern parts of the Urallian mountains, and
the marshes near the frozen ocean; feeding chiefly on the
lichen rangiferinus, lichen nivalis, and polygonus vi-
ipurus; these articles of food are stored up in bur-
rows, having numerous passages, which it digs under
the turfy soil. This species is migratory, and refem-
bles the lemmus in its manners.

26. The lemmus, or lemming, has a very short tail:
The head is pointed, having very long whiskers, fix
of the hairs on each side being longer and stronger
than the rest; the mouth is small, having only two very
long fore-teeth in each jaw, and the upper lip is di-
vided; the eyes are small and black; the ears are
shorter than the fur, rounded, and reclined backwards;
the fore-legs are very short, having four slender hairy
The males are about ten inches long, and the tail about three, but the females are fearfully more than half so large; the former weigh from 12 to 16 ounces; while the latter seldom exceed from four to six ounces.

The head is thick, with a blunt nose, and numerous whiskers, large full black eyes, and large rounded open ears; usually the head and back are of a reddish brown colour, with red cheeks; the sides are paler, with three white spots; the breast, upper part of the fore-legs and belly, are black; the feet are large and white, having four toes, and a claw instead of a fifth toe on the fore-feet, and five toes on each hind foot: The colour varies; sometimes though rarely, they are found entirely white or yellowish, or white with black spots on the back; sometimes the front is white, and the forehead ash-coloured, or the lower jaw of a white colour. There is a variety (the black German hamster) which is entirely black, excepting the tip of the nose, edge of the ears, and the feet, which are white. This species inhabits Siberia to the north of Russia, Poland, Scalinavia, Hungary, Silesia, Bohemia, and Germany beyond the Rhine, especially in Thuringia.—Each individual forms a subterraneous burrow, consisting of several chambers, with two holes or entrances leading from the surface; one of these is perpendicular and the other, in which the excrements are lodged, is oblique; the holes of the females have several perpendicular openings, and each young one of her family is lodged in a separate chamber: The chambers which are set apart for the lodging of themselves and young are lined with straw or grass; the rest are larger, and are appropriated for containing magazines of grain, beans, peas, linseed, vetches, and other such foods, each in a separate cell. The chambers of the older animals are dug several feet deep, while those of the younger ones seldom exceed a foot under the surface. The hamster sleeps during the winter like the marmots; when in a torpid state, neither respiration nor any kind of breathing can be perceived. The heart, however, beats 15 times in a minute, which has been discovered by opening the chest. The blood continues to be fluid, but the intestines are not irritable; even an electrical shock does not awaken him; but in the open air he never becomes torpid. When dug up in his state of torpifity, the hamster is found with his head bent under his belly between the two fore-legs, and those behind rest upon his muzzle. The eyes are shut; and when the eye-lids are forced open, they instantly close again. The members are stiff, like those of a dead animal, and the whole body feels as cold as ice. When defeptl during this state, he seems to feel very little; sometimes indeed he opens his mouth as if he wanted to respire; but his lethargy is too strong to admit of his awakening entirely. This lethargy hath been ascribed to a certain degree of cold which indeed may be true with regard to dormice, bats, &c. But experience shows, that, in order to render the hamster torpid, he must also be excluded from all communication with the external air; for when he is shut up in a cage filled with earth and straw, and exposed in winter to a degree of cold sufficient to freeze the water, he never becomes torpid; but when the cage is sunk four or five feet underground, and well secured against the access of the air, at the end of eight or ten days he is equally torpid as.

The hammerers copulate about the end of April; when the males enter the apartments of the females, where they remain only a few days. If two males happen to meet in the same hole, a furious combat ensues, which generally terminates in the death of the weakest. The conqueror takes possession of the female; and both, though at every other period they persecute and kill each other, lay aside their natural ferocity during the few days their amours continue. They even mutually defend each other against aggressors; and if a hole is opened about this time, the female defends her husband with the utmost fury. The females bring forth twice or thrice every year. Their litter is never fewer than six, and more frequently from 16 to 18. Their growth is very rapid. At the age of 15 days they begin to dig the earth; and soon after, the mother banishes them from her habitation: so that at the age of about three weeks they are abandoned to their own management. The mother in general discovers little affection for her offspring; and when her hole is opened, flies in the most dastardly manner, leaving her young ones to perish. Her only solicitude at that time is to provide for her own defence. With this view she digs deeper into the earth, which she performs with amazing quickness. The young would willingly follow her; but she is deaf to their cries, and even shuts the hole which she has made.

The hammerers feed upon all kinds of herbs, roots, and grains, which the different seasons produce, and even eat the flesh of such animals as they can conquer. They are particularly fond of places where liquorice grows, and feed much on its seeds. Their pace is very slow, and they do not climb; but they dig with vast quickness, and will gnaw through piece of wood an inch and a half thick in a very short time. As they are not adapted for long journeys, their magazines are first flocked with the provisions which are nearest their abode. This is the reason why some of the chambers are frequently filled with one kind of grain only. When the harvest is reaped, they go to a greater distance in quest of provisions and carry every article they can find, without distinction to their granary. To facilitate the transportation of their food, nature has furnished them with two pouches in the inside of each cheek. On the outside, these pouches are membranous, smooth, and shining; and in the inside there are a great many glands, which secrete a certain fluid, to preserve the flexibility of the parts, and to enable them to reftit any accidents which may be occasioned by the roughness or sharpness of particular grains. Each of these receptacles is capable of containing an ounce and an half of grain, which, on his return to his lodgings, the animal empties, by pressing his two fore-feet against his cheeks. When we meet a hammerer having his cheeks filled with provisions, it is easy to seize him with the hand, without the risk of being bitten; because in this condition he has not the free motion of his jaws. But if he is allowed a little time, he soon empties his pouches, and stands upon his defence. The quantity of provisions found in the holes depends on the age and sex of the inhabitant. The old hammerers frequently amass 100 pounds of grain; but the young and the females content themselves with a quantity much smaller. Their object...
object in laying up provisions, is not to nourish them during winter, which they pass in sleep, and without eating but to support them after they awake in the spring, and previous to their falling into a torpid state, which resembles a profound sleep. At the approach of winter, the hamsters retire into their subterraneous abodes; the entrance to which they shut up with great address. Here the animal reposes, in the situation already described, upon a bed of straw, and in this state he is commonly dug up. They are preyed on by polecats, weasels, cats, dogs, foxes, and birds of prey; and are procured by man, on account of their devotions. In winter the peafants generally go a hammer-hunting as they call it; the retreat is known by a small eminence of earth raised near the oblique passage formerly described. The peafants dig down till they discover the hoard, and are generally well paid for their trouble; as they often find two bushels of corn, besides the skins of the animals, which are valuable for market; and it is remarkable, that the hairs sticks fast to the skin, that it cannot be plucked off without the utmost difficulty. In some species the hamsters are fo numerous, that they occasion a dearth of corn. In one year about 11,000 skins, in a second year 54,000, and in a third year 110,000 skins, were brought to the head, back, and sides are pure white. It inhabits the sandy or muddy places; and in a third year, the whole body is already like that of rabbits; and digs about four inches deep, and in the mountains of the north of Persia; where it is about three inches long, and the tail near one. This species inhabits Dauria, Siberia in the dept of Barabia, towards the Oby, between the Onon and Argum, and in the Chinfe empire near lake Dalai; living chiefly on the seeds of the asparagus and ariphex; but its manners are unknown.

IV. Myotalpe †, or Mole-rat. These have no external ears, very small eyes, and a very short tail or none. They live entirely under ground like the moles.

1. The talpina, or Russian mole-rat, is of a dusky colour; has a very short tail, appearing beyond the fur; and no external ears; the fore-teeth are long, extended from the mouth, wedge-shaped; the eyes are very small, and hid in the fur; the fore feet are very strong, flat, and formed for digging. It is about four inches long, and in the general form resembles the water rat. As to colour the head, back, and sides are dusky, and the belly and limbs white. There is a variety (the nigra), which is entirely black. This species inhabits the plains of Russia and Western Siberia, fearfully extending beyond the Itil, and never beyond the Oby. It is fond of a turfy soil, avoiding sandy or muddy places; and digs holes like those of the hamster, which it lines with soft grass, and fills with bulbous roots, throwing up hillocks of earth all along the tracks; each individual has its separate burrow: it works only in the night, and seldom comes out except in the season of love. Its fight is very weak in the day-time. It feeds chiefly on the roots of tulips, tuberol lathyrus, and tuberol philomus. It procreates about the beginning of April, at which time it shakes strongly of musk; and the females produce three or four young; and when five toes, the fore feet are very strong, flat, and formed for digging.

2. The capensis, or Cape mole-rat, is of a dark brown colour tinged with yellowish, with the fore-part of the face, orbits, and regions of the ears, white. It has a very short tail, and no external ears; and is about five inches and a half long. It inhabits the Cape of Good Hope, where it inhabits the gardens.

3. The maritima, or African mole-rat, is of a pale brownish ash colour mixed with yellowish on the upper parts, the sides and under parts paler; the tail is very short, and there are no external ears. It inhabits the sand hills adjacent to the sea at the Cape of Good Hope; and resembles the former species, but is much larger, measuring 12 or 13 inches long, and the head is more lengthened. It forms burrows in the sand like those of rabbits; and digs with surprising velocity. It runs slowly; but is very fierce, and bites severely. It feeds chiefly on the roots of xise, antholyza, gladiolis, and irides; and is reckoned good eating.

4. The sphaerol, or Daumian mole-rat, is of a dirty yellow ash-colour on the upper parts, and white ash on the lower: it has a very short tail, and no external ears; the eyes are very small, and deep seated; the feet have each five toes, the claws of the fore feet being very long. This species inhabits Dauria, and Sibe in beyond the Itil, between the Aile and Tsilurich rivers.
The Marmot, Agouti, Guinea-pig, Cavy, Jerboa, Dormouse, &c., which were formerly comprehended under the present genus in the Linnaean arrangement, have, in consequence of more accurate investigation, been lately disjoined, and distributed under four new genera, Myoxus, Arctonyx, Dipus, and Cavia*. But as we are not in the alphabetical order in which the three last of these genera should have been introduced, we must still describe these animals (excepting the first) in this place; observing, however, to distinguish them according to their new generic arrangement.

I. Myoxus, or Dormouse. See Myoxus, the Marmot.

II. Arctonyx, the Marmot; the characters of which genus are: There are two wedge-like cutting teeth in each jaw; the grinders are five above, and four below, on each side; and there are perfect clavicles or collar-bones.

1. The marmotto, or common marmot, has short round ears; gibbous cheeks; a short hairy tail; the upper parts of the body of a dusky brown colour, and the lower parts reddish. The body and head measure 8.5 inches, the tail 8 inches. This species inhabits the upper parts of the black turfy soil or firm sand, throwing up numerous hillocks, which extend over a considerable surface; it works both with its feet and nose, and sometimes with its teeth. It feeds chiefly on the roots of bulbous plants.

This species varies in size, those of Dauria being near nine inches long, while those farther east are scarcely fix.

5. The typhus, or blind mole-rat, is of a reddish ash colour; and has no tail, external ears, or appendent eyes, but has each five sharp teeth, and the four front teeth are broad. The body and head measure between seven and eight inches: the mouth is continually gaping, with short wrinkled nose-tooth above, and very long ones below, likewise furrowed or wrinkled, none of them being hid by the lips: the body is covered with short, soft, and close fur, which is of a dusky colour at the bottom, with the ends of a rusty brown mixed with ash-colour; the legs are very short, having five toes on each foot armed with short claws, and slightly connected by a short membrane at their bases.

This species inhabits the southern parts of Russia, from Poland to the Volga. Each individual forms burrows under the turfy soil of very considerable extent, with many lateral passages, and throws out the earth at different distances, in large hillocks sometimes two yards in circumference, and proportionally high. It works with its snout, feet, rump, and even with its teeth; and digs with great celerity, especially when frightened, in which case it digs directly downwards. When irritated, it thrusts its head in a menacing posture, and bites with great ferocity. It feeds on roots, especially those of the bulbous chamomile. It is entirely blind, though it has the rudiments of very small eyes, which are covered over with a continuation of the skin; but it possesses the sense of touch and hearing in a very eminent degree, to make up for the loss of sight. It breeds in spring and summer; and the female, which has two teats, brings from two to four young ones at a birth.

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that he is protected by his mawer, he attacks and bites dogs of the most formidable kind. Though not so large as a hare, he is fouter, and his strength is aided by a peculiar suppleness and dexterity. With his fore-teeth, which are pretty long, he bites not cruelly: he attacks not, however, other dogs or men unless previously irritated. If not prevented, he gnaws furniture and fluids; and when confined, piers even through wood. His voice resembles the murmuring of a young dog when carewitted or in a sporting humor; but when irritated or frightened, he makes a whistling noise, so loud and piercing, that it tears the ear. The marmots eat every thing presented to them: as flesh, bread, fruit, roots, pot herbs, may bugs, grasshoppers, &c. but milk and butter they prefer to every other aliment. Though lefs inclined to theft than the cat, they endeavour to slip into the dairy, where they drink great quantities of milk, making, like the cat, a murmuring noise expressive of pleasure. Milk is also the only liquor that is agreeable to them; for they rarely drink water, and they refuse wine. They procreate but once a year; and the female, after three or four weeks, produces two, three, or four young. The growth of their young is very quick; they live only nine or ten years, and the species is neither numerous nor much diffused. They are easily caught when on plain ground, but with difficulty in their holes, as they dig deeper when in danger of being taken, except in winter when torpid; at which time they are caught in great numbers. They are searched for partly on account of their flesh, which is tender and delicate; partly for their skins: and partly for their fat which is esteemed medicinal by the inhabitants of the Alps: but they are chiefly taken by the Savoyards for the purpose of being exposed as hawks through various parts of Europe. The marmot would make very good eating, if it had not always a disagreeable flavour, which cannot be concealed but by strong seasonings.

Plate CCCXVII, figs. 1 & 4

2. The monax, or American marmot, is about the size of a rabbit. It has short rounded ears: the nose and cheeks are bluish; the body is of a deep brown colour; the tail is longish, and very hairy. This species inhabits the warmer states of North America and the Bahamas. It forms holes in the crests of rocks and under the roots of trees, in which it passes the winter in a torpid state; though it is uncertain if those of the Bahamas hibernate, as the climate of those islands is very mild. It feeds on vegetables; and its flesh is very good, resembling that of a pig.

3. The bobac, or Polish marmot, is of a greyish colour, mixed with long dusky hairs on the upper parts of the body, the under parts yellowish; It has small oval ears, small eyes, a hairy straight tail, and the fore-feet have each a claw in place of the thumb or fifth toe. The head and body measure sixteen inches, the tail four and a half. This species inhabits the dry and sandy places of the mountains, from the Borithenes through the temperate climates of Asia as far as China and Kamtschat. It forms very deep burrows, in which societies of 20 or more live together, each individual having a particular nest at the bottom of the common gallery, which is often three or four yards deep, and from which numerous galleries or passages branch off to the several apartments. They go about in search of food in the morning and middle of the day, placing a sentinel to give warning of approaching danger. The bobac is a timid animal, and feeds only on vegetables, chieflyleracious plants. It fits up on the hams, and carries its food with the fore paws to its mouth, and defends itself in the same posture. It may be easily tamed even when old; it then eats cabbages or bread, and laps milk; but refuses to drink water. In summer it feeds on worms; but in winter it gnaws torpid all winter when kept in very warm places; and even then it eats very little; and escapes if possible, that it may get to some place proper for hibernating; but returns to its marmot in spring. The flesh resembles that of a hare, though rank; the fat is used for dressing leather and furs; and the skins are employed for clothing by the Russians. The female has eight teats; and probably brings forth early, as by the month of June the young ones are half grown.

4. The citillus, or earless marmot, is of a variable colour, has a convex head, no external ears, and a short hairy tail. This species inhabits the southern parts of Russia as far as Kamtschatka, and the islands between Asia and America; is found in Persia and China; but is now rarely met with in the west of Europe. They dwell in open, high, dry, and uncultivated places, preferring turfy and loamy soils, near the high roads, and never frequent bogs or woods. Each individual has its separate burrow, in which, for provision in the beginning and end of winter, it lays up vegetables, fruit, and berries; sometimes though rare, the carcasses of mice and small birds are added. In the middle of winter these animals lie torpid during the greatest severity of the frost. From the very beginning of spring, as soon as the weather becomes mild, they go out in the day time in quest of food, which they eat fitting on their haunches, carrying it in their fore paws to the mouth. The male is very easily tamed; but the female is fiercer, more given to bite, and is less easily made tame; she goes between there and four weeks with young, and brings forth from three to eight young ones about the beginning of May. The fur is very good in the spring; and the flesh is reckoned tolerable. They are preyed on by polecats, weasels, hawks, carrion crows, and cranes.

This animal varies considerably both in size and colour, being sometimes as large as the common marmot, and sometimes not larger than the water-rat. In general the colour is of a yellowish ash on the upper parts, and dirty white on the belly, (the head of Buffon;) sometimes it is variegated either with waves or small spots of white, (the fouslik of the same author.) Some are white on the upper parts, and waved with tawny or yellow, being pale yellow on the yellow parts of the body, and having a longish tail, with shied hair like that of a squirrel; others are of a grey colour on the upper parts of the body, spotted with white; the under parts being of a yellowish white, with white orbits, and the face, between the eyes and the nose, of a brownish yellow, with a short tail.

5. The empetra, or Canadian marmot, is of a mixed grey colour on the upper parts of the body; the lower parts orange; having short rounded ears, and a hairy tail. It is rather larger than a rabbit, and the tail is about two inches and a half long; the head is round, with a blunt nose, and short rounded ears; the cheeks
are full, and of a grey colour: the face is dusky, with a black nose: the hair on the back is grey at the roots, black in the middle, and whitish at the tips; the belly and legs are of an orange colour; the feet are black and naked, having four long, slender, divided toes, and the rudiments of a thumb on each fore foot, and five similar on each behind, all armed with pretty strong claws. This animal was described by Mr. Pennant from a living specimen in possession of Mr. Brooks, which was very tame, and made a hissing noise. It inhabits Canada, Hudson's Bay, and the other northern parts of America.

Five or six other species of arctomys, some of them suspected to be only varieties, are described by Kerr.

III. Dirus, or Jerboa. There are two fore-teeth in each jaw: the tail is long, and tufted at the end: but the most striking characteristic of this genus is the enormous length of the hind feet and extreme shortness of the fore-paws. From this conformation, instead of walking or running on all fours, they hop like the hare on the hind-feet like birds, making prodigious bounds, and only use the fore paws for burrowing, or for carrying their food to the mouth like squirrels. From this peculiarity of conformation, the kangaroo, genus is the enormous length of the hind leg; the contortion, the faphon is gregarious, and builds its nest always to dig under the roots of some bushy plant or shrub. It particularly delights in those places which are frequented by the cerastes or horned viper, though it would appear that the serpent sometimes preyed upon it; for Mr. Bruce tells us that he once saw a jerboa taken out of the belly of a female viper big with young, and almost consumed by the digestive powers of the animal. It is a very cleanly creature, and keeps its hair always in excellent order. It jumps about with great agility, in which it is assisted by its long tail, which we should suppose would rather be a hinderance to it. The Arabs of the kingdom of Tripoli in Africa teach their greyhounds to hunt the antelope, by learning them first to catch jerboas; and so agile are the latter, that Mr. Bruce has often seen, in a large court-yard or inclosure, the greyhound employed a quarter of an hour before he could kill his diminutive adversary; and had he not been well trained, so that he made use of his feet as well as his teeth, he might have killed two antelopes in the time he could have killed one jerboa. This animal is very fat, and the flesh well coloured: the buttocks, thighs, and part of the back, are roasted and eaten by the Arabs, as already mentioned, and taste almost exactly like a young rabbit, but without the strong smell of the latter. It is said, that the flesh dried in the air is very nourishing, and prevents coughs; so that it seems endowed also with medical qualities. The animal is found in most parts of Arabia and Syria, and in all parts of the southern desert of Africa, but nowhere in fuch plenty as in the Cyrenaicum or Pentapolis. In his journey thither, Mr. Bruce employed several Arabs, together with his own servants, to kill these animals with sticks, that their skins might not be hurt with their teeth. Having got them dressed in Syria in Greece, and fewed together, making use of the tail, in as ermine, for the lining of a cloak, he found they had a very good effect, making a finer and glossier appearance the longer they were worn.

Bochart thinks this animal is the saphe of holy writ, and displays a vast deal of learning on the subject. But this opinion is refuted by Mr. Bruce, who observes, that the faphon is gregarious, and builds its nest often seen, in a sandy place, with the word is expressly translated jerboa. See the article Saphe.

2. The figutta, or Arabian jerboa, has three toes on the hind feet, and no thumb or fifth toe on the fore-paws. It is only about six inches long, and the tail rather shorter than the body; the soles of the hind feet and bottom of the toes are covered with a very thick coat of hair; the head is more rounded than that of the preceding animal, and the ears are much longer than the head. It inhabits Arabia, and near the Irish in Siberia, where it frequents the sandy plains.

The two following are distinguished as different species by Mr. Pennant, though Dr. Gmelin seems not to have considered them as distinct from the preceding.

A. The
A. The aegyptius, or Egyptian Jerboa, has three toes only on the hind feet; and four toes with a scarcely apparent thumb or fifth toe, furnished with a claw on the fore-paws.

This animal Mr Pennant supposes to be the mus bi-fer of the ancients, mus fogitis of Pallas, jerbo of Buffon, and daman Ifrael of the Arabs. He says: that it inhabits Egypt, Barbary, Palestin, the deserts between Bafora and Aleppo, the sandy tracks between the Don and Volga, and the hills south of the Iridh.

Fig. 17.

B. The fibricius, or Siberian jerboa, with three toes on the hind feet, and two flat toes some way up the legs; five toes on the fore feet, the thumb or fifth toe having no nail. Of this species Mr Pennant distinguishes four varieties, the major, medius, minor, and pumilio; differing in size, colour, &c. But they all (he says) agree in manners. They burrow is hard ground, clay, or indurated mud; not only in high and dry spots, but even in low and flat places. They dig their holes with great celerity, not only with their fore-paws but with their teeth, and flinging the earth back with their hind feet so as to form a heap at the entrance. The burrows are many yards long, but not above half a yard deep. These run obliquely; and end in a large space or nest, the receptacle of the finest herbs. They have usually but one entrance; yet by a wonderful sagacity they work from their nest another passage to within a very small space of the surface, which in case of necessity they can burst through, and so escape.

They sleep rolled up with their head between their thighs: at sun-fet they come out of their holes, clear them of the filth, and keep its hole exceedingly clean, to which it returns on the return of cold.

The Meridianus, Caspian jerboa, has five toes behind and three before, with the rudiments of a thumb or inner toe. It is five inches long, and the tail three. This species inhabits the sandy deserts between the Ural and Volga, near the Cape of Good Hope, is larger than any of the foregoing, being 14 inches long, the tail 15, the ears three. It is called aerdiuannius, or little earth man, and fpringen baas, or leaping hare, by the Dutch at the Cape. It has a grunting voice; is very strong, and leaps 20 or 30 feet at one bound. It burrows with its fore-feet; and leaps sitting on its hind legs, with the knees separated, the head between, and holding its ears with the fore-paws over its eyes. It is eaten by the natives; and is caught by pouring water into its hole, which forces it to come out.

Fig. 6.

The Meridianus, Caspian jerboa, or long-legged mouse, has five toes behind and three before, with the rudiments of a thumb or inner toe. It is five inches long, and the tail three. This species inhabits the sandy deserts between the Ural and Volga, near the Caspian. It forms burrows, with three entrances, about a yard in depth; and feeds chiefly on the seeds of the pterococci and aftragali.

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The tamaricinus, or marib jerboa, has five toes. Fig. 19. behind and three before, with the rudiments of a fourth; the tail is obscurely annulated. The body and head measure about five inches and a half in length; the tail is about the same length. This species inhabits the salt marshes near the Caspian sea; and is supposed to feed on the fruit of the tamarix and nitrium, which grow in these marshes. Under the roots of these trees it forms very deep burrows, which have two entrances. It is a very elegant little animal. There are two or three other species of this genus.

IV. The Cavia, or Coy, a genus which seems to hold a middle place between the murine and the leporine quadrupeds. The characters are: there are two wedge-like cutting teeth in each jaw, and eight grinders in both jaws; the fore-feet are furnished with four or five toes: the hind feet have three, four, or five each; the tail is either very short or entirely wanting: there are no clavicles or collar-bones.

1. The paca, or spotted coy, has five toes on all the feet; and the sides are marked with rows of grey cccxv, or pale yellow spots. The body and head measure about two feet in length; the tail is like a small button, and so extremely short as to be hardly apparent; the mouth is very small, and the upper lip is divided; the nostrils are very large, and the muzzle is garnished with long whiskers; the ears are short and rounded; the eyes are large, prominent, and brownish; the two cutting teeth in each jaw are very long and of great strength; the hind legs are longer than the fore.—This species inhabits Brazil, Guyana, and probably all the warmer parts of America. It lives in fenny places near rivers, burrowing in the ground, and keeping its hole exceedingly clean, to which it has always three distinct outlets: It grows very fat, and is esteemed a great delicacy. The female has

3 N two
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Two sorts of pigs are found in England; both are very voracious, and when fat, their flesh is white like that of a rabbit, but dry. What food they cannot immediately consume they hoard in their retreats, and eat at their leisure. Their pace is hopping like that of a hare or rabbit; they beat the ground like them with their feet, when angry; they flop and listen to the sound of music; and they take shelter when pursued, in their holes, or in hollow trees.—They are hunted with dogs. When one of them is forced among the cut sugar canes, he is soon taken; because these grounds being generally covered a foot thick with straw and leaves, at each leap he finks in this litter, so that a man may overtake and slay him with a baton. He commonly runs very nimbly before the dogs; and when he gains his retreat, he lies quiet, and remains obstinately in his concealment. The hunters are obliged to chase him out by filling his hole with smoke. The animal, half suffocated, utters mournful cries; but never issues forth unless when pushed to the last extremity. His cry, which he often repeats when disturbed or irritated, resembles that of a small hog. If taken young he is easily tamed, and goes out and returns of his own accord.

3. The cobaya or reflexive cavy, has four toes on the fore, three on the hind-feet, with no tail: it is about seven inches in length; and the whole body is white, usually variegated with irregular orange and black blotches. This species inhabits Brazil; but its manners in a wild state are not mentioned by authors. In a domestic state, as they appear in Europe, they are very refractory and make a continual noise.—They feed on all kinds of herbs; but especially on parsley, which they prefer to grain or bread; and they are likewise fond of apples and other fruits. They eat precipitately like the rabbit, little at a time, but very often. Buffon says they never drink; but Gmelin, that they drink water. Their voice is commonly a kind of grunt like a young pig; when engaged in their amours, it resembles the chirp of a bird; and when hurt, they emit a sharp cry. They are of a tame and gentle, but stupid disposition. The female breeds at two months old, bringing from four or five to ten or twelve young ones at a birth, though she has only two teats; and breeds very often during the year, as she goes but three weeks with young, and takes the male 12 or 15 days after littering. As they breed so fast their multitudes would be innumerable, if there were not so many enemies which destroy them. They cannot resist either cold or moisture; when cold, they assemble and crowd close together; in which case they often all perish together. They are also devour in great numbers by cats, and many are killed by the males. Rats are said to avoid their haunts. They are called in England Guinea-pigs, from their being supposed to come from that country.

4. The magellanica, or Patagonian cavy, has hardly Fig. 12. any tail; the fides of the nose are garnished with tufts of curly hair and long numerous whiskers. This species inhabits the country about Port Defire in Patagonia, and is of considerable size, sometimes weighing 26 pounds. It has the same manners with the rest of the genus; it fits on its hind legs, burrows in the ground, and feeds on vegetables. The flesh is very white, and has an excellent flavour.

5. The
Plate CCCCXIX

Mus
5. The capybara, or thick nosed tapir, has no tail; the hind feet have each three webbed toes. The length of the animal, when full grown, is above two feet and a half; the head and nose are very large and thick; having small, erect, rounded, naked ears, and large black eyes: and the nose is garnished with numerous black whiskers: in each jaw are two large strong fore-teeth, and eight grinders; the legs are short, having the toes connected by a web, and their extremities are guarded with a kind of hoofs instead of claws; the neck is short and thick; the hair is short, rough and harsh, like bristles, being longer on the back, and mottled of them are yellowish in the middle and black at both ends.—This species inhabits the eastern side of South America, from the illims of Darien to Brazil and Paraguay; living in fenny woods near the large rivers, such as the Amazons, Oroonoko, and Plata. They swim and dive remarkably well, and keep for a long time under water. They catch fish at night with great dexterity, and bring them on shore to eat them; which they do sitting on the hind legs, and holding the food in the fore-paws like the apes. They likewise live on fruits and vegetables, especially the sugar cane, and feed only in the night. They keep together in large herds, making a great noise like the braying of asses, and do not micturite in gardens. They grow very fat; and the flesh is eating, tender, but has an oily and fishy flavour. In the breeding season, one male and one female live together, and the female only produces a single one at a birth. These animals are easily rendered tame, and become very familiar.

6. The acufchry, or olive cavy, has a short tail; the upper parts of the body are of an olive colour, the under parts whith. This species inhabits Guiana, Cayenne, and Brazil.—It is about the size of an half-grown rabbit, is easily tamed, and is reckoned very delicate food. The female brings one, sometimes two at a litter. This animal resembles the agouti, but is uniformly smaller, has a tail of some length, and is of a different colour. It inhabits the woods, living on fruits; abhors water; and sometimes, though rarely, makes a cry like that of the reitfeus cavy.

There are five or six other species described by authors as belonging to the cavy genus. Two of them, however, have been lately marked by Dr Gmelin under a new genus Hyrax; while, as there was not an opportunity of introducing it in the order of the alphabet, we shall here subjoin together with the descriptions of the species as given by Mr Kerr.

V. Hyrax, or afhoko. There are two broad and distant fore-teeth above; four contiguous, broad, flat, notched fore-teeth below; and four large grinders on each side in both jaws. The fore feet have four toes, the hind feet only three. There is no tail; and the clavicles are wanting.

1. The capenisch, or cape afhoko, “has flat nails on all the toes, except one toe of each hind-foot which is armed with a sharp pointed claw. It inhabits the Cape of Good Hope.—This animal is about the size of a rabbit, being about 15 inches long; the head is short, with the back part very thick, and the snout very short and blunt; the eyes are small; the ears are oval and open, brown, woolly, and half hid in the fur; the legs are very short, the upper joints of both being concealed beneath the skin; the hind legs are rather longer than the fore; the feet are large, black, and naked; the body is short, thick, and contracted, with a prominent belly, and is covered with a soft woolly fur of a yellowish brown or greyish colour, hoary at the roots; the sides are of a dirty whitish grey; and along the back is a brownish stripe; this fur is intermixed with longer and coarser black hairs; and a few very coarse long bristles. The fore-feet have four short, scarce divided, thick toes, furnished with flat nails; the two outer toes of the hind-feet are similar, but the inner toe is longer, and has a sharp claw. This animal has a sharp voice, and acute sense of hearing; its gait is very wavering and unsteady, owing to the shortness of its thighs and unequal length of the hind and fore legs; notwithstanding of which it is very active and moves by leaps; it is very cleanly living entirely on vegetable food, drinks little, is fond of heat and burrows in the ground. In manners and general appearance, this animal resembles the marmot and cavy; in the conformation of its toes it has some analogy with the muscovado; but from the circumstances of the teeth it cannot be ranked with the last; and the peculiarity of the feet has caused Dr Gmelin to separate it from both of the former.”

2. The syriacus, or Syrian afhoko, (Bruce, Schreber), has soft tender nails on all the toes. It inhabits Syria and Ethiopia.—The body of this is more lengthened than that of the former, and the foot more oblong. The fur is of a reddish grey colour like that of the wild rabbit, the throat, breast, and belly, being white; all over the body a number of long, strong and polished hairs are scattered among the fur. The body and head of the individual described by Mr Bruce measured 17 inches. The ears are broad, open, and rounded; each side of the mouth is garnished with long whiskers. In walking, which is performed creeping low with the belly almost touching the ground, the hind feet are used as far as the heel. All the toes have short, broad, weak, flat nails, except the inner toe of the hind foot, which is provided with a flat crooked nail somewhat longer than the rest; the soles of the feet are formed of fleshy naked protuberances, divided by furrows. It lives mostly about the mouths of caves or clefts in rocks; is gregarious; feeds entirely on vegetables; is mild, feeble, timid, and unctuous. Opposite to the bristles, or rickets, it has no voice or cry. Mr Bruce is of opinion, that this animal is the ganim or Daman Lizard of the Arabs, and the fipham of sacred scripture, which has erroneously been translated the reitfeus.—Its flesh is very white, but is not eaten by the Abyssinians or Mahometans. The fame celebrated traveller is of opinion that it ruminates or chews the cud.”

MUSA, the Plantain-tree: A genus of the monacca order, belonging to the polyantra clas of plants; and in the natural method ranking under the eighth order, Scitamnia. The calyx of the male hermaphrodite is a spathe or flat; the corolla is tepalous; the one petal erect and quinquedentate; the other nectariferous, conca, and shorter; there are fix filaments; five of which are perfect; one style; the stamens inferior and abortive. The female hermaphrodite has the calyx, corolla, filaments, and pistil of the male hermaphrodite, with only one filament perfect; the berry is oblong, and three-angled below. The
most remarkable species are, 1. The paradisiaca, or plantain; 2. The maja sapientum, or banana-tree. See Plate CCCXX.

The first is cultivated in all the islands of the West Indies, where the fruit serves the Indians for bread; and some of the white people also prefer it to most other things, especially to the yams and caffada bread. The plant rises with a soft stalk 15 or 20 feet high; the lower part of the stalk is often as large as a man's thigh, diminishing gradually to the top, where the leaves come out on every side; these are often eight feet long, and from two to three feet broad, with a strong fleshy midrib, and a great number of transverse veins running from the midrib to the borders. The leaves are thin and tender, so that where they are exposed to the open air, they are generally torn by the wind: for as they are large, the wind has great power against them: these leaves come out from the centre of the stalk, and are rolled up at their first appearance; but when they are advanced above the stalk, they expand and turn backward. As these leaves come up rolled in the manner before-mentioned, their advance upward is so quick that their growth may almost be discerned by the naked eye; and if a fine line is drawn across level with the top of the leaf, in an hour's time the leaf will be near an inch above it. When the plant is grown to its full height, the spikes of flowers will appear in the centre, which is often near four feet in length, and nod on one side. The flowers come out in bunches: these in the lower part of the spike being the largest; the others diminish in their size upward. Each of these bunches is covered with a sheath or sheath of a fine purple colour, which drops off when the flowers open. The upper part of the spike is made up of male or barren flowers, which are not succeeded by fruit, but fall off with their covers. The fruit or plantains are about a foot long, and an inch and a half or two inches diameter: it is at first green, but when ripe of a pale-yellow colour. The skin is tough; and when it is a soft pulp of a juicy sweet flavour. The spikes of fruit are often so large as to weigh upwards of 40 lb. The fruit of this sort is generally cut before it is ripe. The green skin is pulled off, and the heart is roasted in a clear fire for a few minutes; and frequently turned: it is then scraped, and served up as Bread. Boiled plantains are not so palatable. This tree is cultivated on a very extensive scale in Jamaica; without the fruit of which, Dr Wright says, the island would scarce be habitable, as no species of provision could supply their place. Even flour or bread itself would be less agreeable, and less able to support the laborious fatigue, so as to enable him to do his business or to keep in health. Plantains also fatten horses, cattle, swine, dogs, fowls, and other domestic animals.

The leaves being smooth and soft are employed as duplings after blisters. The water from the soft trunk is affreignant, and employed by some to check diarrhoeas. Every other part of the tree is useful in different parts of rural economy. The leaves are used for napkins and table cloths, and are food for hogs.

The second sort differs from the first, in having its stalks marked with dark purple stripes and spots. The fruit is shorter, straighter, and rounder; the pulp is softer, and of a more luscious taste. It is never eaten green; but when ripe it is very agreeable, either eaten raw or fried in slices as fridies; and is relished by all ranks of people in the West Indies.

Both of these plants were carried to the West Indies from the Canary islands; whether, it is believed, they had been brought from Guinea, where they grow naturally. They are also cultivated in Egypt, and in most other hot countries, where they grow to perfection in about 10 months from their first planting to the ripening of their fruit. When their stalks are cut down, there will several suckers come up from the root, which in six or eight months will produce fruit: so that by cutting down the stalks at different times, there is a conflant succession of fruit all the year.

In Europe there are some of these plants preferred in the gardens of curious persons, who have hot-houses capacious enough for their reception, in many of whom they have ripened their fruit very well; but as they grow very tall and their leaves are large they require more room in the stove than most people care to allow them. They are propagated by suckers, which come from the roots of these plants which have fruited; and many times the younger plants, when they are fruited in growth, will also put out suckers.

The fruit of the banana-tree is four or five inches long, of the size and shape of a middling cucumber, and of a high, grateful flavour: the leaves are two yards long, and a foot broad in the middle; they join to the top of the body of the tree, and frequently contain in their cavities a great quantity of water which runs out, upon a small incision being made into the tree, at the junction of the leaves. Bananas grow in great bunches, that weigh a dozen pounds and upward. The body of the tree is so porous as not to merit the name of wood; the tree is only perennial by its roots, and dies down to the ground every autumn.

When the natives of the West Indies (says Labat) undertake a voyage, they make provision of a palte of banana; which, in case of need, serves them for nourishment and drink: for this purpose they take ripe bananas; and having squeezed them through a fine sieve, form the solid fruit into small leaves, which are dried in the sun or in hot ashes, after being previously wrapped up in the leaves of Indian flowering-reed. When they would make use of this pulse they dissolve it in water, which is very easily done; and the liquor, thereby rendered thick, has an agreeable acid taste imparted to it, which makes it both refreshing and nourishing.

The banana is greatly esteemed, and even venerated, by the natives of Madeira, who term it the forbidden fruit, and reckon it a crime almost inexpiable to cut it with a knife; because, after digestion, it exhibits, as they pretend, a similitude of our Saviour's crucifixion: and to cut the fruit open with a knife is, in their apprehension, to wound his sacred image.

Some authors have imagined, that the banana-tree was that of the leaves of which our first parents made themselves aprons in Paradise. The sacred text, indeed, calls the leaves employed for that purpose fifth leaves: and Milton, in a most beautiful but erroneous description, affirms the bearded or Bengal fig to have been the tree alluded to. But besides that the fruit of the banana is often by the most ancient authors called...
called a fig, its leaves, by reason of their great size and solidity, were much more proper for a veil or covering than those of the Bengal fig, which are seldom above six or eight inches long and three broad. On the other hand, the banana leaves being three, four, and five feet long, and proportionally broad, could not fail to be pitched upon in preference to all others; especially as they might be easily joined, or sewed together, with the numerous thread-like filaments that may, with the utmost facility, be peeled from the body of this tree.

Some have supposed the Abyssinian plant ensete to be a species of musa. It is said to be a native of the province of Narea, where it grows in the great marshes and swamps for which that province is remarkable, owing to the many rivers which originate in that country, and have but a small declivity to the ocean.

This plant, as well as the coffee-tree, is said to have been unknown in Abyssinia before the arrival of the Galla, who imported them both along with them. It comes to great perfection about Gondar; but the principal plantations of it are in that part of Maitha and Gouth, to the west of the Nile, where it is almost the sole food of the Galla who inhabit that country. Maitha is almost entirely on a dead level; so that the rains flagitate and prevent the sowing of grain.

Were it not for the enete, therefore, the Galla would have scarce any vegetable food. Mr Bruce thinks that the enete may have been cultivated in some of the gardens of Egypt about Rosetta, but that it was not a native of the country. He strongly controverts the opinion that this plant is a species of musa. It is true, (says he), the leaf of the banana resembles that of the enete; it bears figs, and has an excrecence from its trunk, which is terminated by a conical figure, and this is the part which is eaten. This fig is sweet, though mealy, and of a taste highly agreeable. It is supposed to have no seeds, though in fact there are four small black seeds belonging to every fig. But the figs of the enete are not eatable: they are of a soft tender substance: watery, tasteless, and in colour and consistence resembling a rotten apricot: they are of a conical form, crooked a little at the lower end; about an inch in length, and an inch in breadth where thickened. In the inside of the leaf is a large thin white, long, the shape of a bean or cashewnut, of a dark-brown colour; and this contains a small seed, which is fedom hardened into fruit, but confists only of skin.

The long stalk that bears the figs of the enete springs from the centre of the plant, or rather is the body or solid part of the plant itself. Upon this, where it begins to bend, are a parcel of loose leaves; then grows the fig upon the body of the plant without any stalk; after which the top of the stalk is thickened with small leaves, in the midst of which terminates the flower in the form of an artichoke; whereas in the banana, the flower in form of the artichoke grows at the end of that shoot or stalk, which proceeds from the middle of the plant, the upper part of which bears the row of figs. The leaves of the enete are of a web of longitudinal fibres closely set together; the leaves grow from the bottom without stalks; whereas the banana is in form like a tree, and has been mistaken for such. One half of it is divided into a stem, the other is a head formed with leaves; and in place of the stem that grows out of the enete, a number of leaves, rolled round together like a truncheon, shoot out of the heart of the banana, and renew the upper as the under leaves fall off; but all the leaves of the banana have a long stalk; this fixes them to the trunk, which they do not embrace by a broad base or involucre as the enete does.

"But the greatest differences are still remaining.—The banana has by some been mistaken for a tree of the palmaceous kind, for no other reason but a kind of familiarity in producing the fruit on an excrecence or stalk growing from the heart of the plant: but all the musa is neither woody nor perennial; it bears the fruit but once; and in all these respects it differs from trees of the palmaceous kind, and indeed from all sorts of trees whatever. The enete, on the contrary, has no naked stem; no part of it is woody: the body of it, for several feet high, is succulent; but no part of the banana plant can be eaten. As soon as the stalk of the enete appears perfect and full of leaves, the body of the plant turns hard and fibrous, and is no longer fit to be eaten: before, it is the best of all vegetables. When boiled, it has the taste of the best new wheat bread not perfectly baked. When you make use of the enete for eating, you cut it immediately above the small detached roots, and perhaps a foot or two higher, as the plant is of age. The green musa is stripped from the upper part till it becomes white: when soft, like a turnip well boiled, if eat with milk or butter, it is the best of all food, wholesome, nourishing; and easily digested."

Our author now proceeds to consider an hieroglyphic sometimes met with in Egypt, viz. "the figure of Isis sitting between some branches of the banana tree, as is supposed, and some handfuls of ears of wheat. You see likewise the hippopotamus ravaging a quantity of the banana tree. Yet the banana is merely adventitious in Egypt; it is a native of Syria; it does not even exist in the low hot country of Arabia Felix; but chooses some elevation in the mountains where the air is temperate; and is not found in Syria farther to the southward than Lat. 34°.

For these reasons Mr Bruce thinks, that the banana, not being a plant of the country, "could never have entered into the list of their hieroglyphics; for this reason it could not figure any thing regular or permanent in the history of Egypt or its climate. I therefore imagine (adds he), that this hieroglyphic was wholly Ethiopian; and that the supposed banana, which, as an adventitious plant, signifies nothing in Egypt, was only a representation of the enete; and that the record in the hieroglyphic of Isis and the enete-tree was something that happened between harvest, which was about August, and the time that the enete-tree came in ū, which was in October.—The hippopotamus is generally thought to represent a Nile that has been so abundant as to be destructive. When, therefore, we see upon the obelisks the hippopotamus destroying the banana, we may suppose it meant, that the extraordinary inundation had gone so far as not only to destroy the wheat, but also to retard or hurt the growth of the enete, which was to supply its place."
MUSÆUS, an ancient Greek poet, was, according to Plato and Diodorus Siculus, an Athenian, the son of Orpheus, and chief of the Eleusinian mysteries initiated at Athens in honour of Ceres: or, according to others, he was the only disciple of Orpheus: but from the great resemblance which there was between his character and talents and those of his master, by giving a stronger outline to the figure he was called his son, as those are styled the children of Apollo who cultivated the arts of which he was the tutelar god.

Museus is allowed to have been one of the first poets who verified the oracles. He is placed in the Arundelian marbles, epoch 15. 1426 B. C. at which time his hymns are said to have been received in the celebration of the Eleusinian mysteries. Laerterius tells us, that Museus not only composed a theogony, but formed a sphere for the use of his companions; yet as this honour is generally given to Chiron, it is more natural to suppose, with Sir Isaac Newton, that he enlarged it with the addition of several oracles after the conquest of the golden fleece. The sphere itself shows that it was delineated after the Argonautic expedition, which is described in the after-times, together with several other ancient histories of the Greeks, and without anything later; for the ship Argo was the first long vessel which they had built: hitherto they had used round ships of burthen, and kept within sight of the shore; but now, by the dictates of the oracle, and consent of the princes of Greece, the flower of that country sail rapidly through the deep, and guide their ship by the stars.

Museus is celebrated by Virgil in the character of hierophant, or priest of Ceres, at the head of the most illustrious mortals who have merited a place in Elysium. Here he made the conductor of Æneas to the recess where he meets the shade of his father Anchises.

A hill near the citadel of Athens was called MUSEUM, according to Pausanias, from Museus, who used to retire thither to meditate and compose his religious hymns; at which place he was afterwards buried. The works which went under his name, like those of Orpheus, were by many attributed to Oronomacritus. Nothing remains of this poet now, nor were any of his writings extant in the time of Pausanias, except a hymn to Ceres, which he made for the Lycomides.

And as these hymns were likewise set to music, and sung in the mysteries by Museus himself in the character of priest, he thence perhaps acquired from future times the title of musician as well as of poet; the performance of sacred music being probably at first confined to the priesthood in these celebrations, as it had been before in Egypt, whence they originated. However, he is not enumerated among ancient musicians by Plutarch; nor does it appear that he merited the title of son and successor to Orpheus for his musical abilities, so much as for his poetry, piety, and profound knowledge in religious mysteries.

MUSCA, the Fly, in zoology; a genus of insects belonging to the order of diptera. The mouth is furnished with a feathery proboscis, and two lateral lips; but it has no palp. This genus is divided into two different sections: 1. Those with simple antennae. 2. Those which are furnished with a lateral hair or feather. Those have downy bodies, though scarce perceptibly so; and have either a lateral plume or feather on the antennae, or a simple hair on the side of the antenna. The pilose have a few hairs scattered upon their bodies, principally upon the thorax; they have either a lateral feather or a lateral hair. Under these divisions are comprehended about 400 different species, as enumerated in Dr. Gmelin's edition of the Systema Naturae. "Variety (as Mr. Barbut observes) runs through their forms, their structure, their organization, their metamorphosis, their manner of living, propagating their species, and providing for their posterity. Every species is furnished with implements adapted to its exigencies. What exquisiteness in what proportion in the several parts that compose the body of a fly! What precision, what mechanism in the springs and motion! Some are oviparous, others viviparous; which latter have but two young ones at a time, whereas the propagation of the former is by hundreds. Flies are lascivious troublesome insects, that put up with every kind of food. When storms impend, they have most activity, and fly with greatest force. They multiply most in hot moist climates; and go great was formerly their numbers in Spain, that there were fly-hunters commissioned to give them chase. The vapour of sulphur or arsenie destroys them; and their numbers may be reduced by taking them in phials of honeyed water, or between boards done over with honey." There are 129 species, principally distinguished by the peculiarities in their feelers.

Museus, a name given to such persons among the Romans as officially thrust themselves into the company of their superiors and those who defied them, by finding means of getting admission to entertainments without invitation, and without a welcome: so that mutsa were the same as parasites, who were frequently by the Greeks termed museus. See Parasite.

MUSCADINE, a rich wine, of the growth of Provence, Languedoc, Cividal, &c. —The word, as well as the liquor, is French: Some fetch its origin from the mutsa; the wine being suppos'd to have a little of the smell of that perfume; others from mutsa, a fly," because the flies are extremely fond of its grapes; as the Latins had their vinum apianum, so called ab aphis, from the bees which fed on it.

The way of making muscadine at Frontignac is as follows: They let the muscadine grapes grow half dry on the vine; as soon as they are gathered, they tread and press them immediately, and run up the liquor, without letting it stand and work in the fat; the lees occasioning its goodness.

MUSCHENBROECK. (Peter de), a very distinguished natural philosopher and mathematician, was born at Utrecht a little before 1700. He was first professor of theology in his own university, and afterwards invited to the chair at Leyden, where he died full of reputation and honours in 1761. He was a member of several academies; particularly the Academy of Sciences at Paris. He was the author of several works in Latin, all of which show the greatest penetration and exactness in this way. He was also very eminent in the knowledge of law.

MUSCI, Mosaii, one of the seven families or classes into which all vegetables are divided by Linnaeus in the Philosophia Botanica. The ancients took the moss of trees to be the effect of a disorder or decomposition of the texture of the bark; or at most a kind of little filaments arising from the bark; but the moderns find by several observations, that mosses are all
all real distinguid plants, whose feed, being extremely
small, is inoculated in little capfule: which bursting of
themselves, the feed is carried off by the winds; till,
falling into the inequalities of the bark of trees, it is
there stopped, takes root, and feeds at the expense of
the tree, as mouldines does on bread, &c.

What the botanical writers freely understand by
the word moss, is a class of plants appearing of an
inferior rank to the common vegetables; the
fruit of flower or feed, or any thing analogous to ei.
fifty parts; the semblance of those parts which ferve other plants for
Goll their appropriated organs
of parts, and carry fomething that looks analo
gous to vegetation in the common way, having a re
semblance of thofe parts which ferve other plants for
their fructification. The more perfect genera of the
mofes not only confit of different parts, but have alto
their appropriated organs containing a pulpy matter,
which finally becomes dry, and affumes the form of a
fine and fubtile powder, compofed of granules, each of
which is either a feed or a granule of farina, ferve
for the propagation of the species.
The more imperfect mofes are diftinguifhed
from the others by their appearance to the naked eye; they
are either in form of a fine lanugo or down covering
the surface of different bodies; or else they appear as
fleender filaments, or foliaceous bodies, floating about
in the water; or as filaments of a tougher texture,
hanging down from the branches of old trees; or as
little frubs, or fingle horns, growing creft on the
parched earth of mountains and heathy places; or
finally, as broad and foliaceous bodies reading
over the dry barks of trees or rocks, without
any pedicle or other fupport.
The more perfect kinds of mofes are found in the
shape of small but regular plants, divided into feveral
branches, and clothed with leaves: these are of vari
ous forms and ftructures; fome being broad and thin,
others flenfer as hairs; fome pelhucd, others opake;
fome smooth, others hairy. From the fide of thefe
leaves in fome kinds, and from the fummit of the
flalk; in others, there arife heads or capfules of va
rious form and ftructure, but all peculiar to mofes; fome
of these are naked, and others covered with a calyptra
or hood; fome fland on long pedicles, and others
are placed clofe to the flalks. Thofe heads are ufual
ly called capfules, which contain their feeds or farina,
and their pedicles fata, in the moss, hypna, brya, and
polyptrichas, &c.

Thefe capfules in fome are covered with a calyptra
or hood; in others they are naked. Of the first kind
are the fphacium, polyptrichum, meium, bryum, hypna,
fostinulus, and buxbaumia; and of the latter for, the
lycophorium, porrela, fphagnum, and phalcaum.
The fublinance with which the heads or capfules of
all the mofes are filled, resembies either feeds, or the
small globules of the farina of flowers, which all re
femblce feeds of particular figures in miniature. The
fructifications of thofe minute plants feem to be either
from these, as feeds falling to the earth; or, according
to the opinion of fome, they feem to contain only fa
rina in the capfules, which impregnating certain bulbs
or nodules in the ale of the leaves, caufe them to grow
and vegetate, as is seen in fome of the larger plants;
as in the bulbs produced in the ale of the leaves of the
dentaria, and of the libes, and fome others. The for
mer opinion, of the powder in the heads or capfules
being actually perfect feeds, is the more probable, as
the bulbs in the ale of the leaves are found only in
fome of the hypna, and others of a few other genera;
whereas the propagation is as quick and certain in
thofe which have none of them as in thofe which
have; and the want of female parts of fructification,
which makes fo many defiderata in the Linnean fytem
of botany, is easily made up, and the whole explain
ed according to the ufual courfe of nature in other
vegetables, by allowing the powder in the capfules to
be real feeds, and the small globules on the points;
surrounding the aperture of the capfule, the farina.
The opinion of the mofes growing from thofe no
dules in the ale of the leaves, or from the impregnated
ends of the branches which had received the pow
der from the capfules, was originally founded on the
observing that the trailing or branched hypna an
nually grew out in length, from the extremities of all
their branches, and annuallv loft as much of the old
flalk at the root as they gained of the new at the fum
mit; but it appears from farther obfervations, that
they are real feeds which are contained in form of
powder in the capfules; fince the brya, and many
others, are found growing from small points or spot
which are afsemblages of their minute leaves, propa
gated on the ground, under the old ones juft where
the powder of the capfules has fallen; and though it
be allowed that the hypna and other trailing mofes do
grow from the ends of the branches, yet they may
also be produced in form of new plants, from regular
and perfect feeds fed from the capfules. It is cer
tain that the brya are by this means propagated and
spread into large tufts, and the other genera may alto
be fo propagated, though they have bene a property
of increasing by growth of the flalk; which feems no
other than the property of many of the large plants
to creep at the root, and fhoot out in length greatly
from the extremities of their horizontal branches, ly
ing on or under the ground, as thofe spreading parts
may more properly be fo called than roots, the fibres
propagated out from them peculiarly adhering to the
earth being properly the roots; and it is well known that
thofe plants, though they propagate themselves thus
by the root, they produce feed alto like others, by
which they may be equally propagated: and this ana
logy is to be carried yet farther; for as thofe plants
which creep by the roots produce fewer feeds than thofe which are propagated only by feeds; fo the hyp
na, which are the genus of mofes in which this
growth by the flalk is principally observed, are very
thinly befet with capfules of feed, and many of them
produce but very few in a feafon; whereas the brya,
and other mofes which have not this advantage of
growing from the ends of the flalks, are found every
year profusely covered with capfules from every tuft;
and, there is scarce any branch which does not pro
duce its capfule. Now, if thofe capfules contained only
a farina capable of impregnating the nodules or the
ends of the branches, it is obvious there would be as
much of it required for the hypna as for any other
kinds of mofes; but if they are real and perfect feeds,
it is no wonder that nature has given them profu
to such kinds as are to be propagated only by seeds, and more sparingly to those which are propagated also by the increase of the branches.

To this it may finally be added, that the ferns and other epiphylophorperous plants approach most of all others to the nature of the mosses; and though it has been suspected by many that the fine powder at the back of their leaves was not seeds, but only a farina, yet it is now well known that it is true and perfect feed; since, under many species of them, there are constantly found new and self-torn plants arising in their first rudiments of leaves and figure, which have plainly grown from the dust or powder fallen from the old plants; and as this is now found to be the case in regard to the ferns, probably it will also appear the same in regard to mosses, when they have been yet farther examined than at present. But whether these grains of powder have the lobes and radicles by which the seeds of larger plants propagate themselves, or whether they grow into plants like the parent ones, in the manner of the lichens, by mere expansion, is a thing that requires farther observation to determine.

Some of the mosses, it is evident, approach to the nature of the plants which have their male and female parts in the same flower, and others to those which have them in different ones.

After all, this tribe of plants, as well as the mushrooms, ferns, and sea-weed, is still imperfectly known. Dillenius, professor of botany at Oxford, was the first who attempted an arrangement of them. In his Catalogus Plantarum circa Cifam, published at Francfort in 1719, and afterwards in his Historia Musorum, published at Oxford in 1744, he divides the mosses into 16 genera. This arrangement, however, includes the lichens, some of the fungi, and other plants which belong to very different families. The work in question is, notwithstanding, valuable, in having introduced the knowledge of upwards of 200 plants, which were unknown before Dillenius; it is, besides, of all his works of this kind, the best executed, both for the descriptions and figures, and should serve as a model to such authors as intend to publish in detail the history of any particular family of plants.

Micheli, in a work intitled Nova Plantarum Genera, published at Florence in folio in 1629, divides the mosses into two sections, from the figure and situation of their flowers. These sections comprehend together 16 genera, among which are improperly arranged, like those of Dillenius, several of the lichens and other sea-weeds.

The discovery of the seeds of the mosses, though made by Dillenius in 1719, is arrogated by Linnaeus to himself, who did not begin to write till 1735.

In Ray’s method, the mosses form the third class: in Tournefort’s, they continue a single genus, by the name of muscos, in the first section of the 17th class, which comprehends the mosses, mushrooms, and some of the algae or sea-weed, and is distinguished by the name of alperna, or plants without feed; the feeds of the mosses not having been detected by Tournefort.

The characteristics of these plants, according to the fourth section, are: 1. Top without filaments or threads. 2. The male flower, constituted by the presence of the anthere or tops, placed apart from the female, either on the same or distinct roots. 3. The female flowers deprived of the pilillum or pointal. 4. The feeds devoid of both lobes (castiglileus) and proper coverings; so that they exhibit the naked embryo.

In the sameylum, these plants constitute the second order of the class cryptogama, which contains all the plants in which the parts of the flower and fruit are wanting, or not conspicuous. This order is subdivided into 13 genera, from the presence or absence of the calyx, which in these plants is a veil or cover like a monk’s cowl, that is placed over the male organs or tops of the flamina, and is denominated calyptra, from the fexes of the plants, which bear male and female flowers, sometimes on the same, sometimes on distinct roots; and from the manner of growth of the female flowers, which are sometimes produced fingly, sometimes in bunches or cones. These distinctions are mostly borrowed from Dillenius, whose excellence in developing this part of the vegetable kingdom Linnaeus very readily acknowledges.

The manner of feeding of mosses in general may be more clearly understood from the description of that genus of them which has been traced through all its stages, and to which most of the others, though every genus has its distinct fructification in some respects, yet bear a very great general analogy.

The genus already observed, is that called by Dr Dillenius the hypnum. The species of this are very numerous and common; but that particular one which was the subject of these observations, is the short branched silky kind, common on old walls; and called by that author in his history hypnum vulgare, sericum, recurvum, capulis ereticis sustitutus.

The head of this moss appears to the naked eye a small, smooth, brownish-yellow, oblong body, of about a ninth of an inch long; this is covered at its upper end with a membranaceous calyptra or hood, in shape resembling an extinguiher or a funnel inverted. When this calyptra is taken off, and the head viewed with a microscope, the surface of it is seen to be ridged with longitudinal frits. The base of the head is of a deep orange colour, and more opaque than the rest; and the top is bounded by an orange-coloured ring, dwelling out something beyond the surface of the contiguous parts of the head. The whole glass show that in this head there are not wanting the parts effectual to the fructification of what are usually called the more perfect plants. This ring is truly a monophyllous undulated calyx, within which arise sixteen pyramidal fringed flamina; these are of a pale greenish colour, and are loaded with a whitish oval farina. The flamina all bend toward each other from their bases, and almost meet at a point in the tops. This is their appearance when the head is nearly ripe; and immediately under the arch formed by these flamina is a cylindric hollow pilillum, through which the farina makes its way, and is dispersed among the feeds in the head; the fruit is a large capsule, filling every part of the membrane which shows itself on the outside of the head, and in most places is contiguous to it; this capsule is filled with perfect and very beautiful seeds; they are round, transparent when unripe, but afterwards opaque, and of a very beautiful green, which colour they retain even when dried.

When this head is first produced from the plant, the flamina are very slender, and stand erect; the head
is scarce any thicker than the stalk, and the calyx
covers it all over, to shield the tender substance of the
farina from external injury. As the farina afterwards
swells in the stamina, the seeds in the head increase
also in bulk, and by their increase the head is more ex-
tended in thickness; and the stamina are by this means
separated farther and farther from each other at their
bales, but bend inwards toward their points, so as to
form a kind of arched covering over the stigma of the
pilifillum, which is single; and from hence the far-
ina falls as it ripens into the head, and impregnates
the seeds.

The principal genera are as follow: Lycopodium,
polytricum, bryum, folgens, ufnce, minutum, bryf, sphag-
num, hypna, conserves, and fontinalis. These are found
growing on the barks of trees as well as on the
ground. See Plates CCCXI and CCCXII.

Mothes, by the inconsiderate mind, are generally
debuted an ufeless or in{ignificant part of the creation.
That they are not, is evident from hence; that He who
made them has made nothing in vain, but on the con-
trary, has pronounced all his works to be very good.
Many of their ues we know; that they have many
more which we know not, is unquestionable, since
there is probably no one thing in the universe of which
we dare to assert that we know all their ues. Thus
much we are certain of with respect to mothes, that as
they flourish moft in winter, and at that time cover
the ground with a beautiful green carpet, in many
places which would be otherwise naked, and when
little verdure is elsewhere to be seen; fo at the fame
time they shelter and preserve the seeds, roots, gems,
and embryo plants of many vegetables, which would
otherwise perish; they furnish materials for birds to
build their nests with; they afford a warm winter's
retreat for some quadrupeds, fuch as bears, dormice,
and the like, and for numberlefs insects, which are the
food of birds and flies, and these again the food or
delight of man. Many of them grow on rocks and
barren places, and roting away, afford the
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1. The grifola, or spotted fly-catcher, is about five Mucicapa.
inches and three quarters long. The head is large of
a brownhine hue spotted obscurely with black; the back
is of a moule-colour: the wings and tail are difky:
the breast and belly white; the throat and fides under
the wings darted with red: the legs and feet are short
and black. It is a bird of palette; appears in England
in the spring, breeds there, and departs in September.
It builds its nest again any part of a tree that will
support it; often in the hollow caufed by the decay
of some large limb, hole in a wall, &c. on old
pofts and beams of barns; and is found to return to the
fame place inear after foearon. It lays four or
five pale eggs marked with reddifh. It feeds on in-
sects, and collects them on the wing. When the young
can fly, the old ones withdraw with them into thick
woods, where they frolic among the top branches;
dropping from the boughs frequently quite perpendi-
cularly on the flies that sport beneath, and rising again
in the fame direction. It will also take its stand on
the top of fome flake or poft, from whence it fprings
forth on its prey, returning till to the fame ftand, for
many times together. They feed alfo on fherries, of
which they ftew very fond.

2. The pondiceriana, Pondicherry or Coromandel
fly-catcher, is rather bigger than a sparrow. The
general colour of the upper parts is a cinereous grey:
the throat, breast, belly, white: the legs black. It
inhabits the coaft of Coromandel; where, from the
agreeableness of its fong, it is called the Indian night-
ingale.

3. The flabellifera or fan-tailed fly-catcher, is in
length six inches and a half; the head is black, which
colour descends on the back part lower than the nape,
whence it passes forward in a narrow collar to the
throat; the chin, throat and fides of the neck, except
where this collar paffes, are white; and over the eye
is a white ftrâk like an eye-brow: the upper parts of
the body are olive-brown; the under parts yellowish
ruft, growing whitifh towards the vent: the tail is
longer than the body; the two middle feathers black,
the others white: the legs are dusky. This species
inhabitsthe fouth ifle of New Zealand; where it is
cenefantly hunting after insects, and flies always
with its tail in fhape of a fan. It is easily tamed;
will then fit on any person's shoulder, and pick off the
flies. It has a chirping kind of note; and is called by
the natives Diago-wagh-wagh. There is a beautiful fi-
gure of this bird in Mr Latham's Synophis, plate
xlí.

4. The caribonenfis, or cat-bird, is somewhat bigger
than a lark: length eight inches. Bill black: the
upper parts of the body and wings are of a deep
brown; the under ash-coloured; the crown of the
head is black; the tail is blackish, and the legs are
brown. This species is found in Virginia in the sum-
mer-seaon: where it frequents shrubs rather than tall
trees; and feeds on insects; its cry resembles that of a
cat, whence the English name given it by Catesby.
See Plate CCCXX, fig. 1.

5. The crinita, or crested fly-catcher, is about the
size of a lark: the head is crested, and of a dull green:
the hind part of the neck and back are of the fame
colour; the under parts from the chin to the break
of an ashy-colour, and from thence to the vent yellow: the legs are black. This inhabits Carolina and Virginia in summer; builds there, and departs in autumn.

6. The rubricollus, purple throated fly-catcher, is about the size of a black bird; the whole plumage is black; except the chin, throat, and fore part of the neck, on which is a large bed of beautiful crimmon, including to purple; the legs are black.—These birds inhabit Cayenne and other parts of South America; where they are found in flocks, and precede in general the toucans in their movements. They feed on fruits and insects; and are lively birds, always in action. They for the most part frequent the woods, like the toucans; and where the first are found the others are seldom far off.

7. The rubra, or summer red-bird of Catesby, is a most beautiful species, somewhat bigger than a sparrow: the bill is yellowish; the eyes are black; the legs dusky; the male is wholly of a scarlet colour, except the tips of the quill-feathers, which are of a dusky red; the colour of the female is brown tinged with yellow. It inhabits Carolina and Virginia in the summer.

This is a very numerous genus: there being about 90 other species described by authors. In the Syll. Nat. (Gmelin), the whole number is 92; in Mr Latham's Index Ornithologicus, 62 are enumerated.

MUSCLE, in anatomy. See Anatomy, Part II. Fac, ii.

The motion of the muscles of animals has been thought a matter of such curiosity and importance, that an annual lecture upon it was founded by Dr Croone, one of the original members of the Royal Society at London. In consequence of this the investigation of the subject has exercised the pens of a great number of very learned and ingenious men; notwithstanding which it still remains involved in almost as much obscurity as ever. Many curious observations, however, have been made; and as far as the laws of dead mechanism can be applied to a living machine, the investigators have been successful; but still there has been a ne plus ultra, a certain barrier by which their investigations have been limited, which no person has hitherto been able to pass, and which it is very improbable ever will be passed. To give an account of all the different theories which have appeared on this subject is impossible; but in the year 1788 a lecture on the subject was delivered by Dr Blanc, F. R. S., of which, as it seems to contain the substance of all that can be said upon the subject, we shall here give the following abridgment.

The doctor considers as muscles not only those large masses of flesh which compose so great a part of the bulk of the body, but likewise all the minute organs subervient to circulation, nutrition and secretion; since not only the heart itself, but the whole vascular system and the intestines, owe their action to certain powers of irritability and contrariety peculiar to muscular fibres.

The first and most obvious considerations with respect to the muscles is the regular organization of their fibres in a parallel direction. In this they are distinguished from every other matter of a fibrous structure, whether vegetable or mineral, by a certain degree of moisture, tenacity, and elasticity, entirely peculiar to themselves.

The fibres of the muscles visible to the naked eye are composed of others discoverable by glasses, and these others of fibres still smaller; neither hath any per son been able to discover the ultimately fine fibres of a muscle, which are not composed of others. Some have indeed imagined that they have been able to do this, but their observations have been fallacious, and it is now universally allowed that the fibres are divisible beyond what the best assisted sight can trace, and that they are to all appearance uniform. In this regular and fibrous organization they resemble the crystals of salts, many of which are found composed of fibres more and more fine, and which, like those of the muscles, can never be ultimately traced.

The doctor next touches a little upon the vis inertia of matter; and, contrary to the generally received opinion of modern philosophers, considers matter as an active substance. What is called the vis inertia, he thinks, is not a resistance of change from rest to motion, or from motion to rest, but a resistance to acceleration or retardation, or to change of direction. The activity of matter is further proved by the attractions and repulsions which take place universally among its parts; and every influence of motion within the cognition of our senses, may be referred, either in itself or its cause, to some mode of attraction or repulsion. These may both be considered as one principle, being both expressive of that state of activity originally inherent in matter; and because any two particles, having affinity with each other, must either attract or repel, according to their distance, their common temperature, and other circumstances; and it is so universal an agent in nature, that some modern philosophers have made it absorb, as it were, every other power and property in matter. It is evident, however, whether this hypothesis be just or not, that the cause of muscular motion cannot be referred to mechanism, which is itself only a secondary principle. Some have had recourse to a fluid conveyed into the fibres of muscles, by which they were swelled, and thereby shortened. One of the most plausible of these hypotheses supposes this fluid to be the blood; but this is plainly a petitio principii: for in order to set the blood in motion, muscular motion is necessary. Other fluids have been supposed to have this effect; but even the existence of these has not been proved, and indeed the most solid objections might be brought against all the theories that have hitherto been invented.

Our author having now established it as a maxim, that the primary properties of matter, are attraction and repulsion, and that mechanism is only a secondary property, he next considers muscular motion as referable to an original law of animated matter, whereby its particles are endowed with an attractive power, for which no cause can be assigned any more than for gravitation, cohesion, or chemical affinity. If the shortening of a muscular fibre depends on this increased power of attraction between its particles, the effect will be to add to the power of cohesion in the fibre; and to determine this the doctor made the following experiment: Having taken the flexor muscle of the thumb of a man newly dead while yet warm and flexible,
MUS

MUS

Muscles, he appended a weight to it, continually augmenting it until the muscle broke; and this he found was done when 26 pounds had been added: yet a living man of the same apparent strength and age could with ease lift a weight of 38 pounds by the exertions of the same muscle. "It is farther in proof of this fact (adds he), that in the case of a violent strain from muscular contraction in the living body, it is the tendon that gives way; whereas we have seen that in the dead body the muscle is the weaker of the two. It is also well known, that in cases of our exertion the muscular fibres themselves do not give way, though the strongest tendons, such as the tendon Achilles, and even bones, such as the knee-pan, are broken by their living force, which in such instances must be many times greater than the strength of the dead fibres. There is a case related in the Philosophical Transactions by Mr Amyand, wherein the os humeri was broken by an exertion of the muscles. Every one has heard of fractures happening from very slight accidents. These occur most probably from a jerk of the muscles concurring with the external violence. The sensible increase of the length of a muscle, when in a state of contraction, may also be considered as a proof of an increased attraction of its particles to each other at that time."

The Doctor next considers whether or not a muscle, when in a state of contraction, undergoes any change of density. "Every homogeneous body (says he) possesses a certain degree of density, determined by the dismance of its integrant particles. The most common means in nature by which the density of such bodies is altered, are heat and cold; the one universally producing expansion, the other condensation. Whether mechanical force has the same effects, is a point in natural philosophy not so well acertained; for though tension and collision produce in solid elastic bodies a change of figure, which they immediately resume when the force is withdrawn, it has not been ascertained whether in such cases a change of density takes place while the body is in a state of elongation or compression. Two elastic balls in the act of collision undergo a momentary change of figure, so that there must be an approximation of particles in the direction in which they are flattened; and in the elongation of an elastic cord by tension there must be an increased distance of the particles in one direction: but while these changes take place in one dimension of the respective bodies, they may be compensated by contrary changes in the other dimensions, so that the several bodies may preserve, upon the whole, the same solid contents. In order to ascertain this in the case of tension, which is the only case bearing analogy to muscular motion, I made the following experiment: I took a piece of the elastic gum, or caoutchouc, three inches square, and about the eighth of an inch in thickness; I procured a piece of sheet tin three inches broad and about six inches long, cut into sharp teeth at each end. The gum was first weighed in air, and found to be 380.25 grains. It was then weighed in water along with the tin, to which it was loosely attached, and the weight of both was then 758.75 grains. The gum was then stretched upon the tin by means of the teeth at each end to a surface of about five inches square, the tin being bent so as to leave a free space between it and the gum; in order that when immersed in water no air-bubbles might be entangled. In this situation, the weight of both in water was found to be 746.75 grains. Here was a difference of 12 grains, which could be owing only to a diminution of specific gravity; and in order to be sure that there was no fallacy nor inaccuracy in the experiment, the gum was immediately disengaged from one end of the tin so as to allow it to shrink; and being again weighed in this state in the water, it was found to have recovered exactly its former weight."

From this very remarkable experiment, the Doctor argues to what may probably happen in the contraction of the muscles. "This point (he says) cannot be decided but by an experimental examination. It might be determined whether a muscle occupies most space when relaxed or when contracted, by finding its specific gravity in each of those states by means of the hydrostatical balance. But this would be found extremely difficult; for the state of contraction is very transitory, and the motion itself would produce such a disturbance as would render the result unsatisfactory. As there is this obstacle to an experiment on a living muscle, it occurred to me that it might be performed on the muscles of a fish which had undergone the operation of cramping, as it is called; for in consequence of dividing the muscles, by cutting them when alive, they undergo a contraction which continues after death; and upon comparing by the hydrostatical balance, portions of muscle which had been crimped with those of the opposite side of the same fish which had on purpose been faved from this operation, it did not appear that there was any difference in the specific gravity. Two trials were made; one with the maeifter muscles of a skate, the other with the sides of a large trout."

To determine whether the contraction or relaxation of a living muscle made any alteration in its density, our author took one half of a living eel, and put it into a glass flask, of which the mouth was afterwards futed by a blow-pipe, and drawn out like the stem of a thermometer. The flask and tube being then filled with water, our author observed, with great attention, whether the convulsive agonies of the creature would make the fluid rise or fall; but it did neither. The tail part of the eel was made use of in this experiment, that there might be no deception from the other, which contained the organs of respiration and the air-bladder. In one of his trials, the tail portions of two eels were introduced into the flask; but though they were frequently both in convulsion at once, not the leaft motion of the fluid in the tube could be perceived. On this account also the Doctor made some experiments to decide the question, whether the mere circumstance of life made any alteration in the gravity of bodies? His first trials were with animals of warm blood, included in oil-skin and close tin vessels: but not being satisfied with the accuracy of these, from the difficulty of cutting off all communication with the external air, he included live eels in flasks; and having sealed them hermetically, he found that the weight of them when alive and dead was the very same.

The result of all our author's experiments is, that the contraction of a muscle produces no change in its density, and that animal life differs from inanimate matter in this respect, as well as in most of its other properties and laws. One purpose in nature for muscles always
always preferring the same density may be, that as
some of them act in confined cavities, inconveniences
might arise from their occupying more space at one
time than at another. In the extremities of crufi.
cacious animals, for instance, which are filled with
muscles, a change of density would be apt to burst them.

Another circumstance in which the contractions
of muscles differ from simple elasticity is, that the
former, however frequent and violent, does not pro-
duce any heat, as collision and tension are known to
do. This may admit of some cavil with regard to
animals of warm blood; for one of the theories with
regard to animal heat is, that it arises from the perpe-
tual vibration of muscular fibres, particularly those
of the vascular system; but this will not hold with re-
spect to animals of cold blood, in which the actions
of life are equally vigorous. The principal pheno-
mena, therefore, of muscular motion are, the shorten-
ing of the fibres, the lateral swell, the increase of
cohesion and hardness, and the unchanged density and
temperature. It would appear from the two last cir-
stances, that the intimate motions of the particles in
relation to one another must be different from what
take place in the several infancies of contraction and ex-
pansion of dead bodies. In the expansion arising from
the action of heat and the contraction from cold, the
change of density flows, that in the one case the ul-
timate particles must recede from each other, and in
the other they must approach. The same may be said
of elasticity. But as there is no alteration in the den-
fity of a muscle in passing from relaxation to contrac-
tion, this change cannot consist in the approximation
of the integral parts of the fibres, but must depend
on some other circumstances in the intimate dispositions
of the particles. In attempting to conceive in what
this consists, the following explanation may be offered.
It is probable that the regular structure of solid bodies
depends on the polarity and shape of their integrant
parts. Now all bodies, except such as are spherical,
must have a long and a short axis; and let us imagine
the fibres of muscles to be composed of spheroidal
particles, we may then conceive relaxation to consist
in their being disposed within their long axis in the line
of their fibres and contraction to consist in their short
axis being disposed more or less in that direc-
tion. This will not only account for the decurrent
and uniform density, but for the lateral swell, and
also for the increased hardness and cohesion; for
though the particles do not approach or recede, as
in bodies simply elastic, yet their power of attraction
will be increased by their centres being brought near-
er, and by being applied to each other by more ob-
late surfaces. This hypothesis accords with what has
been before proved concerning the unchangeable
density, for what is lost in one dimension is gained in
another; and the cause for there being no increase in
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another; and the cause for there being no increase in
temperature depends probably on the same circum-
stance by which the density is preferred unaltered.”

Thus far the Doctor has proceeded upon a plan,
which may become plausible by means of an hypothe-
sis at least; but in the prosecution of his subject he is
involved in the same difficulty which has proved too
hard for every other person, and which he, indeed,
does not attempt to solve. This is the action of stim-
uli, by which the muscles are exerted to contraction,
and upon which all the phenomena of life depends,
and which indeed is the thing that particularly ought
to be explained; but of this our author is forced to
confess his entire ignorance, and to content himself
with enumerating the stimuli of which he cannot ex-
plain the action. Stimuli then, according to him, are
divided into internal and external. An example of the
former kind is the circulation of the blood, which is
kept up by an exciting influence of the blood upon
the heart and vessels which contain and impel it. The
earliest perceivable instance of muscular motion is the
beating of the heart, as it is seen in the frst
rudiments of the embryo in an egg, and called the pudeum falens.
There seems to be established by nature a certain habi-
tude of action between the vessels and their fluids; for
if a fluid even more mild than the blood, such as milk, be injected into the circulation, it will produce great
disturbance; and if the blood, by being deprived of
the influence of respirable air, becomes destitute of a
certain property which it would naturally acquire in
the act of respiration, it does not prove a stimulus to
the heart.

In like manner, all the containing parts are accom-
modated to the nature of their respective contents.—
The intestines are so calculated as to have proper mo-
tions excited in them by the aliment and the secre-
tions which are mixed with it; and there are bodies
which, though perfectly mild, such as alimentary sub-
stances of difficult digestion, yet excite more violent
commotions in the stomach than other substances which
are very apericinous. The various effects of poisons
in different parts of the body may also be mentioned
as an illustration of the peculiar susceptibility of the
several organs of the body. The poison of a viper, for
instance, is perfectly innocent, not only in the re-
ceptacles of the animal which produces it, but may be
taken into the stomach of any animal without the least
bad effect, and only exerts its deleterious power when
brought in contact with a wounded part. Some ve-
getable poisons, on the contrary, such as that of lau-
vel water, prove deadly when taken into the mouth, or
applied to any part of the alimentary canal, but are
innocent when injected into the veins. It may be re-
marked also, that the receptacles of the several se-
crated fluids, such as the gall-bladder and bladder of
urine, are so adapted to their natural contents, by a
due measure of irritability, as to bear their accumu-
lation to a certain degree, and then to expel them.
We have here also a proof that irritability is not in pro-
portion to senibility; for both these receptacles are
extremely sensitive to pain and irritation from extra-
aneous acrmony, though so moderately sensitive to the
acrimony of their natural contents. This disposition
in the several organs to perform their natural functions,
in consequence of the stimulus of the respective fluids
they contain, has aply enough been called the natural
perception of these organs.

Our author now considering that the internal or-
gans are calculated to perform their functions in conseque-
ence of certain stimuli, concludes the application of che-
ical and mechanical stimuli is not a mode of expe-
iment likely to produce useful knowledge; and hence,
he thinks, we may fuggelt the most likely means of
reftoring lost irritability and action to the vital func-
tions, when suspended by suffocation, strangulation,
or immersion. In these cases, he says, that all other
means are far inferior to that of inhaling the lungs
with
muscles with atmospheric air, and stroking and pressing the ribs in such a manner as to imitate natural respiration. The only other thing which he supposes to be any way useful, is the application of heat to such as have been immersed in cold water; but of cool air to those who have suffered from mephitic vapours.

The Doctor having thus considered some other points of the animal economy, enters into an investigation of the analogy between motion and sensation. This analogy (says he) is the more exact, that the nerves seem to be the instruments of both; for not only the organs of sensation and voluntary motion, but those of involuntary motion, are supplied with nerves, and dependent upon them; for if the influence of the nerves leading to the heart or intestines be interrupted by cutting, ligation, or paralysis, the function of these parts, is thereby destroyed. Thus, as there is a peculiar sensibility belonging to the several senses, so there is a peculiar irritability belonging to the several organs of motion. The intention of nature, therefore, in distributing nerves to every muscular organ, was probably in order to constitute those peculiar perceptions on which the various vital and natural functions depend. But I give this view only as a conjecture, and though the nervous influence may thus modify irritability, there is reason to think that it does not flow it.

Our author controverts the principle which has been held by some very able physiologists, that all muscular irritability depends upon a sentient principle. There have been several influences (says he) in support of this opinion is, the existence of animals without brain or nerves. That there are such, was, I believe, first observed by Haller, and has been confirmed by Mr. Hunter, who maintains farther, that the stomach is a centre or seat of life more essential to it than the brain. That the stomach should be an organ of so much consequence, from natural enough from the importance of its function, which is that of assimilation; and life can be more immediately and completely extinguished by an injury to it, such as a blow, than by the flame violence to any other part of the body. It is also well known, that the muscular fibres of animals endowed with a nervous system, will retain their irritability for some time after their separation from the brain and nerves. It is evident likewise, from the phenomena of vegetation, that irritability may exist in nature without sensation, consciousness, or any fulpicion of the existence of a nervous system. In favour of this opinion, it is farther observable, that those animals which are defective of brain and nerves are of the class of nematous, the most simple in nature, having only one function, viz. that of assimilation; and therefore not requiring that variety of action, and those perceptions which are peculiar to more complex animals. Lastly, the state of an egg before incubation, and the condition of those animals which become torpid from cold, and afterwards revive, affords facts which favour this opinion; as they show that there is a certain principle of self-preservation, independent not only of the operation of the nervous system, but even of the circulation; for in this quiescent state, those portions of animal matter are preferred for a great length of time from that corruption to which they would otherwise be liable, and their fluids are prevented from freezing in a degree of cold which would congeal them, were they deficient of every principle of life.

In the course of his reasoning, our author considers the nervous system not only as a mere appendage to life, but as tending to impede its operation, and shorten its existence. "Simple life (adds he) will not only survive sensation, but will survive it longer, if the animal is killed by destroying the nervous system, than if it had been destroyed by hemorrhagy, suffocation, or other violence. If a fish, immediately upon being taken out of the water, is stunned by a violent blow on the head, or by having the head crushed, the irritability and sweetness of the muscles will be preserved much longer then if it had been allowed to die with the organs of sense entire. This is so well known to fishermen, that they put it in practice in order to make them longer susceptible of the operation called crimping. A salmon is one of the fishes least tenacious of life, inasmuch that it will lose all signs of life in less than half an hour after it is taken out of the water, if suffered to die without any farther injury; but if immediately after being caught, it receives a violent blow on the head, the muscles will show visible irritability for more than 12 hours afterwards."

To the same purpose, our author observes, that in warm-blooded animals an excessive exertion of voluntary motion immediately before death, prevents the muscles from being rigid when cold, and renders them more prone to putrefaction. Thus, if an ox is killed immediately after being overdrove, the carcass will not become stiff when it grows cold, nor is it capable of being preserved by means of salt. In confirmation of the same hypothesis also, our author observes, that in some disorders of the brain, such as hydrocephalus, and apoplectic palsy, in which the functions of the brain are suspended, the office of digestion is sometimes better performed than in health.

From all this our author concludes, along with Mr. Hunter, that the exercise of sensation is inimical to life, and that a sort of fatigue is induced by this as well as by voluntary motion; so that all that intercourse carried on through the nerves, whether towards the brain in the case of sensation, or from the brain in acts of volition, tends to wear out the animal powers. And, as intense and long continued thought, thought not terminating in any outward action, tends also to produce an inability for farther exertions, it would appear that the brain or fenestrum is more particularly the organ which is subject to that species of sufferance called fatigue. From these facts we perceive the necessity of sleep, which consists in a temporary suspension of sensation, volition, and thought, and is a resource of nature, whereby the powers of life recover themselves after satiety and fatigue, which are provided as guards to warn us when nature is in danger of being strained, either by repose or over-exertion; and it is evident that such barriers were absolutely necessary, in order to set bounds to operations which are only occasionally requisite, and which would otherwise depend on the caprice of the will. The exercise of sensation and voluntary motion in a moderate degree is conformable to the intention of nature, and therefore salutary; and it is only when they are excessive
efficaciously that they tend to wear out the powers of life, and more especially if there are not duly recruited by sleep. It follows, from the same principle, that when life is threatened by certain diseases, of which the chief symptom is irritation, any means by which sensation, whether natural or morbid, and muscular motion, whether voluntary, or involuntary, convulsive or spasmodic, can be foothered or suspended, will prove salutary, by allowing the powers of life to rally as it were, and to recover themselves. In this consists the operation of narcotic medicines, such as opium; which, in complaints both of a general and local nature, proves useful, not merely as a palliative by the time being then in the case of the removal of temporary pain or spasm, or by procuring sleep, but as a principal instrument of recovery, by allowing the powers of life to exert their natural action, in consequence of the removal of irritation."

In treating this subject, the Doctor considers the effects of opium as affecting simple or sensitive life; and to determine this, he made the following experiments: Having made a solution of opium in water he put into one portion of it some found living eels, and other portion he treated bruised; and in a number of trials it was found that the found eels generally died much sooner than the bruised ones. This, however was the case only when the solution was of a certain degree of strength, such as half a grain of opium at least to an ounce of water; for when only about half this strength, the found eels lived much longer, the time being then protracted to that in which the bruised eels would have died merely in consequence of their injury; but it must be observed, that even the wounded eels died considerably sooner than when put into plain water.

From all this, our author concludes, that "the great muscles of muscle in the trunk and extremities of the body are the instruments of the mind in acting upon external bodies; and we may therefore rank in the list of stimuli the nervous power by which the will and the passions excite external motions. This is a function sufficiently important for the nerves, without admitting as the principle on which irritability depends."

Having disclaimed all inquiry into the connection between muscular motion and volition, the Doctor proceeds to consider the effects of the different passions upon the muscles. Though these are distinct from the motions directly produced by the will, yet he considers them among those arising from consciousness; "for there are emotions of the mind which have visible and powerful effects upon the heart and vasaular system, which are organs entirely out of the reach of the will. Not to mention the well-known effects of grief, fear, and joy, which affect the whole circulation, there are certain passions and sentiments which produce partial and local effects. These are established by nature, either to answer some important purpose in nature, as in the case of the conjuction of the fluids in the parts of generation in consequence of the venereal appetite, to serve as natural expressions, as in the case of blushing or weeping. One of the most striking effects of the passions upon muscular action, is the influence they have upon the strength or mechanical force of the voluntary muscles. Fear produces debility almost amounting to palsy. Courage and ardour of mind, on the contrary, add to the natural strength. When the mind is agitated by some interesting object, and calls upon the body for an extraordinary exertion to effect its end, the muscles are thereby enabled, as it were by magic, to perform acts of strength of which they would be entirely incapable in cold-blood. In circumstances of danger, for instance, where life or honour are at stake, exertions are made for overcoming mechanical resistance which seem incredible, and would be impossible, were not the mind in a fort of frenzy; and it is truly admirable in the economy of nature, that an idea in the mind should thus in a moment augment the powers of motion and inspire additional resources of strength adequate to the occasional calls of life. The great increase of strength in maniacs is also referable to the passions of the mind. These considerations would almost lead us to doubt whether or not the accounts we have of the great feats of strength ascribed to individuals in the heroic ages be fabulous or not. It is also worthy of remark, that, in great and lafting exertions of strength to which men are impelled by active and generous affections, fatigue is not induced in the same proportion by the same degrees as by the same quantity of muscular action in the cool and deliberate actions of common life."

Having thus discussed the subject of internal stimuli, our author next proceeds to take notice of the second class, viz. such as are external. These are either immediate or remote, viz. such as are excited by mechanical means, or by acronymly directly and artificially applied to a muscular fibre; or such as occur in the instances of sympathy, and in the case of those instincts which have instituted for the purpose of self-preservation in brutes, and in the early part of human life. "There are certain habits (says he) between outward stimuli and the moving powers whereby natural propensities are constituted equally necessary to the support of life as the internal functions. Thus, in new born animal, the first contact of the external air excites the act of respiration, and the contact of the nipple excites the act of sucking; both of which actions are absolutely necessary to the maintenance of life, and require the nice co-operation of a great number of muscles prior to all experience. Actions of this kind are called instinctive; but though different from those of voluntary motion, they nevertheless run into one another; so that what was at first merely instinctive, may afterwards become a matter of deliberate choice. The same muscles are the instruments of both; and they differ from the muscles obeying the internal stimuli, such as the heart, as being liable to fatigue, and thereby concurring with the exercise of sensation and of thought, in rendering sleep necessary. There are no muscles except those of respiration, of which the constant action is necessary to life, and which are void of consciousness in their ordinary exercise, but which are yet in some measure under the control of the will. The principal and answered by this power of the will over the muscles of respiration in man, is to form and regulate the voice. But though instinctive motions are in some cases convertible into those which are voluntary, they ought by no means to be confounded together; for even those animals which are destitute of brain and nerves, are capable of actions evidently of the instinctive kind."
Besides these observations on the inferior animals, our author brings some experiments to shew, that instinctive actions, even in animals furnished with a brain and nerves, do not depend on sensibility. Having divided the spinal marrow of a live kitten a few days old, he irritated the hind-paws by touching them with a hot wire. By this the muscles of the posterior extremities were thrown into contractions, so as to produce the motion of shrinking from the injury; and the same effects were observed in another kitten of which the head was entirely separated from the body. In repeating this experiment he found, that when the spinal marrow was cut through between the lumbar vertebrae and os ilium, the posterior extremities lost their irritability, but the tail returned it. Even the head retained its irritability after it was cut off; as appeared by touching the ears with a hot wire, or by prickling them: “and (says our author) as the extremities are also irritable, it will not be said that consciousness and sensation exist in two separated portions of the body.”

The effects of habit are then considered; and the conclusion from the doctor’s reasoning upon this subject is, that “there is a co-ordination, or pre-establish ed harmony, as it were, between the faculties of animals and the laws of external matter, which is the foundation of all the instinctive habits of animals, as well as the rational conduct of man.”

To the law of habit have been referred the effects of certain contagions, such as that of the small-pox, which do not produce their effect more than once in life. With respect to this he observes, “that upon whatever principle this property of the animal economy depends, it is an undoubted fact, that these morbid poisons, after exciting a certain degree of disturbance, and a certain series of diseased actions, no longer make any impression on the powers of life, otherwise there could be no such thing as recovery; for at the time in which a person begins to recover from the small-pox, the poison actually present in the circulating fluid is multiplied infinitely beyond what it was when it excited the disease. The constitution has therefore at that time, with respect to this acrimony, acquired an insensibility, or rather want of irritability; and this it preserves ever afterwards. This, however, holds only with regard to those morbid poisons which excite febrile affections, and seems to be a necessary provision of nature to guard against such noxious principles as are generated within the body itself.”

Having lastly considered the effects of irritation upon the human body, the Doctor goes on to consider a very remarkable property of living muscles, viz. that of their being in a constant state of tension, more or less, independent of any temporary stimulus. This is evident from what happens when any muscle is cut; for then there is an immediate retardation of the separated parts; and that this is their natural state is farther proved by the spontaneous motion which takes place in consequence of the relaxation of an antagonist muscle, as when the mouth is drawn to one side in consequence of hemiplegia. Some degree of tension indeed is necessary for the performance of the natural motions of the muscles, whether voluntary or involuntary; and the vigour with which the several actions are performed depends on the due degree of this tone.

This tone of muscles is every where maintained by a certain counteracting mechanical power; the great muscles are kept on the stretch by the bones, the heart and vessels by the mass of fluids, and the intestines by the aliment taken in, and their other contents. Difficulties of various kinds may arise from the different degrees of this tension, and the vacuular system is more apt to be affected by different degrees of tension than any other part of the body; and our author considers what is called a nervous habit as one of the effects of want of tension. He likewise attributes to the different degrees of tension, more than to any thing else, the great difference of constitutions observable among mankind. He observes also that the tension of the muscles is greatly affected by sympathy. “This, says he) is particularly observed in the blood-veins and intestines; for a relaxation in those will produce a like affection in every other part of the animal system. With regard to the intestines, it may be mentioned among other proofs, that it is common for persons in a state of great weakness to be affected by syncope, and even instantaneous death in the act of evacuating the bowels. It seems to be from a like cause that a temporary lowness is produced by an abscess being opened.

The Doctor concludes his subject with considering the muscles as mechanical powers. “As they constitute the strength of animals, it may be proper to consider the relation of their strength to their bulk, and the relation of the bulk and strength of the body to the density and cohesion of its own materials; and to the bulk, density, and cohesion of the external inanimate bodies with which it is conterminous.”

“According to the observations of Galileo, that in familiar unequal bodies, of a cylindrical or prismatic shape, such as the limbs of animals nearly are, the ratio of their efforts to break by their own weight is in the quadruplicate ratio of their lengths; but that the resistance they make to the same force is only in the triple ratio of their lengths. It follows from this, that in order to endow the limbs of animals with the same relative force, it is not only necessary that the bones should possess an increased proportion of thickness, in order to give an adequate increase of what may be called the dead strength; but a similar increase of living strength is necessary, by a suitable addition of muscular power, in order to keep pace with the increased size of the bones. Now we observe, in fact, that in the large-sized animals, such as the bull and the elephant, the thickness of their bones and muscles becomes greater in proportion to the length of their limbs than in the smaller animals, and they are therefore of a less elegant form. But nature has not carried this so far as to compensate for the disadvantage arising from the increase of size; for the greater animals have not the same proportional strength, in relation to their bulk, that the smaller animals have. It has been computed that a flea can draw from 70
to 80 times its own weight, whereas a horse cannot
with ease draw more than three times his own weight.
This disproportion between size and strength is very
obvious in different individuals of the human species;
and great men are not muscular, even in the simple
proportion of their stature."

Our author now proceeds to assign some reasons why
the stature of mankind in general is not larger than we
see it. Some observations upon this subject are made
under the article Giant, where it is attempted to show,
that by increasing the proportional strength of the
materials, the size of the human body might have
been augmented in any proportion. To this, however,
the Doctor replies, that "had the bones been
harder, they would not have been calculated for the
common duration of life, the effect of which being to
increase their hardneß and dryness, they must be
endowed originally with a certain degree of softness
and succulence; and, with regard to muscles, a degree of
hardness much greater than they possess would have been
incompatible with their contractility." But the reason
that does not seem to be conclusive. The bones of
a lion are said to be much harder than those of any
other animal; yet we do not find that these creatures
are liable to any kind of disease in consequence of this
superior hardneß. Neither is any inconvenient degree
of hardneß in the muscles a necessary consequence of
their increased strength; for silk, though equally soft
and flexible, may much more so than hemp or flax, is
nevertheless much stronger; and we cannot by any
means doubt, that if men had formerly been of a larger
stature than they are at present, the materials of
their bones and muscles might have been proportiona-
ably stronger, without the least injury or impediment to
any of the operations of life.

When we consider the manner in which the muscles
act upon the bones into which they are inserted, we
may be apt to think that nature has been very prodi-
gal of mechanical power; for considering the bones
as levers, the muscles act upon them at a very great
disadvantage, being always inserted much nearer
the fulcrum than the weight to be raised. Thus the two
muscles of the arm, named biceps and brachialis internus,
in order to support in the hand a weight of one pound
with the forearm at right angles to the humerus, must
exert a power equal to ten pounds. Another circum-
cance also which tends to waste the power is, the ob-
liquity with which they are inserted into their bones;
so that the greater part of the force is expended in
pressing one bone against another at the articulation,
and only a small part of it in making the flexures
and extensions. These disadvantages, however, are
compensated by a number of conveniences which could
not have been obtained on any other plan. We must
think, that the musculous fibres of the arm are so con-
structed that they are inserted at an angle to the long
axis of the bone, so that, making the momentum of
this last depend on velocity, it is evident that there must
be a great advantage from the insertion of the tendons
in the centre of rotation, as greater velocity with less
expense of contraction will thus be communicated to the extremity. The
muscles, for instance, which are attached to the olecu-
navus, in performing those actions with the hand which
require rubbing, act with a disadvantage exactly pro-
portional to the inequality of the distance from their
insertion to the joint of the elbow, and that from the
same joint to the hand. This is an act of pleasure.
But in the case of percussion, as in the action of using
a hammer, there is an evident advantage resulting from
the velocity communicated to the extremity; for in
order to have produced the same velocity, with the in-
sertion at a greater distance from the centre of motion,
a much greater degree of contraction would have been
necessary; and our author shows that fatigue principally
depends on a contraction of the muscles. "If any
one (says he) will take the trouble of comparing
the fatigue of the biceps muscle, in bearing a weight in
the hand with the elbow-joint bent to a right angle
with that of bearing the same weight for the same
length of time with the joint at an acute angle, he
will be sensible how much the degree of fatigue de-
pends on the extent of contraction; and, by attend-
ing to the relative situation of muscular fibres, it will
appear, that Nature, in distributing the fibres of
muscles obliquely, has had it in view not only to in-
crease their number, but to save contraction."

In considering the actions of the various muscles in
producing the different actions of the body, we find
several one produced that can be called direct. In
some instances, we find two muscles, or two sets of
muscles, co-operating, so that the motion effected by
them shall be in the diagonal of their direction. This
is the case of the oblique muscles of the abdomen in
some of their actions, and of the intercostal muscles in
all theirs. Sometimes different portions of the fame
muscles combine in like manner to produce a similar
effect; and in all the long muscles, however simple
their origin and insertion may be, there is an internal
obliquity of their fibres with regard to one another;
for these do not run from end to end, but there are
parts of the tendon running into the belly of the
muscle, so as to divide it into penniform and rhomboidal
portions. This distribution of the fibres takes off
from the length; but as it takes place in those cases
where the origin and insertion are at a considerable
distance, this can be afforded: and this, as well as the
waste of power, in consequence of oblique action, is
more than compensated by the increased strength from
the fibres being multiplied; for, in consequence of
this structure, there is an extent of tendon afforded
sufficient for the insertion of a greater number of fleth
fibres.

The Doctor illustrates this principle in the mecha-
nism of muscular action from the example of fish;
a species of animals which exert greater muscular
powers than any others. "The muscles of most fish
(says he) consist of regular series of oblique short
fibres, forming those frata which every one must have
observed in their muscular substance. Their motions
are more simple and limited than those of land-animals,
but much more vigorous; for a fish in the sea has to
make its way through a medium about 1000 times
more dense than air, and with more rapidity than
those which inhabit the land. Nature, therefore, in
stead of giving them muscles whose fibres would run
straight from one end of their body to the other, has
multiplied their numbers, by distributing them into
short and oblique portions. I have seen the sword of
a swordfish striking in a plank, which it had
penetrated from side to side: and when it is considered
that
that the animal was then moving through so dense a medium, and in the same direction with the ship, we must form a high conception of its muscular power.

Lastly, our author gives a mathematical demonstration, that by the obliquity of the muscles a very considerable quantity of contraction is saved, and consequently a proportional degree of fatigue prevented.—

"Let the line AB (says he) in the annexed diagram, represent a moveable bone, and the line CD a fixed bone parallel to it. Let FE, perpendicular to these lines, represent a muscle acting in its own direction, and the lines GE, HE, represent two muscles acting obliquely, and producing by a diagonal action the same effect as the other. If the bone AB be brought to the situation a b by the action of the muscle FE, the muscle will then be in the situation FK. If the bone is brought in the same situation by the action of the muscles GE, HE, these muscles will then be in the situation GK, HK.

"The proposition to be demonstrated is, that the line GK bears a greater proportion to the line GE, than the line FK does to line FE; for FK is to GE as GL is to GE (Eucl. Elem. B. vi. Prop. 2.) and the angle ELK being less than a right angle, the angle GLK, which is adjacent to it, must be greater than a right angle; and the angle GKL being in the same triangle with GLK, must be less than a right angle. The line GK, therefore, which subduals the greater angle, is greater than the line GL, subtending the lesser, and therefore bears a greater proportion to GE. But the line GL is to GE as FK is to FE; and therefore GK bears a greater proportion to GE than FK does to FE; that is, the fibres of the muscles acting obliquely, suffer a less proportional decrature than those of the muscle acting directly.

"It is farther obvious, that the more oblique the action becomes, the greater saving there will be of contraction; for in moving the line a b towards CD, the line FK diminishes in a swifter ratio than the line GK; and when the former has vanished, the latter is in the situation GF."

Besides these advantages in point of diminishing fatigue, there are others relating to the shape of the members. Thus, if the insertions of the muscles had been at a great distance from the joints, they must upon every occasion have paffed like bow-strings from one bone to the other, and the limbs must have been exceedingly clumsy and unwieldy; all the motions must also have been extremely slow: and notwithstanding the superior strength which people would then have enjoyed, it is very plain that they would scarce have been fit for any of the offices of life which they now perform.

MUSCLE, in zoology. See Myotus.
MUSCOVY. See Russia.
Muscovy-Glass, or Glimmer. See Mica.
MUSCULUS, a military machine, made use of by the Romans to cover and protect the soldiers while they approached and undermined the walls of besieged places, or filled the ditches. It seems to have resembled the teitudo in form, but was smaller in size. See Testudo.

MUSEA, were Grecian festivals in honour of the Muses, celebrated with games every fifth year, particularly by the Thesprians. The Macedonians also observed a festival of the same name in honour of Jupiter and the Muses, which lasted for nine days, and was celebrated with stage plays, songs, and poetical compositions.

MUSES, certain fabulous deities among the Pagan, supposed to preside over the arts and sciences; for this reason it is usual for the poets, at the beginning of a poem, to invoke these goddesses to their aid.

The Muses were originally only singers and musicians in the service of Orpheus, or the great Egyptian Bacchus, under the instruction and guidance of his son Orus; but in succeeding times they were called the daughters of Jupiter and Mnemosyne or Memory.

These are the only pagan divinities whose worship has been continued through all succeeding changes in the religion and sentiments of mankind. Protectors of every liberal art in all the countries of Europe still revere them; particularly the poets, who seldom undertake the slightest work without invoking their aid.

Sir Isaac Newton tells us, that the singing women of Oliris were celebrated in Thrace by the name of the Muses; and that the daughters of Pierus, a Thracian, imitating them, were celebrated by the same name.

Diodorus Siculus informs us, that Alcman of Melfene, a lyric poet who flourished in the 27th Olympiad, 670 years B.C. makes them the daughters of Uranus and Terra. It has been asserted by some ancient writers, that at first they were only three in number, but Homer, Hesiod, and other profound mythologists, admit of nine (a).

In his hymn to Apollo, Homer says,

—By turns the nine delight to sing.
And Hesiod, in his theogony, names them all.—
They are said severally to preside over some art or science, as music, poetry, dancing, astronomy. By some they are called virgins, because the virtues of education appear unalterable; they are called musae from a Greek word which signifies to explain mysteries, because they have taught things the most curious 

(a) It has been said, that when the citizens of Sicyn directed three skillful flatuaries to make each of them statues of the three Muses, they were all so well executed, that they did not know which to choose, but erected all the nine, and that Hesiod and Homer only gave them names.
and important to know, and which are above the comprehension of vulgar minds. Each of their names is said to include some particular allegory; Cloe, for instance, has been thus called, because those who are praised in verse acquire immortal fame; Euterpe, on account of the pleasure accruing to those who hear learned poetry; Thalia implies for ever flourishing; Melpomene, that her melody infinuates itself into the immortal recettes of the soul; Terpsichore marks the pleasure which those receive who are versed in the liberal arts; Erato seems to indicate, that the learned command the elate and friendship of all mankind; Polyhymnia, that many poets are become immortal by the number of hymns which they have addressed to the gods; Urania, that those whom the intrusts elevate their contemplations and celebrity to the heavens and the stars; and lastly, the exquisite voice of Calliope has acquired her that appellation, as the inventress and guardian of eloquence and rhetoric.

An epigram of Callimachus gives the attributes of the muses in as many lines.

Calliope the deeds of heroes sings;
Great Cloe sweeps to history the strings;
Euterpe teaches mimes their silent flow;
Melpomene prefides o'er scenes of woe;
Terpsichore the flute's soft pow'r displays;
And Erato gives hymns to the gods to praise;
Polyhymnia's skill inspires melodious strains;
Urania, the harry course explains;
And gay Thalia's glas points out where folly reigns.

This epigram does not however, exactly correspond with the ideas of other poets, or of the ancient painters, in characterizing the attributes of the muses. The ancients had numberless ingenious and fanciful ideas concerning the muses, which we have not room to recite." It seems (says the Abbe Barthelme*) as if the first poets, enchanted with the beauties of nature, occasionally were led to invoke the nymphs of the woods, hills, and fountains; and that yielding to the prevailing taste for allegory, they gave them names relative to the influence they might be supposed to have over the productions of the mind. At first three muses only were admitted, Melete, Mneme, and Aecia: that is to say, the meditation or reflection necessary to study; memory which records illustrious deeds; and song which accompanies their recital. In proportion as improvement was made in the art of verification, its characters and effects were perfonified, the number of the muses increased, and the names they now received referred to the charms of poetry, its celestial origin, the beauty of its language, the pleasure and gaiety it inspires, the song and dance which add to its new charms, and the glory with which it is crowned. Afterwards were associated with them the Graces, whose employment it is to embellish poetry, and Love who is so frequent in its object. These ideas took birth in a barbarous country, in Thrace, where Orphics, Linus, and their disciples, suddenly appeared in the midst of ignorance. The muses were honoured there on the Pierian mount, and extending their dominion, successively to k their illustrious on Pindus, Parnassus, Helicon, and all those solitary places where the painters of nature, surrounded by the most pleasing images, experience the divine glow of inspiration."

Pythagoras, and afterwards Plato, make the muses the soul of the planets in our sytem; from whence the imaginary music of the spheres.

MUSEUM, a name which originally signified a part of the palace of Alexandria, which took up at least one-fourth of the city. This quarter was called the museum, on account of its being set apart for the muses and the study of the sciences. Here were lodged and entertained the men of learning; who were divided into many companies or colleges, according to the sciences of which they were the professors; and to each of these houses or colleges was allotted a handsome revenue. The foundation of this establishment is attributed to Ptolemy Philadelpbus, who here placed his library. Hence the word museum is now applied to any place set apart as a repository for things that have an immediate relation to the arts.

The museum at Oxford, called the Ashmolean museum, is a noble pile of building, created at the expense of the university, at the west end of the theatre, at which tide it has a magnificent portal, sustained by pillars of the Corinthian order. The front, which is to the street, extends about 60 feet, where there is inscribed over the entrance in gilt characters, Museum Ashmoleanum, schola naturalis historiae, officina othyica. It was begun in 1679, and finished in 1683, when a valuable collection of curiosities was presented to the university by Elias Ashmole, Esq: which were the same day repofited there; several acquisitions have been since made to the museum; among which are hieroglyphics, and other Egyptian antiquities, an entire mummy, Roman antiquities, altars, medals, lamps, &c. and a variety of natural curiosities.

The British museum in London is a large, beautiful, and magnificent building, the noblest cabinet of curiosities in the world. See the article London, no 155.

MUSGRAVE (Dr William), a learned physician and antiquary, was born at Charlton-Musgrave in Somcrshire, about the year 1657; and studied at New-college, Oxford. Having distinguished himself by his knowledge in his profession, and his skill in natural philosophy, he was elected fellow of the Royal Society; and being made secretary in 1684, he continued the Philosophical Transactions from no 167 to no 178 inclusive. After having taken his degrees in physic, and being admitted a fellow of the college of physicians, he went and settled at Exeter, where he practiced physic with great reputation and success.

Being a man of extensive learning, he composed, at his leisure hours, several curious and valuable works, as, 1. De arborescere anomala seu interna differentia. 2. De arborescere symptomatica differentia. 3. Full. Visulii epistilium, cum commentario. 4. De legiones epilola. 5. De aquila Romanæ epilola. 6. Inscriptio Terrae-venenatis, cum commentario. 7. Geta Britannicus, &c.—8. Belgium Britannicum. This learned physician died in 1721.

MUSHROOM, in botany. See Agaricus and Lycopus.

To try the quality of mushrooms:—Take an onion, and stripe the outer skin, and boil it with your mushrooms: if the onion become blue or black, there are certainly dangerous ones among them; if it remain white, they are good.
THE art of combining sounds in a manner agreeable to the ear. This combination may be either simultaneous or succesive; in the first case, it constitutes harmony; in the last melody. But though the same sounds, or intervals of sound, which give pleasure when heard in succession, will not always produce the same effect in harmony; yet the principles which constitute the simpler and more perfect kinds of harmony, are almost, if not entirely the same with those of melody. By perfect harmony, we do not here mean that plenitude, those complex modifications of harmonic sound, which are admired in practice; but that harmony which results from the coalescence of simultaneous sounds produced by vibrations in the proportions of thirds, sixths, and octaves, or their duplicates.

The principles upon which these various combinations of sound are founded, and by which they are regulated, constitute a science, which is not only extensive but profound; when we would investigate the principles from whence these happy modifications of sound result, and by which they are determined; or when we would explore the sensations, whether mental or corporeal, with which they affect us. The ancient definitions of music are not proportioned in their extent to our present ideas of that art; but M. Roufeau betrays a temerity highly inconsistent with the philosophical character, from whence he infers, that their ideas were vague and undetermined. Every soul susceptible of refinement and delicacy in taste or of which sounds are susceptible: relations which, comprehending all the possible combinations of music and sounds, seem likewise to comprehend all the causes of the impressions which their succession can make upon the ear and upon the soul.

Practical music is the art of applying and reducing to practice those principles which result from the theory of agreeable sounds, whether simultaneous or succesive; or, in other words, to conduct and arrange sounds according to the proportions resulting from them, from duration and succession, in such a manner as to produce upon the ear the effect which the composer intends. This is the art which we call composition. With respect to the actual production of sounds by voices or instruments, which is called execution, this department is merely mechanical and operative; which, only presupposing the powers of sounding the intervals true, of exactly proportioning their degrees of duration, of elevating or depressing sounds according to those gradations which are prescribed by the voice, and to the value required by the time, demands no other knowledge but a familiar acquaintance with the characters used in music, and a habit of expressing them with promptitude and facility.

Speculative music is likewise divided into two departments; viz. the knowledge of the proportions of sounds or their intervals, and that of their relative durations; that is to say, of measure and of time.

The first is what among the ancients seem to have been called harmonical music. It flows in what the nature of air or melody consists; and discovers what is consonant or discordant, agreeable or disagreeable, in the modulation. It discovers, in a word, the effects which sounds produce on the ear by their nature, by their force, and by their intervals; which is equally applicable to their consonance and their succession.

The second has been called rhythmic, because it treats of sounds with regard to their time and quantity. It contains the explication of their continuance, of their proportions, of their measures whether long or short.
short, quick or slow, of the different modes of time and
the parts into which they are divided, that to these
the succession of sounds may be configured.

Practical music is likewise divided into two depart-
ments, which correspond to the two proceeding.
That which answers to harmonical music, and which
the ancients called melopée, teaches the rules for com-
bining and varying the intervals, whether consonant or
dissonant, in an agreeable and harmonious manner.
The second, which answers to the rhythmical music,
and which they called rythmogetes, contains the rules
for applying the different modes of time, for under-
standing the feet by which verses or phrases were scanned,
and the diversities of measure; in a word, for the practice of
the rhythmus.

Music is at present divided more simply into melody
and harmony; for since the introduction of harmony the
proportion between the length and shortness of sounds,
or even between that of returning cadences, are of less consequence amongst us. For it often
happens in modern languages, that the very affumee their measure from the musical air and almost
together lose the small share of proportion and quantity
which in themselves they possess. By melody the successions of sound are regulated in
such a manner as to produce pleasing airs. See Melo-
dy.

Harmony consists in uniting to each of the sounds,
in a regular succession, two or more different sounds,
which simultaneously striking the ear sound by their
concurrency. See Harmony.

Music, according to Rousseau, may be, and perhaps
likewise ought to be, divided into the physical and the
initiative. The first is limited to the mere mechanism of
sounds, and reaches no farther than the external senses.
without carrying its impression to the heart, and can
produce nothing but corporeal sensations more or less
agreeable. Such is the music of songs, of hymns, of
all the airs which only consist in combinations of mel-
lodious sounds, and in general all music which is
merely harmonious.

It may, however be questioned, whether every sound,
even to the most simple, is not either by nature or by
early and confirmed association, initiative. If we may
trust our own feelings, there is no such thing in nature as
music which gives mechanical pleasure alone. For
if it, must give such pleasure as we receive from
tastes, from odours, or from other grateful titillations;
but we absolutely deny that there are any musical sen-
sations or pleasures in the smallest degree analogous to
these. Let any piece of music be resolved into its ele-
mental parts and their proportions, it will then easily
appear from this analysis that sense is no more than
the vehicle of such perceptions, and that mind alone
can be susceptible of them. It may indeed happen
from the number of the performers and the complica-
tion of the harmony, that meaning and sentiment may be
lost in the multiplicity of sounds; but this, though
it may be harmony, loses the name of music.

The second department of this division, by lively and
accentuated inlections, and by sounds which may be
said to speak, expresses all the passions, paints every
possible picture, reflects every object, subjects the
whole of nature to its skilful imitations, and impres-
ses even on the heart and soul of man sentiments
proper to affect them in the most sensible manner.
This continues he, which is the genuine lyric and
theatrical music, was what gave double charms and
energy to ancient poetry; this is what, in our days,
we exert ourselves in applying to the drama, and what
our fingers execute on the stage. It is in this music
alone, and not in harmonics or the refection of na-
ture, that we must expect to find accounts of those
prodigious effects which it formerly produced.

But, with M. Rousseau's permission, all music which
is not in some degree characterized by these pathetic
and imitative powers, deserves no better name than that
of a musical jargon, and can only be effectuated by such
a complication and intricacy of harmony, as may con-
found, but cannot entertain the audience. This cha-
acter therefore, ought to be added as essential to the
definition of music; and it must be attributed to our
neglect of this alone, whilst our whole attention is be-
lowed on harmony and execution, that the best per-
fomances of our artists and composers are heard with
little or indifference and omission, nor even can con-
vince any admirers, but such as are induced, by pedan-
try and affectation, to pretend what they do not feel.
For may the curfe of indifference and want of pur-
pose and bareness the fons of every composer or per-
former, who pretends to regale our ears with this mu-
cical legedemain, till the grin of scorn, or the hiss of
infamy, teach them to correct this depravity of taste,
and entertain us with the voice of nature!

Whilst moral effects are fought in the natural effects
of sound alone, the scrutiny will be vain, and disputes
will be maintained without being understood; but founds, as representatives of objects, whether by nature
or association, introduce new scenes to the fancy and
new feelings to the heart; not from their mechanical
powers, but from the connection established by the au-
thor of our frame between sounds and the objects
which either by natural resemblance or unavoidable
association they are made to represent.

It would seem that music was one of those arts
which were first discovered, and that the vocal was prior
to instrumental music, if in the earliest ages there
was any music which could be said to be purely intru-
mental. For it is more than probable, that music was
originally formed to be the vehicle of poetry; and of
consequence, though the voice might be supported and
accompanied by instruments, yet music was never in-
tended for instruments alone.

We are told by ancient authors, that all the laws,
whether human or divine, exhortations to virtue, the
knowledge of the characters and actions of gods and
heroes, the lives and achievements of illustrious men
were written in verse, and sung publicly by a quire to
the sound of instruments; and it appears from the
Scriptures, that such from the earliest times was the
custom among the Israelites. Nor was it possible to
find means more efficacious for impressing on the mind
of man the principles of morals, and inspiring the
love of virtue. Perhaps, however, this was not the
result of a premeditated plan; but inspired by sublime
sentiments and elevation of thought, which in accents
that were suited and proportioned to their celestial
nature endeavored to find a language worthy of themselves and expressive of their grandeur.

It merits attention, that the ancients were duly sen-
fible
Music.

Of the value and importance of this divine art, not only as a symbol of that universal order and symmetry which prevails through the whole frame of material and intelligent nature, but as productive of the most momentous effects both in moral and political life. Plato and Aristotle, who disagreed almost in every other maxim of politics, are unanimous in their approbation of music, as an efficacious instrument in the formation of the public character and in conducting the state; and it was the general opinion, that whilst the gymnastic exercises rendered the constitution robust and hardy, music humanized the character, and softened those habits of roughness and ferocity by which men might otherwise have degenerated into savages. The gradations by which voices were exerted and tuned, by which the invention of one instrument succeeded to another, or by which the principles of music were collected and methodized in such a manner as to give it the form of an art and the dignity of a science, are topics so fruitful of conjecture and so void of certainty, that we must leave them to employ minds more speculative and invention more prolific than ours, or transfer them to the History of Music as a more proper place for such dilusions. For the amelioration of the curious, Routian in his Musical Dictionary, Plates C and N, has transferred some fragments of Greek, Persian, American, Chinese, and Swiss music, with which performers may entertain themselves at leisure. When they have tried the pieces, it is imagined they will be less fancifully fond than that author of ascribing the power of music to its affinity with the national accents where it is composed. This may doubtless have its influence; but there are other causes more permanent and less arbitrary to which it owes its most powerful and universal charms.

The music now most generally celebrated and practiced is that of the Italians, or their successful imitators. The English, from the invasion of the Saxons, to that more late though lucid era in which they imbibed the art and copied the manner of the Italians, had a music which neither pleased the soul nor charmed the ear. The primitive muse of the French deserves no higher panegyric. Of all the barbarous nations, the Scots and Irish seem to have possesed the most affecting original music. The first consists of a melody characterized by tenderness: It melts the soul to a pleasing pensive languor. The other is the native expression of grief and melancholy. Tartini informs us, that in his time a prince from Scotland had imported into Italy a lamentable kind of music from his own country; and that he himself had composed pieces in the same spirit. From this expressive though laconic description, we learn, that the character of our natural music was even then established: yet so gross is our ignorance and credulity, that we ascribe the best and most impassioned airs which are past among us to David Rizzie; as if an Italian Lutanist, who had lived but a time in Scotland, could at once, as it were by inspiration, have imbued a spirit and composed in a manner different from his own. It is yet more surprising that Gemmisati should have entertained and published the same prejudice, upon the miserable authority of popular tradition alone; for the fact is authenticated by no better credentials. The primitive music of the Scots may be divided into the martial, the pastoral, and the idyllic. The first consists either in marches, which were played before the chieftains, in imitation of the battles which they fought, or in lamentations for the catastrophes of war and the extinction of families. These wild effusions of natural melody preserve several of the rules prescribed for composition. The strains, though rude and untutored, are frequently terrible or mournful in a very high degree. The port or march is sometimes in common, sometimes in treble time; regular in its measures, and exact in the distance between its returning cadences; most frequently, though not always, loud and brisk. The pastoral, or imitation of battles, is wild, and abrupt in its transitions from interval to interval and from key to key; various and defultory in its movements: frequent irregular in the return of its cadences; and in short, through the whole, seems inspired with such fury and enthusiasm, that the hearer is irresistibly infected with all the rage of precipitate courage, notwithstanding the rudeness of the accents by which it is kindled. To this the pastoral forms a striking contrast. Its cadences are plaintive, yet soothing; its harmony generally flat; its modulations natural and agreeable; its rhythm simple and regular; its returning cadences at equal distance; its transitions from one conciseful interval to another, at least for the most part; its movements slow, and may be either in common or treble time. It scarcely admits of any other harmony than that of a simple bass. A greater number of parts would cover the air and destroy the melody. To this we shall add what has been said upon the fame subject by Dr Franklin. Writing to Lord K——, he proceeds thus:

"Give me leave, on this occasion, to extend a little the sense of your position, 'That melody and harmony are separately agreeable, and in union delightful;' and to give it as my opinion, that the reason why the Scotch tunes have lived so long, and will probably live for ever (if they escape being filched in modern affected ornament), is merely this, that they are really compositions of melody and harmony united, or rather that their melody is harmony. I mean, the simple tunes sung by a single voice. As this will appear paradoxical, I must explain my meaning. In common acceptation, indeed, only an agreeable succession of sounds is called melody; and only the concurrence of agreeable sounds, harmony. But since the memory is capable of retaining for some moments a perfect idea of the pitch of a past sound, so as to compare it with the pitch of a succeeding sound, and judge truly of their agreement or disagreement, there may and does arise from thence a sense of harmony between the present and past sounds, equally pleasing with that between two present sounds. Now the construction of the old Scotch tunes is this, that almost every succeeding emphatic note is a third, a fifth, an octave, or in short some note that is in concord with the preceding note. Thrice are chiefly used, which are very pleasing concords. I use the word emphatic, to distinguish those notes which have a freis laid on them in singing the tune, from the lighter connecting notes that serve merely, like grammar articles in common speech, to tack the whole together."

That we have a most perfect idea of a sound just past, I might appeal to all acquainted with music,
MUSIC is capable of a variety so infinite, so greatly does the most simple differ from the most complex, and so multiplied are the degrees between these two extremes, that in no age could the incidents respecting that fascinating art have been few or uninteresting. But, that accounts of these incidents should have been handed down to us, scanty and imperfect, is no matter of surprise; when we recollect that the history of music is the history only of sounds, of which writing is a very inadequate medium; and that men would long employ themselves in the pleasing exercise of cultivating music before they possessed either the ability or the inclination to record their exertions.

No accurate traces, therefore, of the actual state of music in the earlier ages of the world, can be discerned. Our ideas on the subject have no foundation firmer than conjecture and analogy. It is probable, that among all barbarous nations some degree of similarity is discernible in the style of
History.

Musical instruments, Neithor will much difference appear during the first dawnings of civilization. But in the more advanced periods of society, when the powers of the human mind are permitted without obstacle to exert their native activity and tendency to invention, and are at the same time affected by the infinite variety of circumstances and situations which before had no existence, and which in one case accelerate, and in another retard; then that similarity, once so distinguishable, gives place to the endless diversity of which the subject is capable.

The practice of music being universal in all ages and all nations, it would be absurd to attribute the intelligence and the favourite residence of genius to any one man. It must have suffered a regular progression, through infancy, childhood, and youth, before it could arrive at maturity. The first attempts must have been rude and artless; perhaps the first flute was a reed of the lake.

No nation has been able to produce proofs of antiquity so indisputable as the Egyptians; it would be vain, therefore, to attempt tracing music higher than the history of Egypt.

By comparing the accounts of Diodorus Siculus and of Plato, there is reason to suppose, that in very ancient times the study of music in Egypt was confined to the priesthood, who used it only on religious and solemn occasions; that, as well as sculpture, it was sanctified by law; that it was esteemed a sacred and forbidden to be employed on light or common occasions; and that innovation in it was prohibited before the siege of Troy. These were by the Pharaohs, the Egyptians fell, divided into two pillars, which during the sacking of the city of Heliopolis, about 400 years before the siege of Troy. These were by the order of Augustus brought to Rome after the conquest of Egypt. One of them called juglia rotta, or the broken pillar, which during theacking of the city in 1527 was thrown down and broken, still lies in the Campus Martius. On it is seen the figure of a musical instrument of two strings, and with a neck. It resembles much the cithar of the kingdom of Naples.

This curious relic of antiquity is mentioned, because it affords better evidence than, on the subject of ancient music, is usually to be met with, that the Egyptians, at so early a period of their history, had advanced to a considerable degree of excellence in the cultivation of the arts. By means of its neck, this instrument was capable, with only two strings, of producing a great number of notes. These two strings, if tuned fourths to each other, would form that series of sounds called by the ancients septachord, which consists of a conjunct tetra chord as B, C, D, E, F, G, A; if tuned fifths, they would produce an octave or two disjunct tetra chords. The cithara is tuned in this last manner. The annals of no nation other than Egypt, for many ages after the period of the obelisk at Heliopolis, exhibit the vogue of any contrivance to shorten strings during performance by a neck or finger-board. Father Montfaucon observes, that after examining 500 ancient lyres, harps, and citharas, he could discover no such thing.

Egypt indeed seems to have been the source of human intelligence, and the favourite residence of genius and invention. From that celebrated country did the Greeks derive their knowledge of the first elements of those arts and sciences in which they afterwards so eminently excelled. From Greece again did the Romans borrow their attainments in the same pursuits. And from the records of these different nations have the moderns been enabled to accomplish an improvement so wonderful in literature.

The Hermes or Mercury of the Egyptians, Sir. The Egyptian named Tefyngtus, or threc illustrious, who was, according to Sir Isaac Newton, the secretary of Otho, is celebrated as the inventor of music. It has already been observed, that no one person ought chiefly to be called the inventor of an art which seems to be natural to, and coeval with, the human species; but the Egyptian Mercury is without doubt intended to be the prototype of having made striking improvements in music, as well as of having advanced in various respects the civilization of the people, who; government was chiefly committed to his charge. The account given by Apollodorus of the manner in which he accidentally invented the lyre, is at once entertaining and probable. "The Nile (says Apollodorus), after having overflowed the whole country of Egypt, when it returned within its natural bounds, left on the shore a great number of dead animals of various kinds, and among the rest a tortoise; the flesh of which being dried and salted by the sun, nothing remained within the shell but nerves and cartilages, and these being braced and contracted by the drying heat became concave. Mercury, walking along the shores of the Nile, happened to strike his foot against this shell; and was so pleased with the sound produced, that the idea of a lyre started into his imagination. He contrived the instrument in the form of a tortoise, and strung it with the dried sinews of dead animals."

How beautiful to conceive the energetic powers of the human mind in the early ages of the world, exploring the yet undiscovered capabilities of nature, and directing to the inexhaustible store by the finger of God, in the form of accident!

The monaulon, or single flute, called by the Egyptians, the single flute of the Egyptians, was probably one of the most ancient instruments used either by them or any other nation. From various remains of ancient sculpture, it appears to have been flaped like a bull's horn, and was at first, it may be supposed, no other than the horn itself. Before the invention of flutes, as no other instrument except those of percussion were known, music must have been little more than metrical. When the art of refining and lengthening sounds was first discovered, the
the power of music over mankind, from the agreeable surpise occasioned by soft and extended notes, was probably irresistible. At a time when all the rest of the world was involved in savage ignorance, the Egyptians were possessed of musical instruments capable of much variety and expression. Of this the astonishment remains of the city Thebes still testifying afford ample evidence. In a letter from Mr Bruce, ingrossed in Dr Buraey's History of Music, there is given a particular description of the Theban harp, an instrument of extensive compass, and exquisite elegance of form. It is accompanied with a drawing taken from the ruins of an ancient sanctuary at Thebes, supposed by Mr Bruce to be that of the father of Seolfris.

On the subject of this harp, Mr Bruce makes the following striking observation. "It overturns all the accounts of the earliest state of ancient music and instruments in Egypt, and is altogether, in its form, ornaments, and compass, an incontrovertible proof, stronger than a thousand Greek quotations, that geometry, drawing, mechanics, and music, were at the greatest perfection when this harp was made; and that what we think in Egypt was the invention of arts was only the beginning of the era of their restoration."

Indeed, when the beauty and powers of this harp, along with the very great antiquity of the painting which represents it, are considered, such an opinion as that which Mr Bruce limits at, does not seem to be devoid of probability. It cannot be doubted that during the reigns of the Ptolemies, who were voluptuous princes, music must have been much cultivated and encouraged. The father of Cleopatra, who was the least of that race of kings, derived his title of auletes, or flute-player, from his excessive attachment to the flute. Like Nero himself used to array himself in the dress of a tibicen, and exhibit his performance in the public musical contests.

Some authors, particularly Am. Marcellinus and M. Pau, refuse to the Egyptians, at any period of their history, any musical genius, or any excellence in the art; but the arguments used to support this opinion seem to be inconclusive, and the evidences of the opposite conclusion appear to be incontrovertible.

The sacred Scriptures afford almost the only materials from which any knowledge of Hebrew music can be drawn. In the rapid sketch, therefore, of an ancient music which we mean to exhibit, a few very few observations are all which can properly be given to that department of our subject.

Moses, who led the Israelites out of Egypt, was educated by Pharaoh's daughter in all the literature and elegant arts cultivated in that country. It is probable, therefore, that the taste and style of Egyptian music would be infused in some degree into that of the Hebrews. Music appears to have been interwoven through the whole tiffue of religious ceremony in Palestine. The priesthood seem to have been musicians hereditarily and by office. The prophets appear to have accompanied their inspired effusions with music; and every prophet, like the present improvisator of Italy, seems to have been accompanied by a musical instrument.

Music, vocal and instrumental, constituted a great part of the funeral ceremonies of the Jews. The pomp and expense used on these occasions advanced by degrees to an excursive extent. The number of flute-players in the processions amounted sometimes to several hundreds, and the attendance of the guests continued frequently for 30 days.

The Hebrew language abounds with confonants, and has few vowels, that in the original alphabet they had no characters. It must, therefore, have been harsh and unfavourable to music. Their instruments of music were chiefly those of percussion; so that both on account of the language and the instruments, the music must have been coarse and noisy. The vast numbers of performers too, whom it was the taste of the Hebrews to collect together, could with such language and such instruments produce nothing but clamour and jargon. According to Josephus, there were 200,000 musicians at the dedication of Solomon's temple. Such are the circumstances from which only an idea of Hebrew music can be formed; for the Jews neither ancient nor modern have ever had any characters peculiar to music; and the melodies used in their religious ceremonies have at all times been entirely traditional.

Cadmus, with the Phoenician colony which he led Grecian into Greece, imported at the same time various arts music. into that country. By the assistance of his Phoenician artificers, that chief discovered gold in Thrace and copper at Thebes. At Thebes that metal is still termed cadium. Of these materials, and of iron, they formed to themselves armour and instruments of war. Thus they struck against each other during their dances at sacrifices, by which they first obtained the idea of music. Such is the account given of the origin of that species of music in Greece produced by instruments of percussion. The invention of wind instruments in Greece is attributed to Minerva; and to the Grecian Mercury is assigned, by the poets and historians of that country, the honour of many discoveries probably due to the Egyptian Hermes, particularly the invention of stringed instruments. The lyre of the Egyptian Mercury had only three strings; that of the Grecian Venus: the last was perhaps no more than an improvement on the other. When the Greeks defied a prince or hero of their own country, they usually adorned him an Egyptian name, and with the name beheaded on their new divinity all the actions, attributes, and rites of the original.

The Grecian lyre, although said to have been invented by Mercury, was cultivated principally by Apollo, who first played upon it with method, and accompanied it with the voice. The celebrated contest between him and Marsyas is mentioned by various authors; in which, by conjoining the voice with his lyre (a combination never before attempted), his music was declared superior to the flute of Marsyas. The progress of the lyre, according to Diodorus Siculus, is the following. "The muses added to the Grecian lyre the string called mode; Linus that of Echoes, and Orpheus and Thamyris those strings which are named hypate and parhypate." It has been already mentioned, that the lyre invented by the Egyptian Mercury had but three strings; by putting these circumstances together, we may perhaps acquire some knowledge of the progress of music, or at least of the extension of its scale in the highest antiquity. Mode, in the Greek music, is the fourth sound of the second tetradchord.
I-lify.

Greece, and of Iceland and Scandinavia. They fung their poems of five sounds. The two tetrachords of the great system of the ancients, the hypate and parhypate, corresponding with our B and C in the base, completed the heptachord or seven sounds b, c, d, e, f, g, a; a compass which received no addition till after the days of Pindar.

It might perhaps be expected, that in a history of Greek music something ought to be said concerning the Muses Apollo, Bacchus, and the other gods and demi-gods, who in the mythology of that country appear to have promoted and improved the art. But such a discussion would be too diftructive, and involve too much foreign matter for the plan we have chosen to adopt. We cannot avoid, however, making a few observations on the poems of Homer, in so far as connected with our subject. It has been imagined, with much appearance of probability, that the occupation of the first poets and musicians of Greece resembled that of the Celtic and German bards and the scalds of Iceland and Scandinavia. They sung their poems in the streets of cities and in the palaces of princes. They were treated with high respect, and regarded as inspired persons. Such was the employment of Homer. His poems, so justly celebrated, exhibit the most authentic picture that can be found in the annals of antiquity, although perhaps somewhat highly coloured, of the times of which he wrote and in which he lived. Music is always named throughout the Iliad and Odyssey with rapture; but as in these poems no mention is made of instrumental music unaccompanied with poetry and singing, a considerable share no doubt of the poet's praise is to be attributed to the poetry. The instruments most frequently named are the lyre, the flute, and the syrinx. The trumpet appears not to have been known at the siege of Troy, although it had come to be in use in the days of Homer himself. From the time of Homer till that of Sappho, there is almost a total blank in literature. Only a few fragments remain of the works of those poets and musicians whose names are preferred as having flourished between those periods (†). During the century which elapsed between the days of Sappho and those of Anacreon, no literary productions are preferred entire.—From Anacreon to Pindar there is another chasm of near a century. Subsequent to this time, the works fill extant of the three great tragic poets, Aeschylus, Sophocles, and Euripides, together with those of Plato, Aristotle, Arifloquenous, Euclid, Theocritus, Callimachus, Polybius, and many others, produced all within a space less than 300 years, distinguish this illustrious and uncommon period as that in which the whole powers of genius seem to have been exerted to illuminate and instruct mankind in future ages. Then it was that eloquence, poetry, music, architecture, history, painting, sculpture, like the spontaneous blossoms of nature, flourished without the appearance of labour or of art.

The poets, as well epic as lyric and elegiac, were all likewise musicians; so closely connected were music and poetry for many ages. It would afford amusement to collect the biographical anecdotes of these favourites of genius, and to assign to each the respective improvements made by him in music and poetry; but our limits do not admit of so extensive a disquisition; for which, therefore, reference must be made to the editors and commentators of these authors, and to the voluminous histories of music lately published.

The invention of notation and musical characters marked a distinguished era in the progress of music. There are a diversity of accounts respecting the period to whom the honour of that invention is due; but the evidences seem to preponderate in favour of Terpander, a celebrated poet and musician, to whose genius music is much indebted. He flourished about the 27th Olympiad, or 671 years before Christ.

Before that valuable discovery, music being entirely traditional, must have depended much on the memory and taste of the performer.

There is an incident mentioned in the accounts handed down to us of the Olympic games, which may serve in some degree to mark the character of music at the time in which it happened. Lucian relates that a young flute-player named Harmonides, at his first public appearance in these games, began a solo with so violent a blast, on purpose to surprise and elevate the audience, that he breathed his last breath into his flute, and died on the spot. When to this anecdote, wonderful to us, and almost incredible, is added the circumstance, that the trumpet-players at these public exhibitions expended an excess of joy when they found their exertions had not rent their cheeks nor burst their blood-vessels, some idea may be formed of the noisy and vociferous style of music which then pleased; and from such facts only can any opinion be obtained of the actual style of ancient music.

In whatever manner the flute was played on, there is no doubt that it was long in Greece an instrument of high favour, and that the flute-players were held in much estimation. The flute used by Iphicrates, a celebrated Theban musician, cadd at Corinth three talents, or L.381. 55. If, says Xenophon, a bad flute-player would pass for a good one, he must, like the great flute-players, expend large sums on rich furniture, and appear in public with a great retinue of attendants.

The ancients, it appears, were not less extravagant in gaiifying the minstrels of their pleasures than our selves. 

†) He anon lived so near to Homer, that it has been disputed which of them is the most ancient. It is now, we believe, universally admitted, that the palm of antiquity is due to Homer; but we consider them as having both flourished in the same era.
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History.

selves. Amalbeus, a harper, was paid an Attic talent, or L. 193, 15s. per day for his performance (1).

It is proper to add, that the celebrated musicians of Greece who performed in public were of both sexes; and that the beautiful Lamia, who was taken captive by Demetrius, in the sea engagement in which he vanquished Polemy Soter, and who herself captivated her conqueror, as well as many other elevated female spirits, are recorded by ancient authors in terms of admiration, and of whom, did our limits here admit of biography, we would treat with pleasure. The philosophers of Greece, whose capacious minds grasped every other object of human intelligence, were not inattentive to the theory of music, or the philosophy of sound. This department of science became the source of various fepts, and of much diversity of opinion. The founders of the most distinguished sects were Pythagoras and Arifloctenus. Of their theories, mention is made in the Appendix to this article.

Like every other people, the Romans, from their first origin as a nation, were possessed of a species of music which might be distinguished as their own. It appears to have been rude and coarse, and probably was a variation of the music in use among the Etruscans and other tribes around them in Italy; but as soon as they began to open a communication with Greece, from that country, with their arts and philosophy, they borrowed also their music and musical instruments. No account, therefore, of Roman music is to be expected that would not be a repetition of what has been said on the subject of the music of Greece.

The excessive vanity of Nero with respect to music, displayed in his public contents for superiority with the most celebrated professors of the art in Greece and Rome, is known to every one conversant in the history of Rome. The solicitude with which that detestable tyrant attended to his voice is curious, and will throw some light on the practices of fingers in ancient times. He was in ufe to lie on his back, with a thin plate of lead on his breast; and after his return from Greece established an officer (Phonaecus) to regulate his tones in speaking.

Most nations have conformed in introducing music into their religious ceremonies. That art was early admitted into the rites of the Egyptians and Hebrews; and that it constituted a considerable part of the Grecian and Roman religious service, appears from the writings of many ancient authors. The fame pleasing art soon obtained an introduction into the Christian church, as the Acts of the Apostles discover in many passages. There remain no specimens of the music employed in the worship of the primitive Christians; but probably it was at first the same with that used in the Pagan rites of the Greeks and Romans. The practice of chanting the psalms was introduced into the western churches by St. Ambrose, about 350 years after Christ. In the year 600, the method of chanting was improved by St. Gregory the Great. The Ambrosian chant contained four modes. In the Gregorian the number was doubled. So early as the age of Constan
tine the Great, prior to either of the periods last mentioned, when the Christian religion first obtained the countenance of power, instrumental music came to be introduced into the service of the church. In England, according to bishop Stillingfleet, music was introduced in the church service, first by St. August
tine, and afterwards much improved by St. Dunstan, who was himself an eminent musician, and who is said to have first furnished the English churches and convents with the organ. The organ, the most majestic of all instruments, seems to have been an improvement of the hydraulic or water organ of the Greeks. The first organ seen in France was sent from Constantinople in 757, as a present to king Pepin from the emperor Constantine Copromyus VI. In Italy, Germany, and England, that instrument became frequent during the 10th century.

During the dark ages no work of genius or taste in any department of science seems to have been produced in any part of Europe; and except in Italy, where the cultivation of music was rather more the object of attention, that art was neglected equally with all others. There has always been observed a correspondence in every country between the progress of music and the cultivation of other arts and sciences.

In the middle ages, therefore, when the most fertile provinces of Europe were occupied by the Goths, Huns, Vandals, and other barbarous tribes, whose language was as harsh as their manners were savage, little perfection and no improvement of music is to be looked for. Literature, arts, and refinements, were encouraged more early at the courts of the Roman pontiffs than in any other country; and owing to that circumstance it is, that the scale, the counterimprovements in music had point, the beat melodies, the dramatic religions and fe-
ticular, the chief graces and elegancies of modern mu-

Ancient music. The great point, the beat melodies, the dramatic religions and fe-

In modern times, Italy has been to the rest of Europe what ancient Greece was to Rome. The Italians have sided the civilization of their conquerors, and enlightened the minds of those whose superior powers had enslaved them.

Having mentioned counterpoint, it would be improper not to make one or two observations on an invention which is supposed to have been the source of great innovation in the practice of music. Counterpoint, or music in parts, seems to be an invention purely modern. The term harmony meant in the language of antiquity what is now understood by melody. Guido, a monk of Arezzo in Tuscany, is, in Counterpoint, the general opinion, supposed to have entertained the first idea of counterpoint about the year 1022: an art which, since his time, has experienced gradual and imperceptible improvements, far exceeding the powers or comprehension of any one individual. The term counterpoint, or contra punctum, denotes its own etymology and import. Musical notation was at one time performed by small points; and the present mode is only

(1) Roscius gained 500 sesteria, or L. 4956:9:2 d. Sterling per annum.

(2)...
only an improvement of that practice. Counterpoint, therefore, denotes the notation of harmony or music in parts, by points opposite to each other. The improvements of this important acquisition to the art of music kept pace at first with those of the organ; an instrument admirably adapted to harmony: And both the one and the other were till the 15th century employed chiefly in sacred music. It was at this period that secular music began to be cultivated.

Before the invention of characters for time, music in parts must have confined entirely of simple counterpoint, or note against note, as it is practised in psalmody. But the happy discovery of a time-table extended infinitely the powers of combined sounds. The ancients had no other resource to denote time and movement in music except two characters (— —), equivalent to a long and a short syllable. But time is of such importance in music, that it can impart meaning and energy to the repetition of the same sound; without it variety of tunes has no effect with respect to gravity and accentus. The invention of the time-table is attributed by almost all the writers on music of the last and present century to John de Muris, who flourished about the year 1330. But in a manuscript of John de Muris himself, bequeathed to the Vatican library by the Queen of Sweden, that honour seems to be yielded to Magister Frane, who appears to have been alive as late as at 1383. John de Muris, however, who there is some cause to believe was an Englishman, though not the inventor of the cantus denaturabili, did certainly by his numerous writings greatly improve it. His treatise on the Art of Counterpoint is the most clear and useful essay on the subject of which those times can boast.

In the 11th century, during the first crusade, Europe began to emerge from the barbarous simplicity and ignorance which had long overwhelmed it. While its inhabitants were exercising in Asia every species of rapine and pious cruelty, art, ingenuity, and reason, indefitibly civilized and softened their minds. Then it was that the poets and fongs, known by the name of Troubadours, who first appeared in Provence, instituted a new profession; which obtained the patronage of the count of Poitou, and many other princes and barons who had themselves cultivated music and poetry with success. At the courts of their munificent patrons the troubadours were treated with respect. The ladies, whose charms they celebrated, gave them the most generous and flattering reception. The successes of some inspired others with hopes, and excited exertions in the exercise of their art; impelling them towards perfection with a rapidity which the united force alone of emulation and emulation could occasion. These founders of modern verification, conftructing their songs on plans of their own, classical authority, either through ignorance or design, was entirely disregarded. It does not appear, however, during the cultivation and favour of Provencal literature, that any one troubadour far outfripped the rest as to become a model of imitation. The progress of taste must ever be impeded by the ignorance and caprice of those who cultivate an art without science or principles.

During almost two centuries after the arrangement of the scale attributed to Guido, and the invention of the time-table ascribed to Franco, no remains of secular music can be discovered, except those of the troubadours or Provencal poets. In the simple tunes of these bard no time indeed is marked, but little variety of notation appears; it is not difficult, however, to discover in them the germs of the future melodies, as well as the poetry of France and Italy. Had the poetry and music of the troubadours been treated of in an agreeable manner by the writers who have chosen that subject, it would have been discovered to be worthy of attention; the poetry, as interesting to literature; the melody to which it was sung, as curious to the musical historian. Almost every species of Italian poetry is derived from the Provencals. Air, the most captivating part of secular vocal music, seems to have had the same origin. The most ancient strains that have been spared by time, are such as were set to the songs of the troubadours. The Provencal language began to be in favour with poets about the end of the 10th century. In the 11th it became the general vehicle, not only of poetry, but of prose, to all who were ignorant of Latin. And these were not the laity only. At this period violars, or performers on the vielle or violin, jugglars or flute-players, musars or players on other instruments, and comedians, abounded all over Europe. This swarm of poet-musicians, who were formerly comprehended in France under the general titles of jugglars, travelled from province to province singing their verses at the courts of princes. They were rewarded with clothes, horses, arms, and money. Jougleurs or musicians were employed often to sing the verses of troubadours, who themselves happened to be deficient in voice or ignorant of music. The term troubadour, therefore, implies poetry as well as music. The jouglers, menetriers, trélliers, or minstrels, were frequently musicians, without any pretensions to poetry. These last have been common at all times, but the troubadour or bard has distinguished a particular profession, either in ancient or modern times, only during the early dawning of literature.

In the 13th century the songs were on various subjects, moral, merry, amorous: and at that time melody seems to have been little more than plain song or chanting. The notes were square, and written on four lines only like those of the Romish church in the E flat, and without any marks for time. The movements and embellishments of the air depended on the abilities of the finger. Since that time, by the cultivation of the voice modern music has been much extended, for it was not till towards the end of St. Lewis's reign that the fifth line began to be added to the flat. The finger always accompanied himself with an instrument in unison.

As the lyre is the favourite instrument in Grecian poetry, so the harp held the same place in the embellishment of the poets who flourished in the period of which we are at present speak. A poet of the 14th century, Macca, wrote a poem on the subject of the harp alone, in which he assigns to each of its 25 strings an allegorical name; calling one liberality, another wealth, &c.

The instrument which frequently accompanied, and the violin indeed disputed the pre-eminence with the harp, was the viol. Till the 16th century this instrument was furnished with frets; after that period it was reduced
to four strings; and still under the denomination of violin holds the first place among treble instruments. The violin was played with a bow, and differed entirely from the vielle, the tones of which were produced by the friction of a wheel; the wheel performed the part of a bow.

British harpers were famous long before the conquest. The bounty of William of Normandy to his joculator or bard is recorded in the doomsday book. The harp seems to have been the favourite instrument in Britain for many ages, under the Britsh, Saxons, Danes, and Norman kings. The fiddles, however, is mentioned so early as 1200 in the legendary life of St Christopher. The ancient privileges of the minstrels at the fairs of Chester are well known in the history of England.

The extirpation of the bards of Wales by Edward I. is likewise too familiar an incident to be mentioned here. His perfecuting spirit, however seems to have been limited to that principality; for we learn, that at the ceremony of knighting his sons, a multitude of minstrels attended.

In 1345, during the reign of Edward II. such extensive privileges were claimed by the minstrels, and so many disolute persons assumed that character, that it became necessary to restrain them by express laws. The father of our genuine poetry, who in the 14th century enlarged our vocabulary, polished our numbers, and with acquisitions from France and Italy augmented our store of knowledge (Chaucer), entitles one of his poems The History of St. Cecilia; and the celebrated patronesses of music must no doubt be mentioned in a history of the art. Neither in Chaucer, however, nor in any of the histories or legendary accounts of this Saint, does any thing appear to authorize the religious veneration paid to her by the votaries of music; nor is it easy to discover whence it has arisen. As an incident relative to the period of which we speak, it may be mentioned, that, according to Spelmann, the appellation of Doctor was not among the degrees granted to graduates in England sooner than the reign of King John, about 1207; although, in Wood's history of Oxford, that degree is said to have been conferred, even in music, in the reign of Henry II. It is known that the title was created on the continent in the 12th century; and as, during the middle ages, music was always ranked among the seven liberal arts, it is likely that the degree was extended to it.

After the invention of printing, an art which has tended to disseminate knowledge with wonderful rapidity among mankind, music, and particularly counterpoint, became an object of high importance. The names of the most eminent composers who flourished in England, from that time to the Reformation, were, Fairfax, William of Newark, Sheringham, Turges, Banister, Tudor, Taverner, Tye, Johnson, Parfons; to whom may be added John Marbeck, who set the whole English cathedral service to music.

Before this period Scottish music had advanced to a high degree of perfection. James I. was a great composer of airs to his own verses; and may be considered as the father of that plaintive melody which in Scotch tunes is so pleasing to a taste not vitiated by modern affectation. Besides the testimony of Morison and Major, who may be suspected of being under the influence of national prejudice, we have that of Alessandro Tescani, to the musical skill of that accomplished prince. "Among us moderns (says this foreigner) we may reckon James king of Scotland, who not only composed many sacred pieces of vocal music, but also of himself invented a new kind of music, plaintive and melancholy, different from all others; in which he has been imitated by Carlo Gesuello prince of Venosa, who in our age has improved music with new and admirable inventions."

Under such a genius in poetry and music as king James I. it cannot be doubted that the national music must have been greatly improved. We have seen that he composed several anthems, or vocal pieces of sacred music, which shows that his knowledge of the science must have been very considerable. It is likewise known, that organs were by him introduced into the cathedrals and abbeys of Scotland, and choir-service brought to such a degree of perfection, as to fall little short of that established in any country of Europe.

By an able antiquary of the present age, the great era of music as of poetry, in Scotland, is supposed to have been from the beginning of the reign of James I. down to the end of the reign of James V. During that period flourished Gavin Douglas bishop of Dun­keld, Ballenden archdeacon of Murray, Dunbar, Hen­ryfon, Scott, Montgomery, Sir David Lindsay, and many others, whose fine poems have been preferred in Ba­natyne's Collection, and of which several have been published by Allan Ramsay in his evergreen.

Before the Reformation, as there was but one religion, there was but one kind of sacred music in Eu­rope, plain chape, and the defcant built upon it. Both of these were used by Luther; and in the reform­ation on the Scotch he adopted the Cantus Firmus, and applied it to the composition of his psalms. The most eminent composers of sacred music were not inferior to any others of the same character, nor in any other period of the history of this country. Sacred music was the principal object of study all over Europe.

In the 16th century music was an indispensible part of polite education. The composers of the 16th century were instructed in that art. There is a collection preserved in manuscript called Queen Elizabeth's Virginal Book. If her majesty was able to execute any of the fable part pieces in that book, the music must have been of a great degree of difficulty; a month's practice would not be sufficient for them. If the music were any matter now in Europe to enable him to play one of them to the end. Tallis, singularly profound in musical composition, and Bird his admirable scholar, were two of the authors of this famous collection.

During the reign of Elizabeth, the genius and learning of the British musicians were not inferior to any on the continent; an observation scarcely applicable at any other period of the history of this country. Sacred music was the principal object of study all over Europe.

The most eminent musical theorists of Italy, who flourished in the 16th century, were, Franchinus Gae­rius, or Gaffioro of Lodi, Pietro Aaron of Flo­rence,
Vittorio, deferve likewise to be mentioned; and to mention them is all we can attempt; the purpose of which is, to excite more minute inquiry by those who may choose to investigate the subject particularly.

The Netherlands, likewise, during the period of The Netherlands, which we have been speaking, produced many eminent composers; of whom we may mention Verletot, Gombert, Arkadelt, Berchem, Richafort or Ricciafort, Crequilon Le Cock or Le Coq, Canis, Jacob Clemens Non Papa, Pierre Manchicourt, Balzou, Kerl, Rore, Orlando di Lasso, and his sons Ferdinand and Rodolph.

In the 17th century, the musical writers and composers who acquired fame in England, were, Dr Nathaniel Giles, Thomas Tomkins, and his son of the same name; Elw; Bevin, Orlando Gibbons, Dr William Child, Adrian Batten, Martin Pierson, William Lawes, Henry Lawes, Dr John Willon, John Hilton, John Playford, Captain Henry Cook, Pelham Humprey, John Blow, William Turner, Dr Christopher Gibbons, Benjamin Rogers, and Henry Purcell. Of thefe, Orlando Gibbons, Pelham Humprey, and Henry Purcell, far excelled the rest.

About the end of the reign of James I., a music-lecture or professorship was founded in the university of Oxford by Dr William Hyacin.

In the reign of Charles I., a charter was granted to the musicians of Weftminster, incorporating them, as the king's musicians, into a body politic, with powers to prosecute and fine all who, except themselves, should attempt to make any benefit or advantage of music in England or Wales; powers which in the subsequent reign were put in execution.

About the end of the reign of Charles II. a passion seems to have been excited in England for the violin, and for pieces expressly composed for it, in the Italian manner (*). Prior to 1600, there was little other music except masses and madrigals, the two principal divisions of sacred and secular music; but from that time to the present, dramatic music becomes the chief object of attention. The music of the church and of the chamber continued indeed to be preferred, even in sacred music, by the success of dramatic composition, consisting of recitation and melodies for a fingle voice. Such melodies began now to be preferred to music of many parts; in which canons, fugues, and full harmony, had been the productions which chiefly employed the master's study and the hearer's attention.

So late as the beginning of the present century, according to Riccoboni, the performers in the opera of Germany, particularly at Hamburg, were all tradesmen or handcrafts; your shoemaker (says he) was often the first performer on the stage; and you might have bought fruit and sweetmeats of the same girl.

(*) The most celebrated violin players of Italy, from the 16th century to the present time, have been Farina, M. Angelo Roffi, Baffani the violin-master of Corelli, the admirable Angelico Corelli himself, Terelli, Alberti, Albenoni, Testarini, Vivaldi, Geminiani one of the most distinguished of Corelli's scholars. Tartini, Veracini, Barcella, Locatelli, Ferrari, Martini, Poccherini, and Giardini.
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Girls, whom the night before you had seen in the characters of Armida or Semiramis. Soon, however, the German opera profited to a more reprehensible situation; and even during the 17th century many eminent composers flourished in that country.

The life of great musicians which France produced during the early part of the same century is not numerous. Music seems to have been but little cultivated in that country, till the operas of Lulli, under the powerful patronage of Louis XIV. excited public attention.

The favourite finging-master and composer of France, about the middle of the 17th century, was Michael Lambert. John Baptist Lulli, soon after this time, rose from the rank of a menial servant to fame, opulence, and nobility, by his skill in musical compositions. The celebrated singer La Rochois was taught singing and acting by Lulli.

La Maupin, the successor of La Rochois, on account of her extraordinary character and romantic adventures, deserves to be mentioned. She was equally fond of both sexes, fought and loved like a man, resided and felt like a woman. She eloped from her husband with a fencing-master, of whom she learnt the small sword; she became an excellent fencer. At Marseilles she became enamoured of a young lady, whom she seduced; on account of this whimsical affection the lady was by her friends confined in a convent. La Maupin obtained admittance into the same convent as a novice: she set fire to the convent, and in the confusion carried off her favourite. At Paris, when she appeared on the stage in 1655, Dumenil a singer having affronted her, she put on mens clothes, and infcribed on his drawing his sword and fighting her: when he refused, she came at him, and took from him his sword and flax-box as trophies of victory. At a ball given by Monfieur brother of Louis XIV. she again put on mens clothes; and having behaved impertinently to a lady, three of the lady's friends, supposing La Maupin to be a man, called her out: she killed them all, and returning coolly to the ball, told the story to Monfieur, who obtained her pardon. She became afterwards mistress to the elector of Bavaria. This prince quitting her for the countess of Arco, sent her by the count, husband of that lady, a purse of 40,000 livres: she threw it at the count's head, telling him, it was a recompense worthy of such a fcountred and cuckold as himself. At last, feized with a fit of devotion, she recalled her husband, and spent the remainder of her life in piety. She died in 1677 at the age only of 34.

The English musician whom we last mentioned was the celebrated Purcell; after his time the chief composers for the church were Clarke, Dr Holden, Dr Creyghton, Tucker, Aldrich, Goswin, Weldon, Dr Crofts, Dr Green, Boyce, and Nares; to whom may be added John Stanley, who attained high proficiency in music, although from two years old totally deprived of sight.

The annals of modern music have hitherto furnished no event so important to the progres of the art as the invention of recitative or dramatic melody; a style of music which resembles the manner of the ancient rhetoricians.

The Orfeo of Politian was the first attempt at musical drama. It was afterwards perfected by Metastasio. No musical dramas similar to those afterwards, first musical opera, became so popular. The names of opera and oratorio had existed in Italy before the beginning of the 17th century. It was above the 1660, or a little before that time, that enuchs were first employed for singing in Italy.

There seems to have been no singing enuchs in an earlier time, unless the galli or archigalli, priests of Cybele, were such. Calification has, however, at all times been practised in eastern countries, for the purpose of furnishing to tyrannical jealous guards of female chastity; but never, so far as modern writers on the subject have discovered, merely to preserve the voice, till about the end of the 16th century.

At Rome, the first public theatre opened for the exhibition of musical dramas, in modern times, was il Torre de Nona, where in 1671 Giafone was performed. In 1679, the opera of Don' Amore, set by the famous organist Bernardo Faguan, was represented at Nella Sala de Signori Capranica; a theatre which still subsists. In the year 1680, L'Orfisa nell'Amore was exhibited; the first dramatic composition of the elegant, profound, and original Alessandro Scarlatti.

The inhabitants of Venice have cultivated and encouraged the musical drama with more zeal and dilgence than the rest of Italy, during the end of the 17th and beginning of the present century; yet the opera was not established in Venice before the year 1637; in that year the first regular drama was performed: it was Andromeda.

In 1680 the opera of Berenice was exhibited at Opera de Padua with such astonishing splendour as to merit the notice. There were choruses of 100 virgins, 100 soldiers, 100 horsemen in iron armour, 40 cornets of horse, 6 trumpeters on horseback, 6 drummers, 6 en spoilers, 6 fackluts, 6 great flutes, 6 minstrels playing on Turkish instruments, 6 others on oclave flutes, 6 pages, 3 sergeant's, 6 cymbalists. There were 12 trumpeters, 12 grooms, 12 coachmen for the triumph, 6 others for the procession, 2 lions led by two Turks, 2 elephants by two others; Berenice's triumphal car drawn by 4 horses, 6 other cars with prisoners and spoils drawn by 12 horses, 6 coaches. Among the scenes and representations in the first act were, a vast plain with two triumphal arches, another plain with pavilions and tents, and a foret for the chase: in act third, the royal dressing-room completely furnished, stables with 100 live horses, portico adorned with tapestry, and a stupendous palace in perspective. At the end of the first act were representations of every kind of chase, wild bear, flag, deer, bears. At the end of the third act, an enormous globe, defended as from the sky, divided itself into other globes suspended in the air, and ornamented with emblematical figures of time, fame, honour, &c.

Early in the last century, machinery and decoration usurped the importance due to poetry and music in such exhibitions.

Few instances occur of musical dramas at Naples till the beginning of the present century. Before the time of the elder Scarlatti, it seems as if Naples had been less fertile in great contrapuntists, and less diligent in the cultivation of dramatic music, than any other state of Italy. Since that time all the rest of
Europe has been furnished with composers and performers from that city. The word opera seems to have been familiar to English poets from the beginning of the 16th century. Stilo recitativo, a recent innovation even in Italy, is mentioned by Ben Johnson to early as 1617. From this time it was used in masques, occasionally in plays, and in cantatas before a regular drama wholly set to music was attempted. By the united abilities of Quinault and Lulli, the opera in France had arisen to high favour. This circumstance afforded encouragement to several attempts at dramatic music in England by Sir William D'Avenant and others, before the music, language, or performers of Italy were employed on our stage. Pieces, styled dramatic operas, preceded the Italian opera on the stage of England. These were written in English, and exhibited with a profuse decoration of scenery and habits, and with the best singers and dancers that could be procured: Piffche and Circe, are entertainments of this kind: the Temple and Macbeth were acted with the same accompaniments.

During the 17th century, whatever attempts were made in musical drama, the language sung was always English. About the end of that century, however, Italian singing began to be encouraged, and vocal as well as instrumental musicians from that country began to appear in Britain. The first musical drama, performed wholly after the Italian manner in recitative for the dialogue or narrative parts, and measured melody for the airs, was Arfinoe queen of Cyprus, translated from an Italian opera of the same name, written by Stanzani of Bologna. The English version of this opera was set to music by Thomas Clayton, one of the royal band, in the reign of William and Mary. The singers were all English, Mr. Hughes, Leveredge, and Cook; Mrs Tofts, Mrs Crofs, and Mrs Lyndsey. The translation of Artinoe, and the music to which it is set, are execrable; yet such is the charm of novelty, that this miserable performance, deferving neither the name of a drama by its poetry, nor of an opera by its music, furnished 24 representations, and the second year 11.

Operas, notwithstanding their deficiencies in poetry, music, and performance (no foreign composer or eminent finger having yet arrived), became so formidable to our actors at the theatres, that it appears from the Daily Courant, 14th January 1707, a subcription was opened "for the encouragement of the comedians ad in the Haymarket, and to enable them to keep the diversions of plays under a separate interest from operas."

Mr Addison's opera of Rosamond appeared about this time; but the music set by Clayton is so contemptible, that the merit of the poetry, however great, could not of itself long support the piece. The choice of so mean a composer as Clayton, and Mr Addison's partiality to his abilities, betray a want of musical taste in that elegant author. The first truly great singer who appeared on the stage of Britain was Cavaliier Niclino Grimaldi, commonly known by the name of Nicolini. He was a Neapolitan; and though a beautiful finger indeed, was still more eminent as an actor. In the Tatler, \textit{n}° 115, the elegance and propriety of his action are particularly described. Recently before his appearance, Valentinii Urbani and a female finger called Spedtator, The Barronets, arrived. Margarita de l'Epin, who afterwards married Dr Pepusch, had been in this country some time before.

The first opera performed wholly in Italian, and by Italian fingers was Aiman. As at present, so at that time, operas were generally performed twice a-week.

The year 1710 is distinguished in the annals of music by the arrival in Britain of George Frederick Handel. Handel had been in the service of the elector of Hanover, and came first to England on a visit of curiosity. The fame of this great musician had penetrated into this country before he himself arrived in it: and Aaron Hill, then in the direction of the Haymarket theatre, infantly applied to him to compose an opera. It was Rinaldo; the admirable music of which he produced entirely in a fortnight. Soon after this period appeared, for the first time as an opera finger, the celebrated Mrs Anaflasia Robinson. Mrs Robinson, who was the daughter of a portrait painter, made her first public exhibitions in the concerts in York buildings; and acquired so much the public favour, that her father was encouraged to take a house in Golden Square, for the purpose of establishing weekly concerts and assemblies, in the manner of Conservatorio, which became the resort of the most polite audiences.

Soon after Mrs Robinson accepted of an engagement at the Opera, where her salary is said to have been L. 1000, and her other emoluments equal to that sum. She quit the stage in consequence of her marriage with the gallant earl of Peterborough, the friend of Pope and Swift. The eminent virtues and accomplishments of this lady, who died a few years ago at the age of 88, entitled her to be mentioned even in a compend too short for biography. The conduct of the opera having been found to be more expensive than profitable, it was entirely suspended from 1717 till 1720, when a fund of L. 50,000 for supporting and carrying it on was subscribed by the first perfomans of the kingdom. The subscribers, of whom king George I. was one, for L. 1000, were formed into a society, and named The Royal Academy of Music. Handel was commissioned to engage the most eminent performers; for that purpose he went to Dresden, were Italian operas were at that time performed in the most splendid manner at the court of Augustus elector of Saxony, then king of Poland. Here Handel engaged Seneino-Berendi, Bocchi, and the Duranianti.

In the year 1723, the celebrated Francesca Cuzzoni appeared as a first-rate finger; and two years afterwards arrived her distinguished rival Signora Paulina Bordoni.

In a cantabile air, though the notes Cuzzoni added were few, she never lost an opportunity of enriching the cantilena with the most beautiful embellishments. Her shake was perfect. She possessed a creative fancy, and she enjoyed the power of occasionally accelerating and retarding the measure in the most artificial and able manner, by what is in Italy called tempo rubato. Her high notes were unrivalled in clearness and sweetness. Her intonations were so just and so fixed, that
it seemed as if she had not the power to sing out of tune.

Paulina Bordoni, wife of the celebrated Saxon composer Handel, invented a new kind of singing, by running divisions, with a neatness and velocity which astonished all who heard her. By taking her breath imperceptibly, she had the art of attaining a note apparently longer than any other finger. Her beats and trills were strong and rapid; her intonation perfect. Her professional perfections were enhanced by a beautiful face, fine symmetry of figure, and a countenance and gesture on the stage which indicated an entire intelligence and possession of the several parts allotted to her.

These two angelic performers excited so signal the attention of the public, that a party spirit between the abettors of the one and of the other was formed, as violent and as invertebrate almost as any of those that had ever occurred relative to matters either theological or political; yet so distinct were their styles of singing, so different their talents, that the praise of the one was no reproach to the other.

In less than seven years, the whole L. 50,000 subscribed by the Royal Academy, besides the produce of subscription to non-subscribers, was expended, and the governors and directors of the society relinquished the idea of continuing their engagements; consequently, at the close of the season 1727, the whole band of singers dispersed. The next year we find Senefino, Paulina, Balde, Cuzzoni, Nicollini, Farinelli, and Bofchis, at Venice.

Handel, however, at his own risk, after a suspension of about a twelvemonth, determined to recommence the opera; and accordingly engaged a band of performers entirely new. These were Signor Bernacchi, Signora Merighi, Signora Strada, Signor Anibale Pio Fabri, his wife, Signora Bertoldi, and, John Godfried Reimoldner.

The sacred musical drama, or oratorio, was invented early in the 14th century. Every nation in Europe seems first to have had recourse to religious subjects for dramatic exhibitions. The oratorios had been common in Italy during the last century; they had never been publicly introduced in England till Handel, stimulated by the rivalry of other adventurers, exhibited in 1732 his oratorios of Ethelred, and of Acis and Galatea, the last of which he had composed 12 years before for the duke of Chandos's chapel at Cannons. The most formidable opposition which Handel met with in his conduct of the Italian opera was a new theatre for exhibiting these operas, opened by subscription in Lincoln's Inn Fields, under the conduct of Nicola Porpora, a reputed composer. A difference having occurred between Handel and Senefino, Senefino had for some time deserted the Haymarket, where Handel managed, and was now engaged at the rival theatre of Lincoln's Inn Fields. To supply the place of Senefino, Handel brought over Giovanni Carellini, a singer of the most extensive powers. His voice was at first a powerful and clear soprano; afterwards it changed into the full, fine, deep, counter-tenor that has perhaps ever been heard. Carellini's person was tall, beautiful, and majestic. He rendered every thing he sung interesting by energy, taste, and judicious embellishment. In the execution of difficult divisions from the chief, his manner was articulate and admirable. It was the opinion of Handel, as well as other eminent professors, that whoever had not heard Carellini, was unacquainted with the most perfect style of singing. The opera under the direction of Porpora was removed to the Haymarket, which Handel had left. Handel occupied the theatre of Lincoln's Inn Fields; but his rivals now acquired a vast advantage of attraction, by the accession of Carlo Brodchi, della Farinelli to their party, who at this time arrived. This renowned singer seems to have transcended the limits of all anterior vocal excellence. No vocal performer of the present century has been so unanimously allowed to possess an uncommon power, sweetness, extent, and agility of voice, as Farinelli. Nicollini, Senefino, and Carellini, gratified the eye as much by the dignity, grace, and propriety of their action and deportment, as the ear, by the judicious use of a few notes within the limits of a small compass of voice; but Farinelli, without the abundance of significant gestures or graceful attitudes, enchanted and astonished his hearers, by the force, extent, and mellifluous tones of the mere organ, which he had nothing to execute, articulate, or express. Though during the time of singing he was as motionless as a statue, his voice was so active that no intervals were too close, too wide, or too rapid, for his execution.

Handel having lost a great part of his fortune by the opera, was under the necessity of trying the public gratitude in a benefit, which was not disgraced by the event; the theatre, for the honour of the nation, was so crowded, that he is said to have cleared L. 800. After a fruitless attempt by Heidggeir, the co-operative in Handel the conduct of the opera, and patrician of the King's Theatre in Haymarket, to procure a subscription for continuing it, it was found necessary to give up the undertaking.

It was about this time that the statue of Handel was erected in Vauxhall, at the expense of Mr Tyers, proprietor of those gardens.

The next year (1739), Handel carried on oratorios at the Haymarket, as the opera there was suspended. The earl of Middlesex now undertook the troublesome office of impresario of the Italian opera. He engaged the King's theatre, with a band of singers from the continent almost entirely new. Caluppi was his composer. Handel, almost ruined, retired at this time to Ireland, where he remained a considerable time. In 1744, he again attempted oratorios at the King's theatre, which was then, and till 1746, unoccupied by the opera, on account of the rebellion.

The arrival of Giardini in London this year forms a memorable era in the instrumental music of England. His powers on the violin were unequalled. The fame year Dr Croza, then manager of the opera, eloped, leaving the performers, and innumerable trades-people his creditors. This incident put an end to operas of all kinds for some time.

This year a comic opera, called Il Filippo di Campagna, composed by Caluppi, was exhibited, which surpassed in musical merit all the comic operas performed in England till the Bizona Figliula. Signora Paganini acquired such fame by the airs allotted to her in that piece, that the crowds at her benefit were beyond example. Caps were lost, gowns torn in pieces,
History.

At this period the arrival of Giovanni Manzoli marked a splendid era in the annals of musical drama, by conferring on serious opera a degree of importance to which it had hitherto yet arisen since its establishment in England. Manzoli's voice was the most powerful and voluminous soprano that had been heard since the time of Farinelli; his manner of singing was grand, and full of taste and dignity.

At this time Tenducci, who had been in England some time before, and was now returned much improved, performed in the flation of second tenor to Manzoli.

Gaetano Guadagni made a great figure at this time. He had been in this country early in life (1748), as serious-man in a burletta troop of singers. His voice was then a full and well-toned counter-tenor; but he sung wildly and carelessly. The excellence of his voice, however, attracted the notice of Handel, who assigned him the parts in his oratorios Messiah and Samson, which had been originally composed for Mrs Cibber. He quitted London for the first time about 1753.

The highest expectations of his abilities were raised by fame before his second arrival, at the time of which we treat. As an actor he seems to have had no equal on any stage in Europe. His figure was uncommonly elegant and noble; his countenance replete with beauty, intelligence, and dignity; his attitudes were full of grace and propriety. Those who remembered his voice when formerly in England were now disappointed: it was comparatively thin and feeble; he had now changed it to a soprano, and extended its compass from six or seven notes to fourteen or fifteen. The music he sung was the most simple imaginable: a few notes with frequent pauses, and opportunities of being librated from the composer and the band, were all he required. In these effusions, seemingly extemporaneous, he displayed the native power of melody unaided by harmony or even by unisonous accompaniment; the pleasure he communicated proceeded principally from his artful manner of diminishing the tones of his voice, like the dying notes of the Eolian harp. Most other fingers affect a swell, or mezza voce; but Guadagni, after much practice, now with force, attempted it so delicately that itpossessed all the effect of extreme distance. During the season 1770 and 1771, Tenducci was the immediate successor of Guadagni. This performer, who appeared in England first only as a singer of the second or third clas, was during his residence in Scotland and Ireland so much improved that it was well received as first man, not only on the stage of London but in all the great theatres of Italy. It was during this period that dancing seemed first to gain the ascendant over music by the superior talents of Mademoiselle Heimel, whose grace and execution were so perfect as to eclipse all other excellence.

In the first opera performed this season (Lucio Flora) appeared Miss Cecilia Davies, known in Italy by the name of L'Inglesina. Miss Davies had the honour of being the first English woman who had ever been thought worthy of singing on any stage in Italy. She even performed with celat the principal female characters on many of the great theatres of that country. Gabrielli only on the Continent was said to surpass her. Her voice, though not of great volume, was clear and perfectly in tune; her shake was open and distinct, without the sluggishness of the French cadence. The flexibility of her throat rendered her execution equal to the most rapid divisions.

Next season introduced Venanzio Ravygini, a beautiful and animated young man; a composer as well as a singer.—His voice was sweet, clear, flexible; in compass much wider than most of his age.

The season 1775 and 1776 was rendered memorable by the arrival of the celebrated Caterina Gabrielli, styled early in life La Cochetina, being the daughter of a cardinals cook at Rome. She had, however, in her countenance and deportment no indications of low birth. Her manner and appearance depicted dignity and grace. So great was her reputation before her arrival in England for singing and for caprice, that the public expecting perhaps in both too much, were unwilling to allow her due praise for her performance, and were apt to ascribe every thing she did to pride and insolence. Her voice, though exquisite, was not very powerful. Her chief excellence having been the neatness and rapidity of her execution, the surplice of the public must have been much diminished on hearing her after Miss Davies, who sung many of the same songs in the same style, and with a neatness so nearly equal, that common hearers could distinguish no difference. The discriminating critic, however, might have discovered a superior sweetness in the natural tone of the Gabrielli's voice, an elegance in the finishing of her musical periods or paffages, an accent and precision in her divisions, superior not only to Miss Davies, but to every other singer of her time. In slow movements her pathetic powers, like those in general of performers most renowned for agility, were not exquisitely touching. She now resides at Bologna.

About the time of which we have been treating, the Aguiari at the proprietors of the Pantheon ventured to engage the Aguiari at the enormous salary of L.100 per night, for singing two songs only! Lucresia Aguiari was a truly wonderful performer. The lower part of her voice was full, round, and of excellent quality; its compass more than a twelfth. She had two octaves of fair natural voice, from A on the fifth line in the bass to A on the fifth line in the treble, and beyond that in alto she had in early youth more than another octave. She has been heard to ascend to B in alitissimo. Her shake was open and perfect; her intonation true; her execution marked and rapid; the style of her singing, in the natural compass of her voice, grand and majestic.

In 1776 arrived Anna Pozzi, as successor to the Anna Pozzi. She possessed a voice clear, sweet, and powerful; but her inexperience, both as an actress and as a singer, produced a contrast very unfavourable to her when compared with so celebrated a performer as Gabrielli. Since that time, however, Pozzi, with more study and knowledge, has become one of the best and most admired female singers in Italy.

After the departure of Aguiari for the second and last time, the managers of the Pantheon engaged the Georgi as her successor. Her voice was exquisitely fine, Georgi.
but totally uncultivated. She is now employed as the first woman in the operas of the principal cities of Italy.

During the feasons 1777 and 1778, the principal fingers at the opera in London were Frandefco Roncaologia and Franfesca Danze, afterwards Madame Le Brun.

Roncaologia possessed a sweet-toned voice; but of the three great requites of a complete flage-finger, pathos, grace, and execution, which the Italians call cantabile, graziofa, and bravura, he could lay claim only to the second. His voice, a voci de camera, when confined to the graziofa in a room, leaves nothing to wish for.

Danzc had a voice well in tune, a good shake, great execution, prodigious compass, with great knowledge of music; yet the pleasure her performance imparted was not equal to these accomplishments: but her object was not so much pathos and grace, as to surpise by the imitation of the tone and difficulties of instruments.

This year Gaffaro Pacchierotti appeared in London, whither his high reputation had penetrated long before. The natural tone of his voice is interfing, sweet, and pathetic. His compass downwards is great, with an ascent up to B♭, and sometimes to C in all. He possesses an unbounded fancy, and the power not only of executing the most difficult and refined passages, but of inventing embellishments entirely new. Ferdinando Bertoni, a well-known composer, came along with Pacchierotti to Britain.

During the last ten years, dancing has become an important branch of the amusements of the opera-house. Made'moielle Heinel, M. Veltris le Jeune, Mademoiselle Baccell, had, during some years, delighted the audience at the opera; but on the arrival of M. Veltris l'Aine, pleasure was exchanged for ecstasy. In the year 1781, Pacchierotti had by this time been so frequently heard that his singing was no impediment to conversation; but while the elder Veltris was on the stage, not a breathing was to be heard. Those lovers of music who talked the loudest while Pacchierotti sung, were in agonies of terror lest the graceful movements of Veltris, le dieu de la danse, should be disturbed by audible approbation. Since that time, the most mute and respectful attention has been paid to the manly grace of Le Picq, and the light, fantastic toe of the younger Veltris; to the Roffis, the Theodores, the Coulon, the Hillingburgs; while the lighted fingers have been disturbed, not by the violence of applause, but the clamour of inattention.

The year 1784 was rendered a memorable era in the annals of music by the splendid and magnificent manner in which the birth and genius of Handel were celebrated in Westminster Abbey and the Pantheon, by five performances of pieces selected from his own works, and executed by a band of more than 500 voices and instruments, in the presence and under the immediate auspices of their majesties and the first personages of the kingdom. The commemoration of Handel has been since established as an annual musical festival for charitable purposes; in which the number of performers and the perfection of the performances have continued to increase. In 1785 the band, vocal and instrumental, amounted to 616; in 1786 to 741; in 1787 to 806.

Dr Burney published An Account of the Musical Performances in Commemoration of Handel, for the benefit of the Musical Fund. The members and guardians of that fund are now incorporated under the title of Royal Society of Musicians. See Handel.

This year Pacchierotti and his friend Bertoni left England. About the same time our country was deprived of the eminent composer Sacchini, and Giardini the greatest performer on the violin then in Europe.

As a compensation for these losses, this memorable Excellence year is distinguished by the arrival of Madam Mara, of Madam Mara, whose performance in the commemoration of Handel in Westminster Abbey inspired an audience of 3000 of the first people of the kingdom, not only with pleasure but with ecstasy and rapture.

In 1786 arrived Giovanni Rubinielli. His voice is a Rubinielli, true and full contralto from C in the middle of the scale to the octave above. His style is grand; his execution neat and distinct; his taste and embellishments new, fedt, and masterly.

In 1788 a new dance, composed by the celebrated M. Noverre, called Capit and Pfyche, was exhibited along with the opera Locandiera, which produced an effect so uncommon as to deserve notice. So great was the pleasure it afforded to the spectators, that Noverre was unanimously brought on the stage and crowned with laurel by the principal performers. This, though common in France, was a new mark of approbation in England.

This year arrived Signor Luigi Marchesi, a finger Marchesi, whose talents have been the subject of praise and admiration on every great theatre of Europe. Marchesi's style of singing is not only elegant and refined in an uncommon degree, but often grand and full of dignity, particularly in his recitative and occasional low notes. His variety of embellishment and facility of running extempore divisions are wonderful. Many of his graces are elegant, and of his own invention.

The three greatest Italian fingers of the present time are certainly Pacchierotti, Rubinielli, and Marchesi. In discriminating the several excellencies of these great performers, a very respectful judge, Dr Burney, has particularly praised the sweet and touching voice of Pacchierotti; his fine shake, his exquisiterattle, his great fancy, and his divine expression in pathetic songs: Of Rubinielli's voice, the fulness, steadiness, and majesty; the accuracy of his intonations, his judicious graces; Of Marchesi's voice, the elegance and flexibility, his grandeur in recitative, and his boundless fancy and embellishments.—Having mentioned Dr Burney, we are in justice bound to acknowledge the aid we have derived from his history; a work which we greatly prefer to every other modern production on the subject. During the latter part of the present century many eminent composers have flourished on the continent: such as Jomelli, the family of the Bachs, Gluck, Haydn, and many others, whose different styles and excellencies would well deserve to be particularized, would our limits permit. With the same regard to brevity, we can do no more than just mention the late king of Prufia, the late elector of Bavaria, and prince Lobkowitz, as eminent dilettanti of modern times.

Besides the opera-fingers whom we have mentioned, our
our theatres and public gardens have exhibited fingers of considerable merit. In 1730, Mrs Rafter, afterwards the celebrated Mrs Clive, first appeared on the stage at Drury-lane as a singer. The same year introduced Miss Cecilia Young, afterwards the wife of Dr Arne. Her style of singing was infinitely superior to that of any other English woman of her time.

Our favourite musicians at this time were, Dubourg, Clegg, Clarke, and Pelling, on the violin; Kyte, on the hautboy; Jack Fielding on the German flute; Ballon on the common flute; Kerbi on the basoon; Valentine Snow on the trumpet; and on the organ, Rolle, gravé, Green, Robinson, Magnus, Jack James, and the blind Stanley, who seems to have been preferred. The favourite playhouse singer was Salway; and at concerts Mountier of Chichester.

As composers for our national theatre, Pepusch and Galliard feem to have been unrivalled till 1732; when two competitors appeared, who were long in possession of the public favour: We allude to John Frederick Lampe and Thomas Augustus Arne.

In 1736 Mrs Cibber, who had captivated every hearer of sensibility by her native sweetness of voice and powers of expression as a finger, made her first attempt as a tragic actress. The same year Beard became a favourite singer at Covent-garden. At this time Miss Young, afterwards Mrs Arne, and her two sisters Labella and Ethelred, were the favourite English female singers.

In 1738 was instituted the fund for the support of decayed musicians and their families.

It was in 1745 that Mr Tyers, proprietor of Vauxhall gardens, first added vocal music to the other entertainments of that place. A short time before Relagh had become a place of public amusement. In 1749 arrived Giardini, whose great taste, hand, and style in playing on the violin, procured him universal admiration. A few years after his arrival he formed a morning académie or concert at his house, composed chiefly of his scholars.

About this time San Martini and Charles Avilon were eminent composers.

Of near 150 musical pieces brought on our national theatres within these 40 years, 30 of them at least were set by Arne. The style of this composer, if analyfed, would perhaps appear to be neither Italian nor English; but an agreeable mixture of both and of Scotch.

The earl of Kelly.

The late earl of Kelly, who died but a few years ago, deferves particular notice, as posseffed of a very eminent degree of musical science, far superior to other dilettanti, and perhaps not inferior to any professor of his time. There was no part of theoretical or practical music in which he was not thoroughly versed: He posseffed a strength of hand on the violin, and a genius for composition, with which few professors are gifted.

Charles Frederic Abel was an admirable musician. His performance on the violin da gamba was in every particular complete and perfect. He had a hand which no difficulties could embarrass; a taste the most refined and delicate; a judgment so correct and certain as never to permit a single note to escape him without meaning. His compositions were easy and elegantly simple. In writing and playing an adagio he was superior to all praise: the most pleasing yet learned modulation, the richest harmony, the most elegant and polished melody, were all expressed with the most exquisite feeling, taste, and science. His manner of playing an adagio soon became the model of imitation for all our young performers on bowed instruments. Bartholomew, Cervetto, Cramer, and Credulì, may in this respect be ranked as of his school. All lovers of music must have lamented that Abel in youth had not attached himself to an instrument more worthy of his genius, talents, and learning, than the viol da gamba, that remnant of the old chert of viols which during the last century was a necessary appendage of a nobleman's or gentleman's family throughout Europe, previous to the admission of violins, tenors, and basses, in private houses or public concerts. Since the death of the late elector of Bavaria, who was next to Abel (the best performer on the viol da gamba in Europe), the instrument seems quite laid aside. It was used longer in Germany than elsewhere; but the place of gambill seems now as much superseded in the chapels of German princes as that of lutins. The celebrated performer on the violin, Lolle, came to England in 1785. Such was his caprice, that he was seldom heard; and for eccentricity was his style and composition, that by many he was regarded as a madman.

He was, however, during his lucid intervals a very great and expressive performer in the serious style.

Mrs Billington, after distinguishing herself in childhood as a neat and expressive performer on the piatto-forte, appeared all at once in 1786 as a sweet and captivating finger. In emulation of the Mara and other great bravura fingers, she at first too frequently attempted passages of difficulty; now, however, she greatly has the improved, that no long seems too high or too rapid for her execution. The natural tone of her voice is so exquisitely sweet, her knowledge of music so considerable, her shake so true, her claire and embellishments fo various, her expressions fo grateful, that envy only or apathy could hear her without delight. The present composers, and performers of the first class, are so well known to the lovers of the art, that it would be needless and improper to mention them particularly; and to describe the distinctive powers of Bartholomew, Cramer, Piel-tain, Raimonde, and Salomon, would be too delicate a task for us to undertake.

The Catch-club at the Thatched House, instituted in 1762 by the late earl of Eglinton, the present duke of club and Queensberry, and others; and the concert of ancient music, founded by the earl of Sandwich in 1776, have had a beneficial effect in improving the art. We have been somewhat particular in our account of musical affairs in our own country during the present century, as what would be most interesting to general readers, and of which a well-informed gentleman would not wish to be ignorant. The protector and connoisseur is not to be expected to content himself with disquisitions much more minute than those of which our limits can be supposed to admit.
Preliminary Discourse.

Music may be considered, either as an art, which has for its object one of the greatest pleasures of which our senses (†) are susceptible; or as a science, by which that art is reduced to principles. This is the double view in which we mean to treat of music in this work.

It has been the case with music as with all the other arts invented by men: some facts were at first discovered by accident; soon afterwards reflection and observation investigated others; and from these facts, properly disposed and united, philosophers were not slow in forming a body of science, which afterwards increased by degrees.

The first theories of music were perhaps as ancient as the earliest age which we know to have been distinguished by philosophy, even as the age of Pythagoras; nor does history leave us any room to doubt, that from the period when that philosopher taught, the ancients cultivated music, both as an art and as a science, with great agility. But there remains to us much uncertainty concerning the degree of perfection to which they brought it. Almost every question which has been propounded with respect to the music of the ancients has divided the learned; and may probably still continue to divide them, for want of monuments sufficient in theil number, and discoveries to unite and diffuse in the fame work the moft probable opinions established or propounded by the learned upon a subject so difficult and curious. This philosophical history of a nobly embellished the literature of our times.

In the mean time, till an author can be found sufficiently instructed in the arts and in history to undertake such a labour with success, we shall content ourselves with considering the present state of music, and limit our endeavours to the explanation of those acceptions which have already been communicated to the theory of music in these latter times.

There are two departments in music, melody and harmony. Melody is the art of arranging several sounds in succession one to another in a manner agreeable to the ear; harmony is the art of pleasing that organ by the union of several sounds which are heard at one and the same time. Melody has been known and felt through all ages; perhaps the same cannot be affirmed of harmony (§); we know not whether the ancients made any use of it or not, nor at what period it began to be practised.

Not but that the ancients certainly employed in their music
music, those chords which were most perfect and simple; such as the octave, the fifth, and the third; but it seems doubtful whether they knew any of the other consonances or not, or even whether in practice they could deduce the same advantages from the simple chords which were known to them, that have afterwards accrued from experience and combinations.

If that harmony which we now practise owes its origin to the experience and reflection of the moderns, there is the highest probability that the first essays of this art, as of all the others, were feeble, and the progress of its efforts almost imperceptible; and that, in the course of time, improving by small gradations, the successive labours of several generations have elevated it to that degree of perfection in which at present we find it.

The first inventor of harmony escapes our investigation, from the same causes which leave us ignorant of those who first invented each particular science; because the original inventors could only advance one step, a succeeding discoverer afterwards made a more sensible improvement, and the first imperfect essays in every kind were lost in the more extensive and striking views to which they led. Thus the arts which we now enjoy, are for the most part far from being due to any particular man, or to any nation exclusively: they are produced by the united and successive endeavours of mankind; they are the results of such continued and united reflections, as have been formed by all men at all periods and in all nations.

It might, however, be wished, that after having ascertained, with as much accuracy as possible, the state of ancient music by the small number of Greek authors which remain to us, the same application might be extended to the investigation of the inconstant traces of harmony which appear in the succeeding ages, and to pursue those traces from period to period. The productions of those researches would doubtless be very imperfect, because the books and monuments of the middle ages are by far too few to enlighten any principles of harmony, and the causes of the perfection which we receive from it. His principle of music were produced by it: he reduced all the consonances to a small number of simple and fundamental chords, of which the others are only combinations or various arrangements. He has, in short, been able to discover, and render sensible to others, the mutual dependence between melody and harmony.

Though these different topics may be contained in the writings of this celebrated artist, and in these writings for writing for musicans as were not philosophers, and such philosophers as were not musicians, have long desired to see these objects brought more within the reach of their capacity: such is the intention of the treatise I now present to the public. I had formerly composed it for the use of some friends. As the work appeared to them clear and methodical, they have engaged me to publish it, perfused (though perhaps with too much credulity) that it might be useful to facilitate the progress of initiates in the study of harmony.

This was the only motive which could have determined me to publish a book of which I might without hesitation assume the honour, if its materials had been the fruits of my own invention, but in which I can now boast no other merit than that of having developed, elucidated, and perhaps in some respects improved, the ideas of another (c).

The first edition of this essay, published 1752, has been favourably received by the world, and copies of it have not been found in the hands of booksellers, I have endeavoured to render this more perfect. The detail which I mean to give of my labour, will present the reader with a general idea of the principle of M. general. Rameau, of the consequences deduced from it, of the manner in which I have disposed this principle and its consequences; in short, of what is still a-wanting, and might be advantageous to the theory of this amiable art; of what is still remains for the learned to contribute towards the perfection of this theory; of the rocks and quickfands which they ought to avoid in this research, and which could serve no other purpose than to retard their progress.

Every honourable body, besides its principal found, Rameau’s likewise exhibits to the ear the 12th and 17th major origin of that found. This multiplicity of different yet connected harmonies, cordant founds, known for a considerable time, constitutes

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(c) See M. Rameau’s letter upon this subject, Merc. de Mai 1752.

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they were in possession of what we denominate counterpoint. Without supposing this, there are some passages in the Greek authors which can admit of no satisfactory interpretation. See the Origin and Progress of Language, Vol. II. Besides, we, can discover some vestiges of harmony, however rude and imperfect, in the history of the Gothic ages, and amongst the most barbarous people. This they could not have derived from more cultivated countries, because it appears to be incorporated with their national music. The most rational account, therefore, which can be given, seems to be, that it was conveyed in a mechanical or traditionary manner through the Roman provinces from a more remote period of antiquity.
M U S I C.

Prelim.

*See System.

Difficult.

*See Chord.

*See Tetrachord.

*See Diatonic.

*See Value.

*See Bass.

*See Alteration.

*See Mode.

*See Intonation.

*See Tone.

*See Discord.

*See Chromatic.

*See Enharmonic.

*See Tempered.

One end which we have proposed in this treatise, was not only to place the discoveries of M. Rameau in their most conspicuous and advantageous light, but even in particular respects to render them more simple.

—For instance, besides the fundamental experiment which we have mentioned above, that celebrated musician, to render the explication of some particular phenomena in music more accessible, had recourse to another experiment; I mean that which shows that a nonorous body struck and put in vibration, forces its
tone to a particular kind of diatonics, and the multiplied sounds which arise from it, are a sufficient foundation for the whole harmonic system.

But though this work is intended to explain the theory of music, and to reduce it to a system both complete and more luminous than has hitherto been done, we ought to caution those who shall read this treatise, that they may be careful not to deceive themselves, either by misapprehending the nature of our object, or the end which our endeavours pursue.

We must not here look for that striking evidence which is peculiar to geometrical discoveries alone, and which can be so rarely obtained in these mixed diquisitions, where natural philosophy is likewise concerned: into the theory of musical phenomena there must always enter a particular kind of metaphysics, which these phenomena implicitly take for granted, and which brings along with it its natural obscurity. In this subject, therefore, it would be absurd to expect what is called demonstration: it is an achievement of no small importance, to have reduced the principal facts to a system consistent with itself, and firmly connected in its parts; to have deduced them from one simple experiment; and to have established upon this foundation the most common and essential rules of the musical art. But in another view, if here it be improper to require that intimate and unalterable conviction which can only be produced by the strongest evidence, we remain in the mean time doubtful whether it is possible to elucidate this subject more strongly.

After this declaration, one should not be astonished, that, amongst the facts which are deduced from our fundamental experiment, there should be some which appear immediately to depend upon that experiment, and others which are deduced from it in a way more remote and less direct. In dilquisitions of natural philosophy, where we are scarcely allowed to use any other arguments, except such as arise from analogy or congruity, it is natural that the analogy should be sometimes more sometimes less sensible: and we will venture to assert, that such a mind must be very improper for philosophy, which cannot recognize and distinguish this gradation and the different circumstances on which it proceeds. It is not even surprising, that in a subject where analogy alone can take place, this conduct may drive us all at once in our attempts to account for certain phenomena. This likewise happens in the subject which we now treat; nor do we conceal the fact, however mortifying, that there are certain points (though their number be but small) which appear still in some degree accountable from our principles. Such, for instance, is the procedure of the diatonics scale in descending; the formation of the chord commonly termed the first redundant or superfluous, and some other facts of less importance, for which as redundant we are yet we can scarcely offer any satisfactory account except from the experience alone.

Thus, though the greatest number of the phenomena in the art of music appear to be deducible in a simple and easy manner from the protracted tone of nonorous bodies, one ought not with perhaps too much temerity to affirm as yet, that this mixed and protracted tone is demonstratively the only original principle of nor any law; though they should be incommensurable one with another; the protracted tone of a nonorous body, and the multiplied sounds which result from it, are a sufficient foundation for the whole harmonic system.
of harmony (n). But in the mean time it would not be less unjust to reject this principle, because certain phenomena appear to be deduced from it with less success than others. It is only necessary to conclude from this, either that by future scrutinies means may be found for reducing these phenomena to this principle; or that harmony has perhaps some other unknown principle, more general than that which results from the projected and compounded tone of famous bodies, and of which this is only a branch; or, lastly, that we ought not perhaps to attempt the reduction of the whole science of music to one and the fame principle; which, however, is the natural effect of an impatience fo frequent even among philosophers themselves, which induces them to take a part for the whole, and to judge of objects in their full extent by the greatest number of their appearances.

In those sciences which were called physico-mathematical (and amongst this number perhaps the science of sounds may be placed), there are some phenomena which depend only upon one single principle and one single experiment: there are others which necessarily suppose a greater number both of experiments and principles, whose combination is indispensable in forming an exact and complete system; and music perhaps is in this last case. It is for this reason, that, whilst we bellow on M. Rameau all due praise, we should not at the same time neglect to stimulate the learned in their endeavors to carry them still to higher degrees of perfection, by adding, if it is possible, such improvements as may be wanting to confummate the science.

Whatever the result of their efforts may be, the reputation of this intelligent artist has nothing to fear; he will still have the advantage of being the first who rendered music a science worthy of philosophical attention; to have made its practice more simple and easy; and to have taught musicians to employ in this subject the light of reason and analogy.

We would the more willingly persuade those who are skilled in theory and eminent in practice to extend and improve the views of him who before them pursued and pointed out the career, because many amongst them have already made laudable attempts, and have even been in some measure successful in diffusing new light through the theory of this enchanting art. It Tartini's was with this view that the celebrated Tartini has presented us in 1754 with a treatise of harmony, founded on a principle different from that of M. Rameau. This principle is the result of a most beautiful experiment (†). If at once two different sounds are produced from two instruments of the same kind, these two

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(n) The demonstration of the principles of harmony by M. Rameau was not thus intimated in the exposition which he presented in the year 1749 to the Academy of Sciences, and which that Society besides approved with all the eulogiums which the author deserved; the title, as inserted in the register of the academy, was, "A memorial, in which are explained the foundations of a system of music theoretical and practical." It is likewise under this title that it was announced and approved of by the Commissioners, who in their printed report, which the public may read along with M. Rameau's memorial, have never dignified his theory with any other name than that of a system, the only name in reality which is expressive of its nature. M. Rameau, who after the approbation of the Academy, has thought himself at liberty to adorn his system with the name of demonstration, did not certainly recollect what the Academy has frequently declared; that, in approving any work, it was by no means implied, that the principles of that work appeared to them demonstrated. In short, M. Rameau himself, in some writings posterior to what he calls his demonstration, acknowledges, that upon particular points in the theory of the musical art, he is under a necessity of having recourse to analogy and supposition; this excludes every idea of demonstration, and refounds the theory of the musical art exhibited by M. Rameau to the classes in which it can only be ranked with probability, I mean the classes of probabilities.

(†) Had the utility of the preliminary discourse in which we are now engaged been less important and obvious than it really is, we should not have given ourselves the trouble of translating, nor our readers that of perusing it. But it must be evident to every one, that the caution here given and the advice offered, are no less applicable to students than to authors. The first question here decided is, Whether pure mathematics can be successfully applied to the theory of music? The author is jutly of a contrary opinion. It may certainly be doubted with great justice, whether the solid contents of famous bodies and their degrees of cohesion or elasticity, can be ascertained with sufficient accuracy to render them the subjects of musical speculation, and to determine their effects with such precision as may render the conclusions deduced from them geometrically true. It is admitted, that found is a secondary quality of matter, and that secondary qualities have no obvious connection which we can trace with the sensations produced by them. Experience therefore, and not speculation, is the grand criterion of musical phenomena. For the effects of geometry in illustrating the theory of music (if any will fill be so credulous as to pay them much attention), the English reader may consult Smith's Harmonics, Malcolm's Difcertation on Music, and Pleydel's Treatise on the same subject insert in a former edition of this work. Our author next treats of the famous discovery made by Sig. Tartini, of which the reader may accept the following compendious account.

If two sounds be produced at the same time properly tuned and with due force, from their conjunction a third sound is generated, so much more distinctly to be perceived by delicate ears as the relation between the generating sounds is more simple; yet from this rule we must except the union and octave. From the fifth is produced a sound union with its lowest generator; from the fourth, one which is an octave lower than the highest of its generators; from the third major, one which is an octave lower than its lowest; and from the fifth
MUSIC.

They have inserted in the Encyclopedia, under the article Fundamental, a detail of this experiment according to M. Tartini; and we owe to the public an information of which in composing this article we were ignorant; M. Rameau, a member of the Royal Society at Montpellier, had presented to that society in the year 1753, before the work of M. Tartini had appeared, a memorial printed the same year, and where may be found the same experiment displayed at full length. In relating this fact, which, it was necessary for us to do, it is by no means our intention to detract in any degree from the reputation of M. Tartini; we are persuaded that he owes this discovery to his own researches alone: but we think ourselves obliged in honour to give public testimony in favour of him who was the first in exhibiting this discovery.

But whatever be the case, it is in this experiment that M. Tartini attempts to find the origin of harmony: his book, however, is written in a manner so obscure, that it is impossible for us to form any judgment of it; and we are told that others distinguished for their knowledge of the science are of the same opinion. It were to be wished, that the author would engage some man of letters, equally practised in music and skilful in the art of writing, to unfold these ideas which he has not discovered with sufficient perspicuity, and from whence the art might perhaps derive considerable advantage if they were placed in a proper light. Of this I am so much the more persuaded, that even though this experiment should not be regarded by others in the same view with M. Tartini as the foundation of the musical art, it is nevertheless extremely probable that one might use it with the greatest advantage to enlighten and facilitate the practice of harmony.

In exhorting philosophers and artists to make new attempts for the advancement of the theory of music, we ought at the same time to let them know the danger of mistaking what is the real end of their researches. Experience is the only foundation upon which they can proceed; it is alone by the observation of facts, by bringing them together in one view, by showing their dependency upon one, if possible, or at least upon a very small number of primary facts, that they can reach the end to which they so ardently aspire, the important end of establishing an exact theory of music, where nothing is wanting, nothing obscure, but every thing discovered in its full extent, and in its proper light. The philosopher who is properly enlightened, will not give himself the trouble to explain such facts as are less essential to his art, because he can discern those on which he ought to expatiate for its proper illustration. If one would entire them according to their proper value, he will only find it necessary to cast his eyes upon the attempts of natural philosophers who have discovered the greatest skill in their science; to explain, for instance, the multiplicity of sounds produced by the bodies. These fages, after having remarked (what is by no means difficult to conclude) that the universal vibration of a musical string is a mixture of several partial vibrations, from thence infer, that a sonorous body ought to produce a multiplicity of tones, as it really does. But why should this multiplied sound only appear to contain three, and why these three preferable to others? Some pretend that there are particles in the air, which, by their different degrees of magnitude and texture, being naturally susceptible of different oscillations, produce the multiplicity of found in question. But what do we know of all this hypothetical doctrine? And though it should be granted, that there is such a diversity of tension in these aereal particles, how should this diversity prevent them from being all of them confounded in their vibrations by the motions of a sonorous body? What then should be the result, when the vibrations arrive at our ears, but a confused and inappreciable noise, where one could not distinguish any particular sound?

If philosophical musicians ought not to lose their time in searching for mechanical explications of the phenomena in music, explications which will always be found vague and unsatisfactory; much less is it their province to exhaust their powers in vain attempts to rife above their sphere into a region still more remote from the prospect of their faculties, and to lose themselves in a labyrinth of metaphysical speculations upon the causes of that pleasure which we feel from harmony. In vain would they accumulate hypothesis on hypothesis, to find a reason why some chords should please us.

Sixth minor (whose highest note forms an octave with the lowest in the third formerly mentioned) will be produced a found lower by a double octave than the highest of the lesser sixth; from the third minor, one which is double the distance of a greater third from its lowest; but from the sixth major (whose highest note makes an octave to the lowest in the third minor) will be produced a found only lower by double the quantity of a greater third than the highest; from the second major, a found lower by a double octave from the lowest; from a second minor, a found lower by triple the quantity of a third major than the highest; from the interval of a diatonic or greater femitone, a found lower by a triple octave than the highest; from that of a minor or chromatic semitone, a found lower by the quantity of a fifth four times multiplied than the lowest, &c. &c.

But that these musical phenomena may be tried by experiments proper to ascertain them, two hautboys tuned with scrupulous exactness must be procured, whilst the musicians are placed at the distance of some paces one from the other, and the hearers in the middle. The violin will likewise give the same chords, but they will be left distinctly perceived, and the experiment more fallacious, because the vibrations of other strings may be supposed to enter into it.

If our English reader should be curious to examine these experiments and the conclusions made from them in the theory of music, he will find them clearly explained and illustrated in a treatise called Principles and Power of Harmony, printed at London 1771.
Elements.

Music.

Let us in sincerity confess our ignorance concerning the genuine causes of these effects (+). The metaphysical considerations concerning the acoustical organs are probably in the same predicament with those which are formed concerning the organs of vision, if one may speak so, in which philosophers have even till now made such incon siderable progress, and in all likelihood will not be surpassed by their successors.

Since the theory of music, even to those who confine themselves within its limits, implies questions from which every wise musician will abstain, with much greater reason should they avoid idle excursions beyond the boundaries of that theory, and endeavours to investigate between music and the other sciences chimerical relations which have no foundation in nature. The singular opinions advanced upon this subject by some even of the most celebrated musicians, deserve not to be rescued from oblivion, nor refuted; and ought only to be regarded as a new proof how far men of genius may deviate from truth and taste, when they engage in subjects of which they are ignorant.

The rules which we have attempted to establish concerning the track which every one ought to pursue in the theory of the musical art, may suffice to show our readers the end which we have proposed, and which we have endeavoured to attain in this Work. We have nothing to do here (for it is proper that we repeat it), we have nothing to do with the mechanical principles of protracted and harmonic tones produced by sonorous bodies; principles which till now have been explored in vain, and which perhaps may be long explored with the same success; we have still

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less

(+). We have as great an aversion as our author to the explication of musical phenomena from mechanical principles; yet we fear the following observations, deduced from irrefutable and universal experience, evidently show that the latter necessarily depend on the former. It is, for instance, universally allowed, that dissonances grate and concords please a musical ear; it is likewise no less unanimously agreed, that in proportion as a chord is perfect, the pleasure is increased; now the perfection of a chord consists in the regularity and frequency of coincident oscillations between two sonorous bodies impelled to vibrate; thus the third is a chord less perfect than the fifth, and the fifth than the octave. Of all these consonances, therefore, the octave is most pleasing to the ear; the fifth next, and the third last. In absolute discord, the vibrations are never coincident, and of consequence a perpetual pulsation or jarring is recognized between the protracted sounds, which exceedingly hurts the ear; but in proportion as the vibrations coincide, those pulsations are superceded, and a kindred formed betwixt the two continued sounds, which delights even the corporeal senses: that relation, therefore, without recognizing the aptitudes which produce it, must be the obvious cause of the pleasure which chords give to the ear. What we mean by coincident vibrations is, that while one sonorous body performs a given number of vibrations, another performs a different number in the same time; so that the vibrations of the quickest must sometimes be simultaneous with those of the slowest, as will plainly appear from the following demonstration: Between the extremes of a third, the vibrations of the highest are as 5 to 4 of the lowest; those of the fifth as 3 to 2; those of the octave as 2 to 1. Thus it is obvious, that in proportion to the frequent coincidence of periodic vibrations, the compound sensation is more agreeable to the ear. Now, to inquire why that organ should be rather pleased with these than with the pulsation and tremulous motion of encountering vibrations which can never coincide, would be to ask why the touch is rather pleased with polished than rough surfaces? or, why the eye is rather pleased with the waving line of Hogarth than with sharp angles and abrupt or irregular prominences? No alteration of which any chord is susceptible will hurt the ear unless it should violate or destroy the regular and periodical coincidence of vibrations. When alterations can be made without this disagreeable effect, they form a pleasing diversity; but still this fact corroborates our argument, that in proportion as any chord is perfect, it is impatient of the smallest alteration; for this reason, even in temperament, the octave endures no alteration at all, and the fifth as little as possible.
lefs to do with the metaphysical causes of those plea-
ing sensations which are impressed on the mind by
harmony; causes which are still less discovered, and
which, according to all appearances, will remain latent
in perpetual obscurity. We are alone concerned to
show how the chief and most essential laws of harmony
may be deduced from one single experiment; and for
which, if we may speak so, preceding artists have been
under a necessity of groping in the dark.

With an intention to render this work as generally
useful as possible, I have endeavored to adapt it to
the capacity even of those who are absolutely unin-
structed in music. To accomplish this design, it ap-
ppeared necessary to pursue the following plan.

To begin with a short introduction, in which are
defined the technical terms most frequently used in this
art; such as chord, harmony, key, third, fifth, octave, &c.

Afterwards to enter into the theory of harmony,
which is explained according to M. Rameau, with all
possible perspicuity. This is the subject of the First
Part; which, as well as the introduction, presupposes
no other knowledge of music than that of the names
and powers of the syllables, ut, re, mi, fa, sol, la, ti, or
C, D, E, F, G, A, B, which all the world knows (†).

The theory of harmony requires some arithmetical
calculations, which are necessary for comparing founds
one with another. These calculations are very short,
extremely simple, and conducted in such a manner as
not to be feebly comprehended by every one; they de-
mand no operation but what is clearly explained,
and which every school boy with the greatest simplic-
ity, and other calculations not transferable to fenil
objects but that of the third major as 4 to 5, &c. are not perhaps
transferred to fémil

Thefe calculations I have not endeavoured to mul-
triply; I could even have wished to suppress them, if it
had been possible: so much did it appear to me to be
apprehended that my readers might be miffed upon
this subject, and might either believe themselves, or
at least suspect me of believing, all this arithmetic
necessary to form an artif. Calculations may indeed
facilitate the understanding of certain points in the
theory, as of the relations between the different notes
in the gamut and of the temperament; but the cal-
culations necessary for treating of these points are fo
simple, and, to speak more properly, of too little im-
portance, that nothing can require a lefs minute or

Oftentations display. Do not let us imitate those mu-
icians who, believing themselves geometers, or those
gemeaters who, believing themselves musicians, fill
their writings with fures upon figures; imagining,
perhaps, that this apparatus is necessary to the art.
The propensity of adorning their works with a false
air of science, can only impose upon credulity and
ignorance, and serve no other purpose but to render
their treatises more obscure and less instructive. In
the character of a geometer, I think I have some right
to protest here (if I may be permitted to express myself
in this manner) against fuch ridiculous abuse of geo-
metry in music.

This I may do with so much more reason, that in
this subject the foundations of those calculations are
in some manner hypothetical, and can never arrive to
a degree of certainty above hypothesis. The relation
of the octave as 1 to 2, of that in the fifth and third,
may be fpared to fuch as are not disposed to take it,
whether the genuine relations established in nature; but only
relations which approach them, and such as experience
can discover. For are the refults of experience any
thing more but mere approaches to truth?

But happily these approximated relations are suf-
cient, though they should not be exactly agreeable
to truth, for giving a satisfactory account of those phe-
omena which depend on the relations of found; as
in the difference between the notes in the gamut, of
the alterations necessary in the fifth and third, of
the different manner in which instruments are tuned,
and other facts of the fame kind. If the relations
of the octave, of the fifth, and of the third, are not

The secound part contains the most esential rules of
composition *; or in other words the practice of * See Com-
harmony. These rules are founded on the principles position.
laid down in the first part; yet those who wish to
understand no more than is necessary for practice,
without exploring the reasons why such practical
rules are necessary, may limit the objects of their
study to the introduction and the secound part. They
who have read the first part, will find at every rule
contained in the second, a reference to that passage in

(†) The names of the seven notes used by the French are here retained, and will indeed be continued
through the whole ensuing work; as we imagine, that, if properly associated with the founds which they de-
nominate, they will tend to impress these sounds more distinctly on the memory of the scholar than the letters
C, D, E, F, G, A, B, from which characters, except in syllables, the notes in the diatonic series are gene-

For an account of these variations, see Rousseau's Musical Dictionary, article Gamme. See also the Essay
Elements of Music.

Prel. on the
Difficulties
of
to the notes

92. Some rules on the part of rules and observations which are left to the reader to establish and practice, without the necessity of reading the whole; and beginning with the fundamental principles, I have not the remotest claim. The whole part which I proposed was to be useful; to teach the reader to succeed one in another, do not seek to find my endeavours unsatisfactory.

DEFINITIONS OF SEVERAL TECHNICAL TERMS.

1. What is meant by Melody, by Chord, by Harmony, by Interval.

2. That which arises from the mixture of several sounds heard at the same time; and harmony is properly a series of chords which in their succession one to another delights the ear. A single chord is like the sometimes called harmony, to signify the coalescence of sounds which that chord creates, and the satisfaction produced in the ear by that coalescence. We shall occasionally use the words harmony in this last sense, but in such a manner as never to leave our meaning ambiguous.

3. In melody and harmony, the distance between one sound and another is called an interval; and this is increased and diminished as the sounds between which it intervenes are higher or lower than the other.

4. That we may learn to distinguish the intervals, and the manner of perceiving them, let us take the ordinary scale ut, re, mi, fa, sol, la, ti, ut, C, D, E, F, G, A, B, C, every person whose ear or voice is not extremely false, naturally modulates. These are the observations which will occur to us in singing this gamut.

The sound re is higher or sharper than the sound ut, and the found mi higher than the found re, the found fa the simple sound higher than the found mi, &c. and so through the whole series of intervals, ut, re, mi, fa, sol, la, ti, ut, C, D, E, F, G, A, B, C, every person whose ear or voice is not extremely false, naturally modulates. These are the observations which will occur to us in singing this gamut.

5. In general, the interval between two sounds is proportionally greater, as one of these sounds is higher or lower with relation to the other: but it is between necessary to observe, that two sounds may be of equal and high or low, though unequal in their force. The string of a violin touched with a bow produces always a sound equally high, whether strongly or faintly struck; the sound will only have a greater or lesser degree of strength. It is the same with vocal modulation.

(1) From my general recommendation of this code, I except the reflections on the principles of sound which are at the end, and which I think not advisable any one to read.

(x) Printed at Paris by Lambert in the year 1754.

(1) That criticism and my answers may be seen in the Journeaux Economiques of 1752.
9. As interval composed of a tone and a semitone, as from mi to fa, from la to ut, or from re to fa, is called a third minor.

An interval composed of two full tones as from ut mi, from fa to la, or from fol to fi, is called a third major.

An interval consisting of two tones and a semitone, as from ut to fa, or from fol to ut is called a fourth. Triton, what.

An interval consisting of three full tones, as from fi to fi, is called a triton or fourth redundant.

An interval composed of three tones and a semitone, as from ut to fol, from fa to ut, from re to la, or from mi to fi, &c. is called a fifth.

An interval composed of three tones and two semitones, as from mi to ut, is called a sixth minor.

An interval composed of four tones and a semitone, as from ut la, is called a sixth major.

An interval consisting of four tones and two semitones, as from re to ut is called a seventh minor.

An interval composed of five tones and a semitone, as from ut to fi, is called a seventh major.

And

(a) This experiment may be easily tried. Let any one sing the scale of ut, re, mi, fa, fol, la, fi, ut, it will be immediately observed without difficulty, that the last four notes of the octave are quite similar to the first ut, re, mi, fa; inasmuch, that if, after having sung this scale, one would chose to repeat it beginning with ut in the same tone which was occupied by fol in the former scale, the note re of the last scale would have the same found with the note la in the first, the mi with the fi, and the fa with the ut.

From whence it follows, that the interval between ut and re is the same as between fol and la; between re and mi, as between la and fi; and mi and fa, as between fi and ut.

It will likewise be found, that from re to mi, from fa to fol, there is the same interval as from ut to re. To be convinced of this, we need only sing the scale once more; then sing it again, beginning with ut, in this last scale, in the same tone which was given to re in the first; and it will be perceived, that the re in the second scale will have the same found, at least as far as the ear can discover, with the mi in the former scale; from whence it follows, that the difference between re and mi is, at least as far as the ear can perceive, equal to that between ut and re.

It will also be found, that the interval between fa and fol is, so far as our senses can determine, the same with that between ut and re.

This experiment may perhaps be tried with some difficulty by those who are not inured to form the notes and change the key; but such may very easily perform it by the assistance of a harpsichord, by means of which the performer will be favorably the trouble of retaining the sounds in one intonation whilst he performs another. In touching upon this harpsichord the keys fol, la, fi, ut, and in performing with the voice at the same time ut, re, mi, fa, in such a manner that the same sound may be given to ut in the voice with that of the key fol in the harpsichord, it will be found that re in the vocal intonation shall be the same with la upon the harpsichord, &c.

It will be found likewise by the same harpsichord, that if one should sing the scale beginning with ut in the same tone with mi on the instrument, the re which ought to have followed ut, will be higher by an extremely perceptible degree than the fa which follows mi: thus it may be concluded, that the interval between mi and fa is less than between ut and re; and if one would rise from fa to another found which is at the same distance from fa as fa from mi, he would find in the same manner, that the interval from mi to this new found is almost the same as that between ut and re. The interval then from mi to fa is nearly half of that between ut and re.

Since then, in the scale thus divided ut, re, mi, fa, fol, la, fi, ut, the first division is perfectly like the last; and since the intervals between ut and re, between re and mi, and between fa and fol, are equal; it follows, that the intervals between fol and la, and between la and fi, are likewise equal to every one of the three intervals between ut and re, between re and mi, and between fa and sol; and that the intervals between mi and fa and between fi and ut are also equal, but that they only constitute one half of the others.
Elements.

Definitions.

1. 1st. An interval consisting of five tones and two semitones, as from ut to UT, is called an octave. A great many of the intervals which have now been mentioned, are still signified by other names, as may be seen in the beginning of the second part; but those which we have now given are the most common, and the only terms which our present purpose demands.

10. Two sounds equally high, or equally low, however unequal in their force, are said to be in unison one with the other.

11. If two sounds form between them any interval, whatever it be, we say, that the highest when ascending is in that interval with relation to the lowest; and when descending, we pronounce the lowest in the same interval with relation to the highest. Thus in the third minor, mi, sol, where mi is the lowest and sol the highest; sol is a third minor from mi ascending, and mi is third minor from sol in descending.

12. In the same manner, if speaking of two sonorous bodies, we should say, that the one is a fifth above the other in ascending; this infers that the sound given by the one is at the distance of a fifth ascending from the sound given by the other.

III. Of Intervals greater than the Octave.

13. If, after having sung the scale ut, re, mi, fa, sol, la, si, UT, one would carry this scale still farther in ascent, it would be discovered without difficulty, that a new scale would be formed, UT, RE, MI, FA, &c. entirely similar to the former, and of which the sounds will be an octave ascending, each to its correspondent note in the former scale; thus RE, the second note of the second scale, will be an octave in ascent to the re of the first scale: in the same manner MI shall be the octave to mi, &c. and so of the rest.

14. As there are nine notes from the first ut to the second RE, the interval between these two sounds is called a ninth, and this ninth is composed of six full fifths, tones and two semitones. For the same reason the interval from ut to FA is called an eleventh, and the interval between ut and SOL, a twelfth, &c.

It is plain that the ninth is the octave of the seventh, eleventh the fourteenth of the fourth, and the twelfth of the fifteenth.

The octave above the octave of any sound is called a double octave; the octave of the double octave is called a triple octave, and so of the rest.

The double octave is likewise called a fifteenth; and for the same reason the double octave of the third is called a seventeenth, the double octave of the fifth a ninetieth, &c. (b).

IV. What is meant by Sharps and Flats.

15. It is plain that one may imagine the five tones Sharps and Flats, what enter into the scale, as divided each into two semitones; thus one may advance from ut to re, forming in his progress an intermediate sound, which shall be higher by a semitone than ut, and lower in the same degree than re. A sound in the scale is called flat, when it is raised by a semitone; and it is marked with this character: thus ut flat signifies ut, that is to say, ut raised by a semitone above its pitch in the natural scale. A sound in the scale depressed by a semitone is called flat, and is marked thus, b; thus la b signifies la flat, or la depressed by a semitone.

V. What is meant by Consonances and Dissonances.

16. A chord composed of sounds whose union or consonance pleases the ear is called a consonance; and one, the sounds which form this chord are said to be consonant.

(a) Let us suppose two vocal strings formed of the same matter, of the same thickness, and equal in their tension, but unequal in their length, it will be found by experience.

1/6. That the shortest is equal to half the longest, the found which it will produce must be an octave above the found produced by the longest.

2d/o, That if the shortest constitutes a third part of the longest, the found which it produces must be a twelfth above the found produced by the longest.

3d/o, That if it constitutes the fifth part, its found will be a seventeenth above.

Besides, it is a truth demonstrated and generally admitted, that in proportion as one musical string is less than another, the vibrations of the leaf will be more frequent (that is to say, its departures and returns through the same space) in the same time; for instance, in an hour, a minute, a second, &c. in such a manner that one string which constitutes a third part of another, forms three vibrations, whilst the largest has only accomplished one. In the same manner, a string which is one half less than another, performs two vibrations, whilst the other only completes one; and a string which is only the fifth part of another, will perform five vibrations in the same time which is occupied by the other in one.

From thence it follows, that the sound of a string is proportionally higher or lower, as the number of its vibrations is greater or smaller in a given time; for instance, in a second.

It is for that reason, that if we represent any sound whatever by 1, one may represent the octave above by 2, that is to say, by the number of vibrations formed by the string which produces the octave, whilst the longest string only vibrates once; in the same manner we may represent the twelfth above the found 1 by 3, the seventeenth major above 5, &c. But it is very necessary to remark, that by these numerical expressions, we do not pretend to compare sounds as such; for sounds in themselves are nothing but mere sensations, and it cannot be said of any sensation that it is double or triple to another: thus the expressions 1, 2, 3, &c. employed to denominate a sound, its octave above, its twelfth above, &c. signify only, that if a string performs a certain number of vibrations, for instance, in a second, the string which is in the octave above shall double the number in the same time, the string which is in the twelfth above shall triple it, &c.

Thus to compare sounds among themselves is nothing else than to compare among themselves the numbers of vibrations which are formed in a given time by the strings that produce those sounds,
MUSIC

Definitions.

17. The octave of a found is the most perfect of confronances of which that found is susceptible; then the fifth, afterwards the third, &c. This is a fact founded on experiment.

18. A number of founds simultaneously produced whose union is displeasing to the ear is called a diffusion, and the founds which form it are said to be dissonant one with relation to the other. The second, the triton, and the seventh of a found, are diffonants see Diffusion, with relation to it. Thus the founds ut re, ut fi, or cord. fa, fi, &c. simultaneously heard, form a diffusion.

The reason which renders diffusion disagreeable, is, that the founds which compose it, seem by no means coalescent to the ear, and are heard each of them by itself as distinct founds, though produced at the same time.

PART I. THEORY OF HARMONY.

CHAPTER I. Preliminary and Fundamental Experiments.

Experiment I.

When a sonorous body is struck until it gives a found, the ear, besides the principal found and its octave, perceives two other founds very high, of which one is the twelfth above the principal found, that is to say, the octave to the fifth of that found; and the other is the seventeenth major above the same found, that is to say, the double octave of its third major.

20. This experiment is peculiarly sensible upon the thick strings of the violoncello, of which the found being extremely low, gives to an ear, though not very much practised, an opportunity of distinguishing with sufficient ease and clearness the twelfth and seventeenth now in question (c).

21. The principal found is called the generator*; * See Ge- and resonor.

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(c) Since the octave above the found 1 is 2, the octave below that same found shall be 1; that is to say, that the striking which produces this octave shall have performed half its vibration, whilst the striking which produces the found 1 shall have completed one. To obtain therefore the octave above any found, the operator must multiply the quantity which expresses the found by 2; and to obtain the octave below, he must on the contrary divide the same quantity by 2.

It is for that reason that if any found whatever, for instance ut, is denominated

| Its octave above will be | - | - | - | - | 1 |
| Its double octave above | - | - | - | - | 2 |
| Its triple octave above | - | - | - | - | 4 |
| In the same manner its octave below will be | - | - | - | - | 1 |
| Its double octave below | - | - | - | - | 2 |
| Its triple octave below | - | - | - | - | 4 |

And so of the rest.

Its twelfth above | - | - | - | - | 3 |
Its twelfth below | - | - | - | - | 3 |
Its 17th major above | - | - | - | - | 5 |
Its 17th major below | - | - | - | - | 5 |

The fifth then above the found 1, being the octave beneath the twelfth, shall be, as we have immediately observed, 1; which signifies that this striking performs 1 vibrations; that is to say, one vibration and a half during a single vibration of the string which gives the found 1.

To obtain the found above the found 1, we must take the twelfth below that found, and the double octave above that twelfth. In effect, the twelfth below 1, for instance, is fa, of which the double octave fa is the fourth above ut. Since then the twelfth below 1 is 1, it follows that the double octave above this twelfth, that is to say, the fourth from the found 1 in ascending, will be multiplied by 4, or 2.

In short, the third major being nothing else but the double octave beneath the seventeenth, it follows, that the third major above the found 1 will be 5 divided by 4, or in other words 5.

The third major of a found, for instance the third major mi, from the found ut, and its fifth sol, form between them a third minor mi, sol; now mi is 5, and sol 5, by what has been immediately demonstrated; from whence it follows, that the third minor, or the interval between mi and sol, shall be expressed by the relation of the fraction 5 to the fraction 1.

To determine this relation, it is necessary to remark, that 5 is the same thing with 5, and that 5 are the same thing with 5: so that 5 shall be to 5 in the same relation as 5 to 5; that is to say, in the same relation as 10 to 12, or as 5 to 6. If, then, two founds form between them a third minor, and that the first is represented by 5, the second shall be expressed by 6; or, what is the same thing, if the first is represented by 1, the second shall be expressed by 5.
22. There is no person insensible of the resemblance which subsists between any found and its octave, whether above or below. These two founds when heard together, almost entirely coalesce in the organ of sensation. We may besides be convinced (by two facts which are extremely simple) of the facility with which one of these founds may be taken for the other.

Let it be supposed that any person has an inclination to sing a tune, and having at first begun this air upon a pitch too high or too low for his voice, so that he is obliged, lest he should strain himself too much, to sing the tune in question on a key higher or lower than the first; I affirm, that without being initiated in the art of music, he will naturally take his new key in the octave below or the octave above the first; and that in order to take this key in any other interval except the octave, he will find it necessary to exert a sensible degree of attention. This is a fact of which we may easily be persuaded by experience.

Another fact. Let any person sing a tune in our presence, and let it be sung in a tone too high or too low for our voice; if we will to join in singing this air, we naturally take the octave below or above, and frequently, in taking this octave, we imagine it to be the unison (p).

23. To render our ideas still more precise and permanent, we shall call the tone produced by the for- 

24. This octave of sol then, and this double octave of mi, produce the most perfect chord which can be joined with ut, since that chord is the work and choice of nature (v).

25. For the same reason, the modulation formed by ut with the octave of sol and the double octave of mi, as well as one after the other, would likewise be the most simple and natural of all modulations which do not descend or ascend directly in the diatonic order, if our voices had sufficient compass to form intervals so great without difficulty: but the ease and freedom with which

Thus the third minor, an harmonic found which is even found on the protracted and coalescent tones of a sonorous body between the found mi and sol, an harmonic of the principal found, may be expressed by the fraction 3.

N. B. One may see by this example, that in order to compare two founds one with another which are expressed by fractions, it is necessary first to multiply the numerator of the fraction which expresses the first by the denominator of the fraction which expresses the second, which will give a primary number; as here the numerator 5 of the fraction 9, multiplied by 2 of the fraction 1, has given 10. Afterwards may be multiplied the numerator of the second fraction by the denominator of the first, which will give a secondary number, as here 12 is the product of 4 multiplied by 3; and the relation between these two numbers (which in the preceding example are 10 and 12), will express the relation between these founds, or, what is the same thing, the interval which is between the one and the other; in such a manner, that the farther the relation between these founds departs from unity, the greater the interval will be.

Such is the manner in which we may compare two founds one with another whose numerical value is known.

We shall now show the manner how the numerical expression of a found may be obtained, when the relation which it ought to have with another found is known whose numerical expression is given.

Let us suppose, for example, that the third major of the fifth is sought. That third major ought to be, by what has been shown above, the 9 of the fifth, for the third major of any found whatever is the 9 of that found.

We must then look for a fraction which expresses the 9 of 1; which is done by multiplying the numerators and denominators of both fractions one by the other, from whence results the new fraction 19. It will likewise be found that the fifth of the fifth is the 9 of 1.

Thus far we have only treated of fifths, fourths, thirds major and minor in ascending; now it is extremely easy to find by the same rules the fifths, fourths, thirds major and minor in descending. For suppose ut equal to 1, we have seen that its fifth, its fourth, its third, its major and minor in ascending, are 9, 19, 19, 19. To find its fifth, its fourth, its third, its major and minor in descending, nothing more is necessary than to reverse these fractions, which will give 1, 9, 9, 9, 9.

(p) It is not then imagined that we change the value of a found in multiplying or dividing it by 2, by 4, or by 8, &c. the number which expresses these founds, since by these operations we do nothing but take the simple, double, or triple octave, &c. of the found in question, and that a found coalesces with its octave.

(s) The chord formed with the twelfth and seventeenth major united with the principal found, being exactly conformed to that which is produced by nature, is likewise for that reason the most agreeable of all; especially when the composer can proportion the voices and instruments together in a proper manner to give this chord its full effect. M. Rameau has executed this with the greatest success in the opera of Pygmalion page 34, where Pygmalion sings with the chorus, L'amour triomphe, &c.; in this passage of the chorus, the two parts of the vocal and instrumental basses give the principal found and its octave; the first part above, or treble, and that of the counter-tenor, produce the seventeenth major, and its octave, in descending; and in short, the second part or tenor above, gives the twelfth.
which we can substitute its octave to any found, when it is more convenient for the voice, afford us the mean of representing this modulation.

26. It is on this account that, after having sung the tone ut, we naturally modulate the third mi, and the fifth fa, instead of the double octave of mi, and the octave of fol; from whence we form, by joining the modulation of the octave of the found ut, this modulation, ut, mi, fol, ut, which in effect is the simplest and easiest of them all; and which likewise has its origin even in the protracted and compounded tones produced by a sonorous body.

27. The modulation ut, mi, fol, ut, in which the chord ut, mi, is a third major, constitutes that kind of harmony or melody which we call the mode major; from whence it follows, that this mode results from the immediate operation of nature.

28. In the modulation ut, mi, fol, of which we have now been treating, the founds mi and fol are so proportioned one to the other, that the principal found ut (art. 19.) causes both of them to sound; but the second tone mi does not cause fol to sound, which only forms the interval of a third minor.

29. Let us then imagine, that, instead of this found mi, one should substitute between the founds ut and fol another note which (as well as the founds ut) has the power of causing fa to sound, and which is, however, different from the found ut; the found which we explore ought to be fah, by art. 19. that it may have for its 17th major fol, or one of the octaves of fol; of consequence the found which we seek ought to be a 17th major below fol, or, what is the same thing, a third major below the found fol. Now the found mi being a third minor below fol, and the third major being (art. g.) greater by a semitone than the third minor, it follows, that the found of which we are in search shall be a semitone beneath the natural mi, and of consequence mi,.

30. This new arrangement, ut, mi, fol, in which the founds ut and mi have both the power of causing fol to sound, though ut does not cause mi to sound, is not indeed equally perfect with the first arrangement ut, mi, fol; because in this the two founds ut and fol are both the one and the other generated by the principle found ut; whereas, in the other, the found mi is not generated by the found ut; but this arrangement ut, mi, fol, is likewise dictated by nature (art. 19.), though less immediately than the former; and accordingly experience evinces that the ear accommodates itself almost as well to the latter as to the former.

31. In this modulation or chord ut, mi, fol, ut, Origin of it is evident that the third from ut to mi, is minor; mode mi and such is the origin of that mode which we call minor (heading).

32. The most perfect chords then are, 1. All chords related one to another, as ut, mi, fol, ut, consisting of any found of its third major, of its fifth, and of its Perfect octave. 2. All chords related one to another, as ut, mi, fol, ut, consisting of any found of its third minor, of its fifth, and of its octave. In effect, these two kinds of chords are exhibited by nature: but the first more immediately than the second. The first are called perfect chords major, the second perfect chords minor.

CHAP. III. Of the Series which the Fifth requires, and of the Lows which it observes.

33. Since the found ut causes the found fol to be Fundamental, and is itself heard in the found fa, which founds fol and fa are its two-twelfths, we may imagine a modulation composed of that found ut and its two-twelfths, or, which is the same thing (art. 22.), of its two-fifths, fa and fa, the one below, the other above; which gives the modulation or series of fifths fa, ut, fol, which I call the fundamental basis of ut by fifths.

We shall find in the sequel (Chap. XVIII.), that there may be some fundamental bases by thirds, deduced from the two seventeenth, in which the one is an attendant of the principal found, and of which the other includes that found. But we must advance step by step, and satisfy ourselves at present to consider immediately the fundamental bases by fifths.

34. Thus, from the found ut, one may make a transition indirectly to the found fol, or to the found fa.

35. One may for the same reason, continue this kind of fifths in ascending and in descending, from ut, in this manner:

fa, fol, ut, mi, fol, fa, ut, sa, etc.

And from this series of fifths one may pass to any found which immediately precedes or follows it.

36. But it is not allowed in the same manner to pass

The origin which we have here given of the mode minor, is the most simple and natural that can possibly be given. In the first edition of this treatise, I had followed M. Rameau in deducing it from the following experiment.—If you put in vibration a musical string AB, and if there are at the same time contiguous to the two other strings CF, LM, of which the first shall be a twelfth below the string AB, and the second a seventeenth major below the same AB, the strings CF, LM, will vibrate without being struck as soon as the string AB shall give a found, and divide themselves by a kind of undulation, the first into three, the last into five equal parts; in such a manner, that in the vibration of the string CF, you may easily distinguish two points at rest D, E, and in the tremulous motion of the string LM four sequent points N, O, P, Q, all placed at equal distances from each other, and dividing the strings into three or five equal parts. In this experiment, says M. Rameau, if we represent by ut the tone of the string AB, the two other strings will represent the founds fa and la, and from thence M. Rameau deduces the modulation fa, la, ut, and of consequence the mode minor. The origin which we have assigned to the minor mode, in this new edition, appears to me more direct and more simple, because it presupposes no other experiment than that of art 19, and because also the found equal found ut is still retained in both the modes, without being obliged, as M. Rameau found himself, to change it into fa.
Chapter IV. Of Modes in general.

38. A mode, in music, is nothing else but the order of sounds prescribed, as well in harmony as melody, by the series of fifths. Thus the three sounds fa, ut, sol, and the harmonics of each of these three sounds, that is to say, their thirds major and their fifths, compose all the major modes which are proper to ut.

39. The series of fifths then, or the fundamental series fa, ut, sol, of which ut holds the middle space, may be regarded as representing the mode of ut. One may likewise take the series of fifths, or fundamental series, ut, sol, re, as representing the mode of fa; in the same manner, fa, ut, will represent the mode of fa.

By this we may see, that the mode of fa, or rather the fundamental series of that mode, has two sounds in common with the fundamental series of the mode of ut. It is the same with the fundamental series of the mode of fa.

40. The mode of ut (fa, ut, sol) is called the principal mode with respect to the modes of these two fifths, which are called its two adjunctors.

41. It is then, in form, measure, indifferent to the ear whether a transition be made to the one or to the other of these adjunctors, since each of them has equally two sounds in common with the principal mode.

Yet the mode of fa seems a little more eligible: for fa is heard amongst the harmonics of ut, and of consequence is implied and signified by ut, whereas ut does not cause fa to be heard, though ut is included in the same sound. It is hence that the ear, affected by the mode of ut, is a little more prepossessed for the mode of fa than for that of fa. Nothing likewise is more frequent, nor more natural, than to pass from the mode of ut to that of fa.

42. It is for this reason, as well as to distinguish the two fifths one from the other, that we call fa the fifth above the generator the dominant found, and the satellite fa beneath the generator the subdominant.

43. It remains to add, as we have seen in the preceding chapter, that, in the series of fifths, we may indifferently pass from one found to that which is contiguous: In the same manner, and for the same reason, one may pass from the mode of fa to the mode of ut, after having made a transition from the mode of ut to the mode of fa, as from the mode of fa to the mode of f. But it is necessary, however, to observe, that the ear which has been immediately affected with the principal mode feels always a strong propensity to return to it. Thus the further the mode to which we make a transition is removed from the principal mode, the less time we ought to dwell upon it; or rather, to speak in the terms of the art, the less ought the phrase (1aa) of that mode to be protracted.

Chapter V. Of the Formation of the Diatonic Scale at ut.f by the Greeks.

44. From this rule, that two sounds which are contiguous may be placed in immediate succession in the series of fifths, fa, ut, sol, it follows, that one may form this modulation, or this fundamental bafs, by fifths, sol, fa, ut, sol, fa, ut.

45. Each of the sounds which forms this modulation brings necessarily along with itself its third major, its fifth, and its octave; infomuch that he who, for the formation of the Greek diatonic scale, raises the note sol, may be reckoned to sing at the same time the notes sol, fa, re, sol; in the same manner the found ut in the fundamental bafs brings along with it this modulation, ut, mis sol, ut; and, in the fundamental bafs, the same sound fa brings along with it fa, la, baf, ut, fa.

This modulation then, or this fundamental bafs, sol, fa, ut, sol, fa, ut, fa, gives the following diatonic series, fa, ut, re, mis sol, sol, la, which is precisely the diatonic scale of the Greeks. We see that are ignorant upon what principles they had formed this scale; but it may be discerned perceived, that that series arises from the bafs sol, ut, sol, ut, ut, fa, ut; and of consequence this bafs is justly called fundamental, as being the real primitive modulation, which

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(g) I say especially if they are major; for in the major chord re, fa, la, re, besides that the sounds ut and re have no common harmonic relation, and are even different between themselves (Art. 18.), it will likewise be found, that fae forms a dissonance with ut. The minor chord, re, fa, la, re, would be more tolerable, because the natural fa which occurs in this chord carries along with it its fifth ut, or rather the octave of that fifth. It has likewise been sometimes the practice of composers, though rather by a licence indulged them than freely agreeable to their art, to place a minor in diatonic succession to a major chord.

(1aa) As the more English reader, unacquainted with the technical phraseology of music, may be surprised at the use of the word phrase when transferred from language to that art, we have thought proper to infer the definition of Rouelle.

A phrase, according to him, is in melody a series of modulations, or in harmony a succession of chords, which form without interruption a feint more or less complete, and which terminate in a repose by a cadence more or less perfect.
concludes the ear, and which it feels to be implied in the diatonic modulation, \( f_5, ut, re, mi, fa, fol, la \) (\( n \)).

We shall be still more convinced of this truth by the following remarks.

In the modulation \( f_5, ut, re, mi, fa, fol, la \), the sounds \( re \) and \( fa \) form between themselves a third minor, which is not so perfectly true as that between \( mi \) and \( fol \) (1). Nevertheless, this alteration in the third minor between \( re \) and \( fa \) gives the ear no pain, because that \( re \) and that \( fa \), which do not form between themselves a true third minor, form, each in particular, consonances perfectly just with the sounds in the fundamental bases which correspond with them: for \( re \) in the scale is the true fifth of \( fol \), which answers to it in the fundamental bases; and \( fa \) in the scale is the true octave of \( fa \), which answers to it in the same bases.

If, therefore, these sounds in the scale form consonances perfectly true with the notes which correspond to them in the fundamental bases, the ear gives itself little trouble to investigate the alterations which there may be in the intervals which these sounds in the scale form between themselves. This is a new proof that the fundamental bases is the genuine guide of the ear, and the true origin of the diatonic scale.

Moreover, this diatonic scale includes only seven sounds, and goes no higher than \( f_5 \), which would be the octave of the first: a new singularity, for which a reason may be given by the principles above established. In reality, in order that the sound \( f_5 \), may succeed immediately in the scale to the sound \( la \), it is necessary that the note \( fol \), which is the only one from whence \( f_5 \) as a harmonic may be deduced, should immediately succeed to the sound \( fa \) in the fundamental bases, which is the only one from whence \( la \) can be harmonically deduced. Now, the diatonic succession from \( fa \) to \( fol \) cannot be admitted in the fundamental bases, according to what we have remarked (art. 36.) The sounds \( fa \) and \( f_5 \), then, cannot immediately succeed one another in the scale: we shall see in the sequel why this is not the case in the series \( ut, re, mi, fa, fol, la \), \( f_5, UT \), which begins upon \( ut \); whereas the scale in question here begins upon \( f_5 \).

The Greeks likewise, to form an entire octave, completed added before the first \( f_5 \) the note \( la \), which they distinguished and separated from the rest of the scale, and which for that reason they called \( proflamabonamen \) (= not subject to division). See Pro. Rameau, when he published, in 1726, his New theoretical and practical System of Music, had not as yet found the true reason of the alteration in the consonances which is between \( re \) and \( fa \), and of the little attention which the ear pays to it. For he pretends, in the work now quoted, that there are two thirds minor, one in the proportion of \( 5 \) to \( 6 \), the other in the proportion of \( 27 \) to \( 32 \). But the opinion which he has afterwards adopted, seems much preferable. In reality, the genuine third minor, is that which is produced by nature between \( mi \) and \( fol \), in the continued tone of these honorous bodies of which \( mi \) and \( fol \) are the two harmonies; and that third minor, which is in the proportion of \( 5 \) to \( 6 \), is likewise that which takes place in the minor mode, and not that third minor which is false and different, being in the proportion of \( 27 \) to \( 32 \).
Part I. Theory of Harmony.

137. Intervals in both tetrachords equal.

51. Moreover, the intervals between any two sounds, taken in each tetrachord in particular, are precisely true: thus, in the first tetrachord, the intervals of ut, re, mi, fa; fol, la, ut are thirds, the one major and the other minor, exactly true, as well as the fourth. The same thing is true with the tetrachord mi, fa, sol, la, since this tetrachord is exactly like the former.

52. But the case is not the same when we compare two sounds taken each from a different tetrachord; for we have already seen, that the note re is the second tetrachord with the note fa in the second a third minor, which is not true. In like manner it will be found, that the fifth from re to la is not exactly true, which is evident; for the third major from fa to la is true, and the third minor from re to fa is not so; nor, in order to form a true fifth, a third major and a third minor, which are both exactly true, are necessary.

53. From thence it follows, that every consonance is absolutely perfect in each tetrachord taken by itself; but that there is some alteration in passing from one tetrachord to the other. This is a new reason for distinguishing the scale into these two tetrachords.

54. It may be ascertained by calculation, that in the tetrachord fa, ut, re, mi, the interval, or the tone from re to mi, is a little less than the interval or tone from ut to re (a). In the same manner, in the second tetrachord mi, fa, sol, la, which is, as we have proved, perfectly similar to the first, the note from sol to la is a little less than the note from fa to fol. It is for this reason that they distinguish two kinds of tones; the greater tone*, as from ut to re, from fa to fol, &c.; and the lesser †, as from re to mi, from fol to ut. See la, &c.

Chap. VI. The Formation of the Diatonic Scale among the Moderns, or the Ordinary Gamut.

144. We have just shown in the preceding chapter, how the scale of the Greeks is formed, fi, ut, re, mi, fa, fol, la by means of a fundamental bass composed of three sounds only, fe, ut, fol: but to form the scale ut, re, mi, fa, fol, la, ut, UT, which we use at present, we must necessarily add to the fundamental bass the note re, and, with these four sounds fa, ut, fol, re, the following fundamental basses: ut, fol, ut, fa, fol, re, fol, ut;

from whence we deduce the modulation or scale ut, fa, re, ut, mi, fa, sol, la, ut, UT.

In effect (o), ut in the scale belongs to the harmony of ut which corresponds with it in the bass; re, which is the second note in the gamut, is included in the harmony of fol; the second note of the bass; mi, the third note of the gammut, is a natural harmonic of ut, which is the third found in the bass, &c.

From thence it follows, that the diatonic scale of the Greeks is, at least in some respects, more simple than ours; since the scale of the Greeks (chap. v.) may be formed alone from the mode proper to ut; whereas ours, and theirs is originally and primitively formed, not only from the mode of ut (fa, ut, fol), but likewise from the mode of fol (ut, fol, re).

It will likewise appear, that this last scale consists of two parts; of which the one, ut, re, mi, fa, fol, is

\[ \text{3T2} \]

(a) The proportion of fi to ut is as \( \frac{1}{2} \) to 1, that is to say as 15 to 16; that between mi and fa is as \( \frac{3}{4} \) to \( \frac{3}{4} \), that is to say (note c), as 5 times 3 to 4 times 4, or as 15 to 16; these two proportions then are equal. In the same manner, the proportion of ut to re is as 1 to \( \frac{3}{2} \), or as 8 to 9; that between fa and fol is as \( \frac{1}{2} \) to \( \frac{3}{4} \); that is to say (note c), as 8 to 9. The proportion of mi to ut is as \( \frac{3}{4} \) to 1, or as 5 to 4; that between fa and la is as \( \frac{3}{4} \) to \( \frac{3}{4} \), or as 5 to 4: the proportions here then are likewise equal.

(m) The proportion of mi to ut is as \( \frac{3}{4} \) to 1, or as 5 to 4, which is a true third major; that from re to fi is as \( \frac{3}{4} \) to \( \frac{3}{4} \), that is to say, as 9 times 16 to 15 times 8, or as 9 times 2 to 15, or as 6 to 5. In like manner, we shall find, that the proportion of mi to fi is as \( \frac{3}{4} \) to \( \frac{3}{4} \); that is to say, as 5 times 16 to 15 times 4, or as 4 to 3, which is a true fourth.

(u) The proportion of re to ut is as \( \frac{3}{4} \) to 1, or as 9 to 8; that of mi to re is as \( \frac{3}{4} \) to \( \frac{3}{4} \), that is to say, as 40 to 36, or as 10 to 9: now \( \frac{3}{4} \) is less removed from unity than \( \frac{3}{4} \); the interval then from re to mi is a little less than that from ut to re.

If any one would wish to know the proportion which \( \frac{3}{4} \) bear to \( \frac{3}{4} \), he will find (note c) that it is as 8 times 10 to 9 times 9, that is to say, as 80 to 81. Thus the proportion of a lesser to a greater tone is as 80 to 81; this difference between the greater and lesser tone is what the Greeks called a comma.

We may remark, that this difference of a comma is found between the third minor when true and harmonical, and the same chord when it suffers alteration re, fa, of which we have taken notice in the scale (note 1); for we have seen, that this third minor thus altered is in the proportion of 80 to 81 with the true third minor.

(o) The values or estimates of the notes shall be the same in this as in the former scale, excepting only the tone la; for re being represented by \( \frac{3}{4} \), its fifth will be expressed by \( \frac{3}{4} \); so that the scale will be numerically signified thus:

\[ \text{Ut, Re, Mi, Fa, Sol, La, Fi, UT}. \]

Where you may see, that the note la of this scale is different from that in the scale of the Greeks; and that the la in the modern series stands in proportion to that of the Greeks as \( \frac{3}{4} \) to \( \frac{3}{4} \), that is to say, as 81 to 80; these two lates then likewise differ by a comma.
...the mode of ut; and the other sol, la, si, ut, in that of sol.

57. It is for this reason that the note sol is found to be twice repeated in immediate succession in this scale; once as the fifth of ut, which corresponds with it in the fundamental bafil; and again, as the octave of sol, which immediately follows ut in the same bafil. As to what remains, these two consecutive sols are otherwise in perfect union. It is for this reason that we are satisfied with finging only one of them when one modulates the scale ut, re, mi, fa, sol, la, fa, UT; but this does not prevent us from employing a pause or repose, expressed or understood, after the sound fa. There is no person who does not perceive this whilst he himself sings the scale.

58. The scale of the moderns, then, may be considered as consisting of two tetrachords, disjunctive indeed, but perfectly similar one to the other, ut, re, mi, fa, and sol, la, si, ut, one in the mode of ut, the other in that of sol. For what remains, we shall see in the sequel by what artifice one may cause the scale ut, re, mi, fa, sol, la, si, UT, to be regarded as belonging to the mode of ut alone. For this purpose it is necessary to make some changes in the fundamental basils, which we have already assigned: but this shall be explained at large in chap. xiii.

59. The introduction of the mode proper to sol in the fundamental bafil has this happy effect, that the notes fa, sol, la, si, may immediately succeed each other in ascending the scale, which cannot take place (art. 48.) in the diatonic series of the Greeks, because that series is formed from the mode of ut alone. From whence it follows:

1. That we change the scale at every time when we modulate three notes in succession.

2. That if these three notes are sung in succession in the scale ut, re, mi, fa, sol, la, si, UT, this cannot be done but by the allusion of a pause expressed or understood after the note fa, so much, that the three tones fa, sol, la, si, (three only because the note sol which is repeated is not enumerated) are supposed to belong to two different tetrachords.

60. It ought not then any longer to surprise us, that we feel some difficulty whilst we ascend the scale in singin three tones in succession, because this is impracticable without changing the mode; and if one pauses in the same mode, the fourth found above the first note will never be higher than a semitone above that which immediately precedes it; as may be seen by ut, re, mi, fa, and by sol, la, si, ut, where there is no more than a semitone between mi and fa, and between si and ut.

61. We may likewise observe in the scale ut, re, mi, fa, that the third minor from re to fa is not true, for the reasons which have been already given (art. 49.)—though altered, it is the same scale with the third minor from la to ut, and with the third major from fa to la: but each of these, themselves, founds form otherwise consonances perfectly true, with their correspondent founds in the fundamental basils.

62. The thirds la ut, fa la, which were true in the former scale, are false in this; because in the former scale la was the third of fa, and here it is the fifth of re, which corresponds with it in the fundamental basil.

63. Thus it appears, that the scale of the Greeks contains fewer consonances that are altered than consonances in the fundamental scale than in ours.

We see likewise that the value of la in the diatonic scale, a value which authors have been divided in ascertaining, solely depends upon the fundamental bafil, and that it must be different according as the note la has fa or re for its bafil. See the note (o).

CHAP. VII. Of Temperament.

64. The alterations which we have observed in the Temperament intervals between particular sounds of the diatonic scale, naturally lead us to speak of temperament. To give a clear idea of this, and to render the necessity of it palpable, let us suppose that we have before us an instrument with keys, a harpsichord, for instance, consisting of several octaves or scales, of which each includes its twelve semitones.

(r) In the scale of the Greeks, the note la being a third from fa, there is an altered fifth between la and re; but in ours, la being a fifth to re, produces two altered thirds, fa la, and la ut; and likewise a fifth altered, la mis, as we shall see in the following chapter. Thus there are in our scale two intervals more than in the scale of the Greeks which suffer alteration.

(a) But here it may be with some colour objected: The scale of the Greeks, it may be said, has a fundamental basil more simple than ours; and besides, in it there are fewer chords which will not be found exactly true; why then, notwithstanding this, does ours appear more easy to be sung than that of the Greeks? The Greeks in their scale begins with a semitone, whereas the intention prompted by nature seems to impel us to raise by a full tone at once. This objection may be thus answered. The scale of the Greeks is indeed better disposed than ours for the simplicity of the basil, but the arrangement of ours is more suitable to natural intonation. Our scale coincides by the fundamental found ut, and it is in reality from that found that we ought to begin; it is from this that all the others naturally arise, and upon this that they depend; now, if I may speak for, in this they are included: on the contrary, neither the scale of the Greeks, nor its fundamental basil, commences with ut; but it is from this ut that we must depart, in order to regulate our intonation, whether in rising or descending: now, in ascending from ut, the intonation, even of the Greek scale, gives the series ut, re, mi, fasil, la: and to true it is that the fundamental found ut is here the genuine guide of the ear, that, before we modulate the found ut, we should attempt to rise to it by that note in the scale which is most immediately contiguous, we cannot reach it but by the note fi, and by the semitone from fi to ut. Now to make a transition from fi to ut, by this semitone, the ear must of necessity be predisposed for that modulation, and consequently preoccupied with the mode of ut; if this were not the case, we should naturally rise from fi to ut, and by this operation pass into another mode.
65. What is still more, if, after having successively and alternately tuned the strings UT, SOL, &c. LA, mi, in perfect fifths and fourths one from the other, we continue to tune successively by true fifths and fourths the strings mi, fi, fa, ut, &c. we shall find, that, though fi, being a semitone higher than the natural note, should be equivalent to UT in the scale, it will by no means form a just octave to the first UT in the scale, but be considerably higher (s); yet this fi upon the harpsichord ought not to be different from the octave above UT; for every fi and every UT is the same found, since the octave or the scale only consists of twelve semitones.

66. From thence it necessarily follows, 1. That it is impossible that all the octaves and all the fifths should be just at the same time, particularly in instruments which have keys, where no intervals but a semitone or a eighth is admitted. 2. That, of consequence, it is impossible that the fifths are justly tuned, some alteration must be made in the octaves; now the sympathy or found which subsists between any note and its octave, does not permit us to make such an alteration: this perfect coalescence of found is the cause why the octave should

(r) The LA considered as the fifth of re is 1/16, and the fourth beneath this LA will constitute 1/2 of 1/16, that is to say, 1/32; &c. then shall be the value of mi, considered as a true fourth from LA in descencing: now mi considered as the third major of the found UT, is 1/3, or 1/16: these two mi's are between themselves in the proportion of 1:2 to 2:3; thus it is impossible that mi should be at the same time a perfect third major from UT, and a true fourth beneath LA.

(s) In effect, if you thus alternately tune the fifth above, and the fourth below, in the same octave, you may here see what will be the proceed of your operation.

UT, SOL a fourth; re a fourth; LA a fifth; mi a fourth; fi a fifth; fa a fourth; ut a fifth; re a fourth; LA 1/3; mi 1/2; &c. and so of the rest, till you arrive at fi, which will be found 1/3 1/3. This fraction is evidently greater than the number 2, which expresses the perfect octave ut to its correspondent UT; and the octave below fi would be one half of the same fraction, that is to say 1/3 1/3, which is evidently greater than UT represented by unity. This last fraction is composed of two numbers; the numerator of the fraction is nothing else but the number 3 multiplied 11 times in succession by itself; and the denominator is the number 2 multiplied 18 times in succession by itself. Now it is evident, that this fraction, which expresses the value of fi, is not equal to the unity which expresses the value of the found UT; though, upon the harpsichord, found and UT are identical.

This fraction rises above unity by 1/3 1/3, that is to say, by about 1/2, and this difference was called the comma of Pythagoras. It is palpable that this comma is much more considerable than that which we have already mentioned (note r), which is only 1/12.

We have already proved that the series of fifths produces an ut different from fi, the series of thirds major gives another still more different. For, let us suppose these series of thirds, fi, mi, sol, &c., &c.; we shall have mi equal to 1/2, sol to 1/4, and fi to 1/8, whose octave below is 1/3; from whence it appears, that this last fi is less than unity (that is to say, than ut); by 1/8, or by 1/8, or near it: A new comma, much greater than the preceding, and which the Greeks have called apotome major.

It may be observed, that this fi, deduced from the series of thirds, is to the fi deduced from the series of fifths, as 1/2 is to 1/8, that is to say, in multiplying by 52428/8, as 125 multiplied by 496 is to 531441, or as 51200 to 520832; that is to say, nearly as 26 is to 27. For it may be seen, that the value of fi is very considerably different from the other, and even sufficiently different to make the ear sensible of it; because the difference consists almost of a minor semitone, whose value, as will afterwards be seen (art. 129.) is 1/12.

Moreover, if, after having found the fi equal to 1/2, we then tune by fifths and by fourths, &c., &c., mi, fi, fa, ut, &c., we shall find that the fi must be 1/8 1/8; its difference, then, from unity, or, in other words, from UT, is 1/12, that is to say, about 1/12; a comma still less than any of the preceding, and which the Greeks have called apotome minor.

In a word, if, after having found mi equal to 1/4 in the progression of thirds, we then tune by fifths and fourths mi, fi, fa, ut, &c., we shall arrive at a new fi, which shall be 1/8 1/8, and which will not differ from unity but by about 1/12, which is the least and smallest of all the commas; but it must be observed, that, in this case, the thirds major from mi to sol, from sol to ut, &c. are extremely false, and greatly altered.
should serve as limits to the other intervals, and that all the notes which rise above or fall below the ordinary scale, are no more than replications, i.e. repetitions, of all that have gone before them. For this reason, if the octave were altered, there could be no longer any fixed point either in harmony or melody. It is then absolutely necessary to tune the two $ut$ or $f$ in a just octave with the first; from whence it follows, that, in the progression of fifths, or what is the same thing, in the alternate series of fifths and fourths, UT, SOL, re, LA, $mi$, $fa$, $sol$, $la$, $re$, $mi$, $fa$, $sol$, it is necessary that all the fifths should be altered, or at least some of them. Now, since there is no reason why one should either be altered than another, it follows, that we ought to alter them all equally. By these means, as the alteration is made to influence all the fifths, it will be in each of them almost imperceptible; and thus the fifth, which, after the octave, is the most perfect of all consonances, and which we are under the necessity of altering, must only be altered in the least degree possible.

67. It is true, that the thirds will be a little harsh; but as the interval of sounds which constitutes the third, produces a less perfect consonance than that of the fifth, it is neccessary, says M. Rameau, to sacrifice the justice of that chord to the perfection of the fifth; for the more perfect a chord is in its own nature, the more displeasing to the ear any alteration which can be made in it. In the octave the least alteration is insupportable.

68. This change in the intervals of instruments which have, or even which have not, keys, is that which we call temperament.

69. It results then from all that we have now said, that the theory of temperament may be reduced to this question.—The alternate succession of fifths and fourths having been given, UT, SOL, re, LA, $mi$, $fa$, $sol$, $la$, $re$, $mi$, $fa$, $sol$, or $ut$ is not the true octave of the first UT, it is proposed to alter all the fifths equally, in such a manner that the two $ut$s may be in a perfect octave the one to the other.

70. For a solution of this question, we must begin with tuning the two $ut$s in a perfect octave the one to the other; in consequence of which, we will render all the semitones which compose the octave as equal as possible. By this means ($r$) the alteration made in each fifth will be very considerable, but equal in all of them.

71. In this, then, the theory of temperament consists: but as it would be difficult in practice to tune a method of harpsichord or organ by thus rendering all the semitones equal, M. Rameau, in his "Generation Harmonique," has furnished us with the following method, to alter all the fifths as equally as possible.

72. Take any key of the harpsichord which you please; but let it be towards the middle of the instrument; for instance, UT: then tune the note SOL a fifth above it, at first with as much accuracy as possible; this you may imperceptibly diminie: tune afterwards the fifth to this with equal accuracy, and diminish it in the same manner; and thus proceed from one fifth to another (r) All the semitones being equal in the temperament proposed by M. Rameau, it follows, that the twelve semitones $ut$, $ut$$\sharp$, re, re$$\sharp$, $mi$, $mi$$\sharp$, &c. shall form a continued geometrical progression; that is to say, a series in which $ut$, shall be to $ut$$\sharp$ in the same proportion as $ut$$\sharp$ to re, as re to re$$\sharp$, &c. and so of the rest. These twelve semitones are formed by a series of thirteen sounds, of which UT and its octave $ut$ are the first and last. Thus to find by computation the value of each sound in the temperament, which is the present object of our speculations, our scrutiny is limited to the investigation of eleven other numbers between 1 and 2 which may form with the 1 and the 2 a continued geometrical progression.

However little any one is practised in calculation, he will easily find each of these numbers, or at least a number approaching to its value. These are the characters by which they may be expressed, which mathematicians will easily understand, and which others may neglect.

$$UT \quad ut\sharp \quad re \quad re\sharp \quad mi \quad fa \quad fa\sharp \quad sol \quad sol\sharp$$

$$1 \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2} \quad \sqrt{2}$$

It is obvious, that in this temperament all the fifths are equally altered. One may likewise prove, that the alteration of each in particular is very inconsiderable; for it will be found, for instance, that the fifth from $ut$ to $sol$, which should be $\frac{3}{2}$, ought to be diminished by about $\sqrt{2}$ of $\frac{3}{2}$; that is to say, by $\sqrt{2}$, a quantity almost inconceivably small.

It is true, that the thirds will be a little more altered; for the third major from $ut$ to $mi$, for instance, shall be increased in its interval by about $\sqrt{2}$; but it is better, according to M. Rameau, that the alteration should fall upon the third than upon the fifth, which after the octave is the most perfect chord, and from the perfection of which we ought never to degenerate but as little as possible.

Besides, it has appeared from the series of thirds major $ut$, $mi$, $sol$, $sol\sharp$, that this last $sol\sharp$ is very different from $ut$ (note s); from whence it follows, that if we would tune this $sol\sharp$ in unison with the octave of $ut$, and alter at the same time each of the thirds major by a degree as small as possible, they must all be equally altered. This is what occurred in the temperament which we propose; and if in it the third be more altered than the fifth, it is a consequence of the difference which we find between the degrees of perfection in their intervals; a difference with which, if we may speak so, the temperament proposed conforms itself. Thus this diversity of alteration is rather advantageous than inconvenient.
Another in ascent; and as the ear does not appreciate perfectly just; it will be necessary then to try if this UT, or its octave, forms a just fifth with the last found $mi$ or $fa$ which has been already tuned. If this be the case, we may be certain that the harpichord is properly tuned. But if this last fifth be not true, in this case it will be too sharp, and it is an indication that the other fifths have been too much diminished, or at least some of them; or it will be too flat, and consequently discover that they have not been sufficiently diminished. We must then begin and proceed as formerly, till we find the last fifth in tune of itself, and without our immediate interpolation.

By

(v) All that remains, is to acknowledge, with M. Rameau, that this temperament is far remote from that which is now in practice; you may here see in what this last temperament confisits as applied to the organ or harpichord. They begin with UT in the middle of the keys, and they flatten the four first fifths $sol$, $re$, $la$, $mi$, till they form a true third major from $mi$ to $ut$; afterwards, setting out from this $mi$, they tune the fifths $fa$, $sol$, $ut$, $sol$, but flattening them still less than the former, so that $sol$ may almost form a true third major with $mi$. When they have arrived at $sol$, they flop; they resume the fifth $ut$, and tune to it the fifth $fa$ in defending, then the fifth $sol$, &c. and they heighten a little all the fifths till they have arrived at $la$, which ought to be the same with the $sol$ already tuned.

If, in the temperament commonly practised, some thirds are found to be less altered than in that prescribed by M. Rameau, in return, the fifths in the first temperament are much more faite, and many thirds are likewise so; infomuch, that upon a harpichord tuned according to the temperament in common use, there are five or six modes which the ear cannot endure, and in which it is impossible to execute any thing. On the contrary, in the temperament suggested by M. Rameau, all the modes are equally perfect; which is a new argument in its favour, since the temperament is peculiar necessary in passing from one mode to another, without shocking the ear; for instance, from the mode of $ut$ to that of $sol$, from the mode of $sol$ to that of $re$, &c. It is true, that this uniformity of modulation will to the greatest number of musicians appear a defect: for they imagine, that, by tuning the semitones of the scale unequal, they give each of the modes a peculiar character; so that, according to them, the scale of $ut$,

$$ut, re, mi, fa, sol, la, fa, UT,$$

is not perfectly similar to the gammut or diatonic scale of the mode of $mi$

$$mi, fa, sol, la, fa, ut, re, mi,$$

which, in their judgment, renders the modes of $ut$ and $mi$ proper for different manners of expression. But after all that we have said in this treatise on the formation of diatonic intervals, every one should be convinced, that, according to the intention of nature, the diatonic scale ought to be perfectly the same in all its modes; The contrary opinion, says M. Rameau, is a mere prejudice of musicians. The character of an air arises chiefly from the intermixture of the modes; from the greater or lesser degrees of vivacity in the movement; from the tones, more or less grave, or more or less acute, which are alligned to the generator of the mode; and from the chords more or less beautiful, as they are more or less deep, more or less flat, more or less sharp, which are found in it.

In short, the last advantage of this temperament is, that it will be found conformed, or at least very little different from that which they practice upon instruments without keys; as the bass-viol, the violin, in which true fifths and fourths are preferred to thirds and sixths tuned with equal accuracy; a temperament which appears incompatible with that commonly used in tuning the harpichord.

Yet we must not suffer our readers to be ignorant, that M. Rameau, in his New System of Music, printed in 1726, had adopted the ordinary temperament. In that work, (as may be seen Chap. XXIV.,) he pretends that the alteration of the fifths is much more supportable than that of the thirds major; and that the last interval can hardly suffer a greater alteration than the octave, which, as we know, cannot suffer the slightest alteration. He says, that if three strings are tuned, one by an octave, the other by a fifth, and the rest by a third major to a fourth string, and if a sound be produced from the last, the strings tuned by a fifth will vibrate, though a little less true than it ought to have been; but that the octave and the third major, if altered in the least degree, will not vibrate: and he adds, that the temperament which is now practised, is founded upon that principle. M. Rameau goes still farther; and as, in the ordinary temperament, there is a neccessity for altering the last thirds major, and to make them a little more sharp, that they may naturally return to the octave of the principal found, he pretends that this alteration is tolerable, not only because it is almost insensible, but because it is found in modulations not much in use, unless the composser should choose it on purpose to render the expression stronger. "For it is proper to remark (says he), that we receive different impressions from the intervals in proportion to their different alterations: for instance, the third major, which naturally elevated us to joy, in proportion as we feel it, heightens our feelings even to a kind of fury, when it is tuned too sharp; and the third minor, which naturally inspires us with tenderness and serenity, depresses us to melancholy when it is too flat." All this strain, as you may see, is immensely different from that which this celebrated musician afterwards
By this method all the twelve sounds which compose one of the scales shall be tuned: nothing is necessary but to tune with the greatest possible exactness their octave in the other scale, and the harpsichord shall be well tuned.

We have given this rule for temperament from M. Rameau: and it belongs only to disinterested artists to judge of it. However this question be determined, and whatever kind of temperament may be received, the alterations which it produces in harmony will be but very small, or not perceptible to the ear, whose attention is entirely engaged in attuning itself with the fundamental bafs, and which suffers, without uneasiness, these alterations, or rather takes no notice of them, because it supplies from itself what may be wanting to the truth and perfection of the intervals.

Simple and daily experiments confirm what we now advance. Listen to a voice which is accompanied, in singing, by different instruments; though the temperament of the voice, and the temper of each of the instruments, are all different one from another, yet you will not be in the least affected with the kind of cacophony which one is to feel from these diversities, because the ear supposes these intervals true of which it does not appreciate differences.

We may give another experiment. Strike upon an organ the three keys $\text{mi}$, $\text{fa}$, $\text{si}$, you will hear nothing but the minor perfect chord; though $\text{mi}$, by the constitution of that instrument, must cause $\text{fa}$ like to be heard; though $\text{fa}$ should have the same effect upon $\text{re}$, and $\text{si}$ upon $\text{fa}$ & $\text{re}$: infomuch, that the ear is at once affected with all those sounds, $\text{re}$, $\text{mi}$, $\text{fa}$, $\text{fa}$, $\text{sol}$, $\text{sol}$, $\text{si}$: how many differences perceived at the same time, and which a jarring multitude of discordant sensations, would result from thence to the ear, if the perfect chord with which it is pre-occupied had not power entirely to abstrait its attention from such sounds as might offend!

Chap. VIII. Of Repose or Cadences (+).

73. In a fundamental bafs whose procedure is by fifths, there always is, or always may be, a repose, or crisis, in which the mind acquiesces in its transition from one sound to another: but a repose may be more or less distinctly signified, and of consequence more or less perfect. If one should rise by fifths; if, for instance, we pass from $\text{ut}$ to $\text{sol}$, it is the generator which advances to one of these fifths, and this fifth was already pre-existent in its generator: but the generator exists no longer in this fifth; and the ear, as this generator is the principle of all harmony and of all melody, feels a desire to return to it. Thus the transition from a found to its fifth in ascents, is termed an imperfett repose, or imperfett cadence; but the transition from any found to its fifth in descents, is denominated a perfect cadence, or an absolute repose: it is the offpring which returns to its generator, and as it were recovers its existence once more in that generator itself, with which whenounding it resounds (chap. i).

74. Amongst absolute repoes, there are some, if Perfect cadence we may be allowed the expression, more absolute, that denote s more or less perfects, and why.

75. We may thus add, that what is commonly called cadence in melody ought not to be confounded with what we name evidence in harmony.

In the first case, the word only signifies an agreeable and rapid alteration between two contiguous sounds, called likewise a trill or flake: in the second, it signifies a repose or close. It is however true, that this shake implies, or at least frequently enough pre­ages, a repose, either present or impending, in the fundamental bafs (x).

76. Since there is a repose in passing from one found to another in the fundamental bafs, there is also a fundamental bafs necessary in the diatonic scale, which is formed from it, and which this bafs represents, and as the absolute repose $\text{sol}$ $\text{ut}$, is

- Throughout the page, the author discusses the concept of temperament in music, focusing on the influence it has on harmony and the perception of musical intervals. The text explores the idea that different temperaments can affect the way music sounds, with particular emphasis on the concept of repose or cadence.

- The author references sources such as M. Rouffeau's Musical Dictionary, and Rouffeau's Harmonie Universelle, to support the discussion on the influence of temperament on musical expression.

- The text is rich with examples and experiments to illustrate the concepts being discussed, including comparisons between the perception of music with and without temperament.

- The page contains a variety of musical terms and concepts, such as perfect and imperfect cadences, repose, and the diatonic scale, which are explained in detail.

- The author concludes by emphasizing the importance of understanding the role of temperament in music, and how it can be used to enhance the expressiveness of musical compositions.
music

of all others the most perfect in the fundamental bass, is the scale which contains the notes which answer to it in the scale, and which is likewise terminated by the generator, is for that reason the most perfect of all others in the diatonic scale ascending.

It is then a law dictated by nature itself, that if you would ascend diatonically to the generator of a mode, you can only do this by means of the third major from the fifth of that very generator. This third major, which with the generator forms a fermite, has for that reason been called the sensible note, as introducing the generator, and preparing us for the most perfect repose.

We have already proved, that the fundamental bass is the principle of melody. We shall besides make it appear in the sequel, that the effect of a repose in melody arises solely from the fundamental bass.

CHAP. IX. Of the Minor Mode and its Diatonic Series.

The diatonic series of the minor mode ascended by different examples. 78. In the second chapter, we have explained (art. 59, 60, 71, and 72.) by what means, and upon what principle, the minor chord ut, mi♭, fa, ut, may be formed, which is the characteristic chord of the minor mode. Now what we have there said, taking ut for the principal and fundamental found, we might likewise have said of any other note in the scale, affirmed in the same manner as the principal and fundamental found: but as in the minor chord ut, mi♭, fa, ut, there occurs a mi♭ which is not found in the ordinary diatonic scale, we shall immediately substitute, for greater ease and convenience, another chord, which is likewise minor and exactly similar to the former, of which all the notes are found in the scale.

The scale affords us three chords of this kind, viz. re, fa, la, re; la, ut, mi, fa; and mi, fa, re, mi. Amongst these three we shall choose la, ut, mi, la; because this chord, without including any sharp or flat, has two founds in common with the major chord ut, re, mi, fa; and besides, one of these two founds is the very same found; so that this chord appears both the most immediate, and at the same time the most simple, relation with the chord ut, mi, fa, ut. Concerning this we need only add, that this preference of the chord la, ut, mi, la, to every other minor chord, is by no means in itself necessary for what we have to say in this chapter upon the diatonic scale of the minor mode. We might in the same manner have chosen any other minor chord; and it is only, as we have said, for greater ease and convenience that we fix upon this.

60. Let us now remark, that in every mode, whether major or minor, the principal found which implies the perfect chord, whether major or minor, may be called the tonic note or key: thus ut is the key in its proper mode, la in the mode of la, &c. Having laid down this principle.

61. We have shown how the three founds fa, ut, fa, which constitute (art. 38.) the mode of ut, of which the first fa and the last fa are the two fifths of ut, one defending the other, rising, produce the scale fa, ut, re, mi, fa, ut, fa, of the major mode, by means of the fundamental bass fa, ut, fa, ut, fa, ut, fa: let us in the same manner take the three founds re, la, mi, which constitute the mode of la, for the same reason that the founds fa, ut, fa, constitute the mode of ut; and of them let us form this fundamental bass, perfectly like the preceding, mi, la, mi, la, re, la, re: let us afterward place below each of these founds one of their harmonics, as we have done (chap. v.) for the first scale of the major mode; with this difference, that we must suppose re and la as implying their third minor in the fundamental bass to characterize the minor mode; and we shall have the diatonic scale of that mode, fol, la, ut, re, mi, fa.

82. The fol, which corresponds with mi in the fundamental bass, forms a third major with that mi, though the mode be minor; for the same reason that a third from the fifth of the fundamental found ought to be major (art. 77.) when that third rises to the fundamental found la.

83. It is true, that, in causing mi to imply its third, See Sempire, &c., one might also rise to la by a diatonic progression, but that manner of rising to la would be less perfect than the preceding; for this reason (art. 76.), that the absolute repose or perfect cadence, mi, la, which is found in the fundamental bass, ought to be represented in the most perfect manner in the two notes of the diatonic scale which answer to it, especially when one of these two notes is la, the key itself upon which the repose is made. From whence it follows, that the preceding note fol ought rather to be sharp than natural; because fol, being included in mi (art. 19.), much more perfectly represents the note mi in the bass, than the natural fol could do, which is not included in mi.

84. We may remark this first difference between diversities in the scales

f, ut, re, mi, fa, fol, la,

and the scale which corresponds with it in the major mode

f, ut, re, mi, fa, fol, la,

that from mi to fa, which are the two last notes of the former scale, there is only a semitone; whereas from fol to la, which are the two last of the latter scale, there is the interval of a complete tone: but this is not the only discrimination which may be found between the scales of the two modes.

85. To investigate these differences, and to discover the reason for which they happen, we shall begin by taking these forming a new diatonic scale of the minor mode, similar to the second scale of the major mode,

ut, re, mi, fa, fol, la, fa, ut.

That last series, as we have seen, was formed by means of the fundamental basses fa, ut, fol, re, disposed in this manner,

ut, fol, fa, ut, re, fol, fa, ut.

Let us take in the same manner the fundamental basses re la mi, ut, and arrange them in the following order,

la, mi, la, re, la, mi, fa, mi, la,

and it will produce the scale immediately subjoined,

la, fa, ut, re, mi, fa, fol, la, &c.

in which ut forms a third minor with la, which in the fundamental bass corresponds with it, which denominates the minor mode: and, on the contrary, fol forms a third major with mi in the fundamental bass, because fol rises towards la, (art. 82. and 83.)
It is easily perceived, according to M. Rameau, by this fundamental base, la, re, la, re, la, mi, la, which produces
la, fa, mi, re, ut, fi, la; which may be regarded, as he says, as the real scale of the minor mode in descending; to which is added fol natural between la and fa, to preserve the diatonic order.

This answer appears the only one which can be given to the difficulty above proposed: but I know not whether it will fully satisfy the reader; whether he will not see with regret, that the fundamental base does not produce, to speak properly, the diatonic scale of the minor mode in descending, when at the same time this same base so happily produces the diatonic scale of that identical mode in ascending, and the diatonic scale of the major mode whether in rising or descending (v).

CHAP. X. Of Relative Modes.

91. Two modes which are of such a nature that we can pass from the one to the other, are called relative, or transitive, modes. Thus we have already seen, that the major mode of ut is relative to the major mode of fa and to that of fol. It may likewise appear from what goes before, how many intimate connections there are between the species (v) of the species or the minor mode of la. For, 1. The perfect chord, major ut mi fol ut, the other minor la ut mi fa, which characterizes each of those two kinds of modulation or harmony, have two foundations in common, ut or et. See Mode.

2. The diatonic scale of the minor mode of la in descending, absolutely contains the same sounds with the gamut or diatonic scale of the major mode of ut. It is for this reason that the transition is so natural and easy from the major mode of ut to the minor mode of la, or from the minor mode of la to the major mode of ut, as experience proves.

92. In the minor mode of mi, the minor perfect chord mi fol fi mi, which characterizes it, has likewise two foundations, mi, fol, in common with the perfect chord major ut mi fol ut, which characterizes the major mode of ut. But the minor mode of mi is not so closely related nor allied to the major mode of ut as to the minor mode of la; because the diatonic scale of the minor mode of mi in descending, has not, like the series of
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[28x738]Thetlry of uncertain, with the mode of JIlode which the may 'How

[30x410]mode of JIlode may be obtained by uniting at de-

[31x297]chord

[32x277]fa

[33x246]mea-

[49x297]inv-

[52x420]is mode

[56x246]de-

[69x687]yet the artift does not hesitate sometimes
to pafs immediately from the one to the other.

Of this may be seen one instance (among many others) in the prologue des Amours des Dieux, at this passage Ovide si l'objet de la faire, which is in the minor mode of mi, though what immediately precedes it is in the major mode of ut.

We may see besides, that when we pafs from one mode to another by the interval of a third, whether in descending or rising, as from ut to la, or from la to ut, from ut to mi, or from mi to ut, the major mode becomes minor, or the minor mode becomes major.

There is still another minor mode, into which an immediate transition may be made in ilufing from the major mode of ut. It is the minor mode of ut itself in which the perfent minor chord ut mi b fol ut has two founds, ut and fol, in common with the perfect minor chord mi fol ut. Nor is there anything more common than a transition from the major mode of ut to the minor mode, or from the minor to the major.

Chap. IX. Of Diffonances.

94. We have already observed, that the mode of ut (fa, ut, fol), has two founds in common with the mode of fol (ut, fol, re); and two founds in common with the mode of fa (fi, fa, ut); of consequence, this procedure of the bafs ut fo may belong to the mode of ut, or to the mode of fol, as the procedure of the bafs fa ut, or ut fa, may belong to the mode of ut or the mode of fa. When any one therefore pafs from ut to fa or to fol in a fundamental bafs, he is still ignorant even to that crisis what mode he is in. It would be, however, advantageous to know it, and to be able by some means to diftinguish the generator in its founds.

95. This advantage may be obtained by uniting at the same time the founds fi and fa in the fame harmony, that is to fay by joining to the harmony fol fi re of the fifth fol the other fifth fa in this manner, fol, fi, re, fa; this fa which is added, forms a diftonance with fol (art. 18). It is for this reafon that the chord fol fi re fa, is called a diftonant chord, or a chord of the seventh. It serves to diftinguish the fifth fol from the generator ut, which always implies, without mixture or alteration, the perfent chord ut, mi, fol, ut, resulting from nature itself (art. 32.) By this we may see, that when we pafs from ut to fol, one pafs at the fame time from ut to fa, because fa is found to be comprehended in the chord of fol; and the mode of ut by these means plainly appears to be determined, because there is none but that mode to which the founds fa and fol at once belong.

96. Let us now see what may be added to the harmonic diftonance of the fifth fa, la, ut, of the fifth fa below the generator, to conftruct another kind of harmonic diftonance.

One may here remark the analogy there is observed between the harmony of the fifth fol and that of the fifth fa.

97. For this reafon, instead of fol, we shall take its Chord of fifth re, which is the found that approaches it the nearest; and we shall have, instead of the fifth fa, the chord fifh fa, la, ut, re, which is called a chord of the great fifh.

One may here remark the analogy there is observed between the harmony of the fifth fol and that of the fifth fa.

98. The fifth fa, in rising above the generator, gives a chord entirely consisting of thirds ascending from fol fi, fa, re; now the fifth fa being below the generator ut in desceniding, we shall find, as we go lower by thirds from ut towards fa, the same founds ut, la, fa, re, which form the chord fa, la, ut, re, given to the fifth fa.

99. It appears besides, that the alteration of the harmony in the two fifth fifteen only in the third minor re, fa, which was reciprocally added to the harmony of these two fifths.

Chap. XII. Of the Double Ut or Employment of Diffonances.

100. It is evident by the reformation of founds to account of their oftens, that the chord fa, la, ut, re, is in effect the double of the same as the chord re, fa, la, ut, taken inverfely, employment that the inverted of the chord ut, la, fa, re, has been ment, and that which

(2) There are likewise other minor modes, into which we may pafs in our egress from the mode major of ut; as that of fa minor, in which the perfect minor chord fa, la b, ut, includes the found ut, and whose scale in ascent fa, fol, lab, fi, ut, re, mi, fo, only includes the two founds lab, fi, fol, which do not occur in the scale of ut. We find an example of this transition from the mode major of ut to that of fa minor, in the opera of Pyramion by M. Rameau, where the farahando is in the minor mode of fa, and the rigadoon is in the mode major of ut. This kind of transition, however, is not frequent. The minor mode of re has only in its scale ascending to the scale of ut. For this reason a transition may likewise be made, without grating the ear, from the mode of ut major to the mode of re minor; but this passage is left immediate than the former, because the chords ut, mi, fol, ut, re, fa, la, re, not having a single found in common, one cannot (art. 37) pafs immediately from the one to the other.
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Part I.

Musick (Art. 98.) in defending by thirds from the generator ut (AA).

104. The chord re, fa, la, ut, is a chord of the seventh like the chord sol, fa, re, fa: with this only difference, that in this the third sol, is major; whereas in the second, the third re, fa, is minor. If the fa were sharp, the chord re, fa#, la, ut, would be a genuine chord of the dominant, like the chord sol, fa, re, fa; and as the dominant may defend to ut in the fundamental base, the dominant implying or carrying with it the third major fa#, might in the same manner defend to fa.

105. Now I say that if the fa# should be changed into fa natural, re, the fundamental tone of this chord re, fa, la, ut, might still defend to fa; for the change from fa# to fa natural, will have no other effect, than to prevent the impression of the mode of ut, instead of that of the mode of sol, which the fa# would have here introduced. For what remains, the note re will always preserve its character as the dominant, on account of the mode of ut, which forms a seventh. Thus in the chord of which we treat, re, fa, la, ut, re, may be considered as an imperfect dominant: I call it imperfect, because it carries with it the third minor fa, instead of the third major fa#. It is for this reason that in the sequel I shall call it simply the dominant, to distinguish it from the dominant fol, which shall be called the tonic dominant.†

106. Thus the sounds fa and fol, which cannot succeed each other (Art. 37.) in a diatonic bass, when they only carry with them the perfect chords fa, la, ut, sol, fa, re, may succeed one another if you join re to the harmony of the first, and fa to the harmony of the second; and if you invert the first chord, that is to say, if you give to the two chords this form re, fa, la, ut, sol, fa, re, fa.

107. Besides, the chord fa, la, ut, re, being allowed to succeed the perfect chord ut, mi, fol, ut, it follows for the same reasons, that the chord ut, mi, fol, ut, may be succeeded by re, fa, la, ut, which is not contradictory to what we have said before (Art. 37.), that the sounds ut and re cannot succeed one another in the fundamental bass: for in the passage quoted, we had supposed that both ut and re carried with them a perfect chord major; whereas, in the present case, re carries the third minor fa, and likewise the found ut, by which the chord re, fa, la, ut is connected with that which precedes it ut, mi, fol, ut; and in which the found ut is found. Besides, this chord, re, fa, la, ut, is properly nothing else but the chord fa, la, ut re inverted, and if we may speak so, diguited.

Chap. XIII. Concerning the Use of this Double Employment, and its Rules.

109. Thus the double employment of the fundamental bass fa, ut, fol, re, by twice repeating the word fol in that series, so that this gamut is primitive and originally composed of two similar tetradic chords, one in the mode of ut, the other in that of sol, now it is possible, by means of this double employment, to preserve the impression of the mode of ut through the whole extent of the scale, without twice repeating the note fol, or even without supposing this repetition. For this effect we have nothing to do but to follow the fundamental bass, ut, sol, ut, fol, ut, re, fol, ut; in which ut is underfoot to carry with it the perfect chord ut, mi, fol, ut; fol, the chord fol, re, fa; fa, the chord
CHAP. XIV. Of the Different Kinds of Chords of the Seventh.

112. The dissonance added to the chord of the dominant and of the sub-dominant, though in some measure intimated by nature (chap. xi.), is nevertheless a work of art; but as it produces great beauties in harmony by the variety which it introduces into it, let us discover whether in consequnce of this first advance, art may not still be carried farther.

113. We have already three different kinds of chords of the seventh, viz.

1. The chord $\text{fa} \text{si} \text{re} \text{fa}$, composed of a third major followed by two thirds minor.

2. The chord $\text{re} \text{fa} \text{la} \text{ut}$, or $\text{re} \text{fa} \text{la} \text{ut}$, composed of a third major between two minors.

3. The chord $\text{fa} \text{re} \text{fa} \text{la}$, composed of two thirds minor followed by a major.

114. There are still two other kinds of chords of the seventh which are employed in harmony; one is composed of a third minor between two thirds major, $\text{ut} \text{fa} \text{re} \text{fa}$ or $\text{fa} \text{la} \text{ut}$; the other is wholly composed of thirds minor followed by a major. These two chords, which at first appear as if they ought not to enter into harmony if we rigorously keep to the preceding rules, are nevertheless frequently practised with success in the fundamental bas.

The reason is this:

115. According to what has been said above, if we add a seventh to the chord $\text{ut} \text{mi} \text{fa}$, to make a third dominant of $\text{ut}$, one can add nothing but $\text{fa} \text{fa}$; and in this case $\text{ut} \text{mi} \text{fa} \text{fa} \text{fa}$ would be the chord of the tonic dominant in the mode of $\text{fa}$, as $\text{fa} \text{fa} \text{fa} \text{fa}$ is the chord of the tonic dominant in the mode of $\text{ut}$; but if you would prefer the impression of the mode of $\text{ut}$ in the harmony, you then change this $\text{fa} \text{fa}$ into $\text{fa}$ natural, and the chord $\text{ut} \text{mi} \text{fa} \text{fa}$ becomes $\text{ut} \text{mi} \text{fa} \text{fa}$. It is the same case with the chord $\text{fa} \text{la} \text{ut} \text{mi}$, which is nothing else but the chord $\text{fa} \text{la} \text{ut} \text{mi}$, in which one may substitute for $\text{mi} \text{fa}$, natural, to preserve the impression of the mode of $\text{ut}$, or of that of $\text{fa}$.

Besides, in such chords as $\text{ut} \text{mi} \text{fa} \text{fa} \text{la} \text{ut} \text{mi}$, the sounds $\text{fa} \text{fa}$, though they form a dissonance

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Chords of the seventh continued and explained.

118. With respect to the chord of the seventh folge re fa, wholly composed of thirds minor, it may be regarded as formed from the union of the two chords of the dominant and of the sub-dominant in the minor mode. In effect, in the minor mode of la, for instance, these two chords are mi folge fi re, and re fa la fi, whose union produces mi, folge, fa re fa, la. Now, if we should suffer this chord to remain thus, it would be disagreeable to the ear, by its multiplicity of dissonances, from mi, mi, la, la folge, la fi, re folge, (art. 182); so that, to avoid this inconvenience, the generator la is immediately expunged, which (art. 19) is as it were underfoot in re, and the fifth or dominant mi whose place the sensible note folge is supposed to hold: thus there remains no more than the chord folge fi re fa, wholly composed of thirds minor, and in which the dominant mi is considered as underfoot; in such a manner that the chord folge fi re fa represents the chord of the tonic dominant mi folge fi re, to which we have joined the chord of the sub-dominant re fa la fi, but in which the dominant mi is always reckoned the principal note (as).

119. Since, then, from the chord mi folge fi re, we may pass to the perfect la ut mi la, and vice versa, we may in like manner pass from the chord folge fi re fa to the chord la ut mi la, and from this last to the chord folge fi re fa: this remark will be very useful to us in the sequel.

Chap. XV. Of the Preparation of Dissonances.

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Dissonance.

120. In every chord of the seventh, the highest note, that is to say, the seventh above the fundamental, is called a dissonance or discord; thus fa is the dissonance of the chord fol fi re fa, ut in the chord re fa la ut, &c.

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Manner of preparing dissonances investigated.

121. When the chord fol fi re fa follows the chord ut mi fol ut, as this may happen, and in reality often happens, it is obvious that we do not find the dissonance fa in the preceding chord ut mi fol ut. Nor ought it: indeed to be found in that chord; for this dissonance is nothing else but the sub-dominant added to the harmony of the dominant to determine the mode: now, the sub-dominant is not found in the harmony of the generator.

120. For the same reason, when the chord of the sub-dominant fa la ut re follows the chord ut mi fol ut, the note re, which forms a dissonance with ut, is not found in the preceding chord.

It is not so when the chord re fa la ut follows the chord ut mi fol ut; for ut, which forms a dissonance in the second chord, stands as a consonance in the preceding.

122. In general, dissonance being the product of dissonances, of art (chap. xi.), especially in such chords as are not only tolerable to the ear when found too heterogeneous to the chord, is, that it may be, if in process we may speak so, announced to the ear by being sung found in the preceding chord, and by that means serve chords to connect the two chords. From whence follows this rule:

123. In every chord of the seventh, which is not prepared, the tonic of the dominant, that is to say, (art. 182), which is not composed of a third major followed by two thirds minor, the dissonance which this chord forms ought to stand as a consonance in the chord which precedes it.

This is what we call a prepared dissonance. From whence it follows, that in order to prepare a dissonance, it is absolutely necessary that the fundamental basis should be formed by the interval of a second, as:

UT mi fol ut, RE fa la ut;

or defined by a third, as:

UT mi fol ut, LA ut mi fol;

or defined by a fifth, as:

UT mi fol ut, FA la ut mi:

in every other case the dissonance cannot be prepared. This is what may be easily ascertained. If, for instance, the fundamental basis rises by a third, as ut mi fol ut, mi fol fi re, the dissonance re is not found in the chord ut mi fol ut. The same might be said of ut mi fol ut, fi fol fi re, and ut mi fol ut, fi re fa la, in which the fundamental bases rises by a fifth or sixth by a second.

124. It may only be added, that when a tone, that is to say, a note which carries with it a perfect chord, is followed by a dominant in the interval of a fifth or third, this procedure may be regarded as a process from that same tone to another, which has been

(cc): On the contrary, a chord such as ut mi fol fi, in which mi would be flat, could not be admitted in harmony, because in this chord the fi is not included and under foot in mi. It is the same case with several other chords, such as fi re fa la, fi re re fa la, &c. It is true, that in the latter of these chords, la is included in fa, but it is not contained in re, and this re likewise forms with fa and with la a double dissonance, which, joined with the dissonance fi, would necessarily render this chord not very pleasing to the ear; we shall yet, however, see in the second part, that this chord is sometimes used.

(oo) We have seen (art. 109) that the chord fi re fa la, in the minor mode of la, may be regarded as the inverse of the chord re fa la fi; it would likewise seem, that, in certain cases, this chord fi re fa la may be considered as composed of the two chords fol fi re fa, la ut re, of the dominant and of the sub-dominant of the major mode of ut; which chords may be joined together, after having excluded from them, 1. The dominant fol, represented by its third major fi, which is presumed to retain its place. 2. The note ut which is under foot in fa, which will form this chord fi re fa la. The chord fi re fa la, considered in this point of view, may be understood as belonging to the major mode of ut upon certain occasions.
Moreover, we have seen (art. 119. and 120.) that a dissonance does not stand in need of preparation in the chords of the tonic dominant and of the sub-dominant; from whence it follows, that every tonic carrying with it a perfect chord, may be changed into a tonic dominant (if the perfect chord be major), or into a sub-dominant (whether the chord be major or minor) by adding the dissonance all at once.

**CHAP. XVI. Of the Rules for resolving Dissonances.**

191. Difsonances to be resolved, must be disguised and made to appear in the character of harmony, or in some measure, as much the character of a harmonic found as may be possible, it is necessary that this part of the modulation where it is found, should defend or rise dissonantly upon another note, which may be one of the consonances of the sub-frequent chord.

192. In the chord of the tonic dominant it ought rather to defend than to rise; for this reason. Let us take, for instance, the chord $f_{a} f_{r} f_{s} f_{a}$ followed by the chord $u_{t} m_{i} f_{o} l_{u}$; the part which formed the dissonance $f_{a}$ ought to defend to $m_{i}$ rather than rise to $f_{o}$, though both the founds $m_{i}$ and $f_{o}$ are found in the sub-frequent chord $u_{t} m_{i} f_{o} l_{u}$; because it is more natural and more conformed to the connection which ought to be found in every part of the music, that $f_{a}$ should be found in the same part where $f_{a}$ has already been founded, whilst the other part was founding $f_{a}$, as may be here seen (parts first and fourth.)

193. Consequences of the former rule.

194. Another consequence.

195. But it is deduced from the dissonant or simple, the note which constitutes the seventh, that is to say, the dissonance, ought dissonantly to defend upon one of the notes which form a consonance in the sub-frequent chord.


197. The tell of the perfection in cadences to be found in the fundamental bass.

198. In a fundamental bass which moves by fifths, there is always, as we have formerly observed, (chap. viii.), a repose more or less perfect from one found to another; and of consequence there must likewise be a repose more or less perfect from one found to another in the dissonant scale, which results from that bass.

199. It may be demonstrated by a very simple experiment, that the cause of a repose in melody is solely in the fundamental bass expressed or understood. Let any performer sing these three notes $r_{e} u_{t} r_{e}$, performing on the $r_{e}$ a flage, which is commonly called a cadence; the modulation will appear to him to be finished after the second $u_{t}$, in such a manner that the ear will neither expect nor any thing to follow. The same if we accompany this modulation with its natural fundamental bass $f_{o} l_{u}$; but if, instead of this bass, we should give it the following $u_{t} f_{o} l_{u}$; in this case the modulation $u_{t} r_{e}$ would not appear to be finished, and the ear would still expect and desire something more. This experiment may easily be made.

200. This passage $f_{o} l_{u}$, when the dominant $f_{o} l_{u}$, broken cadentially ascends upon the note $l_{u}$, instead of descending by a fifth upon the generator $u_{t}$, as it ought, but naturally to do, is called a broken cadence; because the perfect cadence $f_{o} l_{u}$, which the ear expected after the dominant $f_{o} l_{u}$, if we may speak so, broken and suspended by the transition from $f_{o}$ to $l_{u}$.

201. From thence it follows, that if the modulation $u_{t} r_{e}$ appeared finished when we supposèd no bass to it at all, it is because its natural fundamental bass $u_{t} f_{o} l_{u}$ is supposed to be implied; because the ear desires something to follow this modulation, as soon as it is reduced to the necessity of hearing another bass.

202. The
138. The series or fundamental bays by fifths produces the diatonic species in common use (chap. vi.).

139. If then we should form this bay ut, ut, fol, fol, and the two first founds carrying each along with their thirds major and fifths, it is evident that ut will give fol, and that mi will give fol, now the semitone which is between this fol and this sol, is an interval much less than the semitone which is found in the diatonic scale between mi and fa, or between fi and ut. This may be ascertained by calculation (xx): it is for this reason that the semitone from mi to fa is called major, and the other minor (vr).

140. If the fundamental bays should proceed by thirds minor in this manner, ut, mi, fa, a succession which is allowed when we have investigated the origin of the minor mode (chap. ix.), we shall find this modulation fol, fol, which would likewise give a minor semitone (gg.)

141. The minor semitone is hit by young practitioners in imitation with more difficulty than the semitone major. For which reason this may be ascribed: The semitone major which is found in the diatonic scale, as from mi to fa, results from a fundamental bay by fifths ut fa, that is to say, by a succession which is most natural, and for this reason the same to the ear. On the contrary, the minor semitone arises from a succession by thirds, which is still less natural than the former. Hence, that scholars may truly hit the minor semitone, the following artifice is employed. Let us suppose, for instance, that they intend to rise from sol to fol ; they rise at first from sol to la, then descend from fa to sol by the interval of a semitone major; for this sol sharp, which is a semitone below si, proves a semitone minor above sol. (See the notes (ee) and (ff).)

142. Every procedure of the fundamental bays by thirds, whether major or minor, rising or descending, gives the minor semitone. This we have already seen from the succession of thirds in ascending. The series of thirds minor in descending, ut, la, gives ut, ut &c.

2

(EE) In reality, ut being supposed 1, as we have always supposed it, mi is 2, and fol 2 3 2 : now fol being 3, fol will then shall be to sol as 5 2 to 5 ; that is to say, as 25 times 3 to 3 16 : the proportion then of fol to sol is as 25 to 2 4, an interval much less than that of 16 to 1 15, which constitutes the semitone from ut to fi, or from fa to mi (note 1.)

(FF) It may be observed, that a minor joined to a major semitone will form a minor tone; that is to say, if one rises, for instance, from mi to fa, by the interval of a semitone major, and afterwards from fa to sol by the interval of a minor semitone, the interval from mi to sol will be a minor tone. For let us suppose mi to be 1, fa will be 1 1 2, and sol will be 1 2 of 1 4; that is to say, 25 times 16 divided by 2 4 times 1 5, or 25 ; and mi then is to sol as 1 is to 1 5, the interval which constitutes the minor tone (note n.).

With respect to the tone major, it cannot be exactly formed by two semitones; for, 1. Two major semitones in immediate succession would produce more than a tone major. In effect, 1 5 multiplied by 1 3 gives 1 5 8, which is greater than 1, the interval which constitutes (note k) the major tone. A semitone minor and a semitone major would give less than a major tone, since they amount only to a true minor. 3. And, a fortiori, two minor semitones would give still less.

(oo) In effect, mi being 2, fol will be 3 of 1; that is to say, (note c) 1 3; now the proportion of 1 to 3 4 (note c) is that of 3 times 25 to 2 times 36; that is to say, as 25 to 24.


Part I.

Music

Theory of Harmony.

143. The jar, enharmonic notes, and the series of thirds major in descending, ut, fa, b, gives ut, ut, b, (ii).

The minor femitone confitutes the species called chromatic, and with the species which moves by diatonic intervals, resulting from the succession of fifths (chap. v. and vi.), it comprehends the whole of melody.

Chap. XIX. Of the Enharmonic Species.

144. The two extremes, or highest and lowest notes, ut, fa, b, give this modulation fa, b, and these two founds ut, fa, b, differ between themselves by a small interval which is called the diffuse, or enharmonic fourth of a tone (ll.), which is the difference between a femitone major and a femitone minor (mm). This quarter tone is inappreciable by the ear, and impracticable upon several of our instruments. Yet have means been found to put it in practice in the following manner, or rather to perform what will have the same effect upon the ear.

145. We have explained (art. 116.) in what manner the chord fa, b, re, fa may be introduced into the minor mode, entirely confituting of thirds minor perfectly pure, or at least fupplely such. This chord supplying the place of the chord of the dominant (art. 116.) from thence we may pass to that of the tonic or generator la (art. 117.). But we must remark,

1. That this chord fa, b, re, fa, entirely confituting of thirds minor, may be inverted or modified according to the three following arrangements, fa, re, fa, b, fa, b, fa, re, fa, b, and that in all these three

3. X nothing,

Theory of Harmony.

\[(\text{HH})\] La being \(\frac{5}{4}\), ut, b, is \(\frac{5}{4}\) of \(\frac{5}{4}\); that is to say \(\frac{5}{4}\), and ut is 1: the proportion then between ut and ut, is that of 1 to \(\frac{3}{2}\), or of 24 to 25.

\[(\text{ii})\] La, b, being the third major below ut, will be \(\frac{6}{4}\) (note c): ut, b, then, is \(\frac{6}{4}\) of \(\frac{6}{4}\); that is to say \(\frac{6}{4}\).

The proportion, then, between ut and ut, b, is \(\frac{24}{25}\) to \(\frac{25}{24}\).

\[(\text{ll})\] Sol, b, being \(\frac{24}{25}\) and fa, b, being \(\frac{24}{25}\) of \(\frac{24}{25}\), we shall have fa, b, equal (note c) to \(\frac{24}{25}\), and its octave above shall be \(\frac{24}{25}\) an interval less than unity by about \(\frac{1}{2}\) or \(\frac{1}{2}\). It is plain then from this fraction, that the \(\frac{24}{25}\) in question must be considerably lower than ut.

This interval has been called the fourth of a tone and this denomination is founded on reason. In effect, we may distinguish in music four kinds of quarter tones.

1. The fourth of a tone major: now, a tone major being \(\frac{6}{4}\), and its difference from unity being \(\frac{6}{4}\), the difference of this quarter tone from unity will be almost the fourth of \(\frac{6}{4}\); that is to say, \(\frac{6}{4}\).

2. The fourth of a tone minor: and as a tone minor, which is \(\frac{6}{4}\), differs from unity by \(\frac{6}{4}\), the fourth of a tone minor will differ from unity about \(\frac{6}{4}\).

3. One half of a tone major: and as this femitone differs from unity by \(\frac{6}{4}\), one half of it will differ from unity about \(\frac{6}{4}\).

4. Finally, one half of a femitone minor, which differs from unity by \(\frac{6}{4}\): its half then will be \(\frac{6}{4}\).

The interval, then, which forms the enharmonic fourth of a tone, as it does not differ from unity but by \(\frac{6}{4}\), may justly be called the fourth of a tone, since it is less different from unity than the largest interval of a quarter tone, and more than the least.

We shall add, that since the enharmonic fourth of a tone is the difference between a femitone major and a femitone minor; and since the tone minor in formed (note rr.) of two femitones, one major and the other minor; it follows, that two femitones major in succession form an interval larger than that of a tone by the enharmonic fourth of a tone; and that two minor femitones in succession form an interval less than a tone by the same fourth of a tone.

\[(\text{xx})\] That is to say, that if you rise from \(\text{mi}\) to \(\text{fa}\), for instance, by the interval of a femitone major, and afterwards, returning to \(\text{mi}\), you should rise by the interval of a femitone minor to another found which is not in the scale, and which I shall mark thus, \(\text{fa}+\), the two founds \(\text{fa}+\) and \(\text{fa}\) will form the enharmonic fourth of a tone: for \(\text{mi}\) being \(\frac{1}{2}\), \(\text{fa}\) will be \(\frac{1}{2}\); and \(\text{fa}+\), \(\frac{1}{2}\); the proportion then between \(\text{fa}+\) and \(\text{fa}\) is that of \(\frac{1}{2}\) to \(\frac{1}{2}\) (note c); that is to say, as \(25\) times \(15\) to \(16\) times \(24\); or otherwise, as \(25\) times \(5\) to \(16\) times \(8\); or as \(125\) to \(128\). Now this proportion is the same which is found in the beginning of the preceding note, to express the enharmonic fourth of a tone.
nothing, in common with the minor mode of la, and which are entirely foreign to it (†).

146. It must, however, be acknowledged, that a transition so abrupt, and so little expected, cannot deceive nor elude the ear; it is struck with a sensation so unlooked-for without being able to account for the passage to itself. And this account has its foundation in the enharmonic fourth of a tone; which is overlooked as nothing, because it is inappetiteble by the ear; but of which, though its value is not ascertained, the whole harshness is sufficiently perceived. The intent of surprize, however, immediately vanishes; and that astonishment is turned into admiration, when one feels himself transported as it were all at once, into a new and entirely unexpected state.

Chap. XXI. Of the Diatonic Enharmonic Species.

147. If we form a fundamental bass, which rises alternately by fifths and thirds, as fa, ut, mi, fa, this bass will give the following modulation, fa, mi, mi, re, in which the femitones from fa to mi, and from mi to re, are equal and major (N). This species of modulation or of harmony, in which all the femitones are major, is called the enharmonic diatonic species. The major femitones peculiar to this species give it the name of diatonic, because major femitones belong to the diatonic species; and the tones which are greater than major by the excess of a fourth, resulting from a succession of major femitones, give it the name of enharmonic (note 1).

Chap. XXII. Showing that Melody is the Offspring of Harmony.

153. All that we have hitherto said, as it seems to The effects of melody, is more than sufficient to convince us, that melody of harmony has its own principle in harmony; and that it is impossible that melody be formed of two sounds which are not contiguous one to the other in the series of thirds (art. 144.).

154. If this should still appear doubtful, nothing or uncertainty is more necessary than to pay due attention to the first and most surprising experiment (art. 19.), where it may be seen that the principal sound is always the lowest, and that the sharp sound which it generates is with relation to it what the treble of an air is to its bass.

155. Yet more, we have proved, in treating of broken cadence (chap. xviii.), that the diversification of basses...
Part I.

MUS I C.

Theory of Harmony.

157. From these different observations it may be main, the same with that of the
classical theory of bases and the different pairs of different names, and the different effects of a modulation, without any other alteration except that of changing its fundamental basis.

M. Rameau has shown, in his New System of Music, printed at Paris 1726, p. 44, that this modulation of a, of which it will be found susceptible of a great many, and each of these bases will give a different character to the modulation of a, though in itself it remains always the same; in such a manner that we may change the whole nature and effects of a modulation, without any other alteration except that of changing its fundamental basis.

217 Consequence deducible from this principle.

158. Composition, which is likewise called counterpoint, is not only the art of composing an agreeable air, but also that of composing a great many airs in such a manner that when heard at the same time, they may unite in producing an effect agreeable and delightful to the ear; this is what we call composing music in several parts.

The highest of these parts is called the treble, the lowest is termed the bass; the other parts, when there are any, are termed middle parts; and each in particular is figured by a different name.

Chap. I. Of the Different Names given to the same Interval.

159. In the introduction (art. 9.), which is at the front of this treatise, we have seen a detail of the most common names which are given to the different intervals. But there are particular intervals which have obtained different names, according to particular circumstances; which it is proper to explain.

160. An interval composed of a tone and a semitone, which is commonly called a third minor, is likewise sometimes called a second redundant; such is the interval from a to f which can be used in ascending, or that of a to a.

This interval is so termed, because one of the grounds which form it is always either sharp or flat, and that, if you deduce that sharp or that flat, the interval will be that of a second.

161. An interval composed of two tones and two semitones is called the false fifth, from its being composed of two tones and two semitones, as f to a, is called the false fifth.

This interval is the same as that of the triton (art. 9.), since two tones and two semitones are equivalent to three tones. There are, however, some reasons for distinguishing them, as will appear below.

162. As the interval from a to a in ascending and descending.

This interval is in the main, the same with that of the fifth minor (art. 6.): but in the fifth redundant, there is always a sharp or a flat; in some, though if this sharp or flat were deduced, the interval would become a true fifth.

163. For the same reason, an interval composed of seven semitones is also.

Three tones and three semitones, as from a to a in minished, ascending, what.

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There are likewise several eminent musicians, who in their compositions, if we can depend on what has been affirmed, begin with determining and writing the bases. This method, however, appears in general, more proper to produce a learned and harmonious music, than a strain prompted by genius and animated by enthusiasm.

224 There are several eminent musicians, who in their compositions, if we can depend on what has been affirmed, begin with determining and writing the bases. This method, however, appears in general, more proper to produce a learned and harmonious music, than a strain prompted by genius and animated by enthusiasm.
afcending, is called a seventh diminished; because if 
you deduce the sharp from fa, the interval from fa to 
fa will become that of an ordinary seventh. The in-
terval of a seventh diminished is in other respects 
the fame with that of the fith major (art. 9.)
164. The major feventh is likewise sometimes called 
a seventh redundant (qq.)

**MUSIC.**

**Part II.**

**CHAP. III. Of the different Clefs: of the Value or 
Quantity; of the Ritbmus; and of Syncopation.**

170. There are three clefs* in music; the cleff of *See Cleff. 
fa F; or the cleff of fa $\begin{array}{l}
\text{the cleff of fa}
\end{array}$; and the cleff of fa 
$\begin{array}{l}
\text{the cleff of fa}
\end{array}$.
But, in Britain, the following characters are 
used: The F, or bafs-cleff $\begin{array}{l}
\text{the C, or tenor}
\end{array}$; and the G, or treble cleff $\begin{array}{l}
\text{the C, or tenor}
\end{array}$.

The cleff of fa is placed on the fourth line, or on 
the third; and the line upon which this cleff is placed 
and the line upon which this cleff is placed. And how 
gives the name of fa or F, to all the notes which are 
placed upon that line.

The cleff of ut is placed upon the fourth, the third, 
the second, or the firft line; and in these different po-
tions all the notes upon that line where the cleff is 
placed take the name of ut, or C.

Lastly, the cleff of fa is placed upon the second or 
first line; and all the notes upon that line where the 
clef is placed take the name of fa or C.

171. As the notes are placed on the lines, and in 
Names of 
the spaces between the lines, any one, when he sees notes to be 
the cleff, may easily find the name of any note what-
soever. Thus he may see, that, in the firft cleff of fa, 
the note which is placed on the lowest line ought to be 
fa; that the note which occupies the space between 
the two firft lines should be fa; and that the note 
which is on the second line is a fa, &c. (kr).

172. A

*The chief use of these different denominations is to distinguish chords: for instance, the chord of the redundant fifth and that of the diminished seventh are different from the chord of the fifth; the chord of the seventh redundant, from that of the seventh major. This will be explained in the following chapters.*
Thus far the translator has followed his original as accurately as possible; but this was by no means an easy task. Among all the writers on music which he has found in English, there is no such thing as different names for each particular part which is employed to constitute full or complete harmony. He was therefore under a necessity of substituting by analogy such names as appeared most expressive of his author's meaning. To facilitate this attempt, he examined in Rousseau's musical dictionary the terms by which the different parts were denominated in l'Alembert; but even Rousseau, with all his depth of thought and extent of erudition, instead of expounding himself with that precision which the subject required, frequently applies the same names indiscriminately to different parts, without alluding any reason for this promiscuous and licentious use of words. The English reader therefore will be best able to form an accurate idea of the different parts, by the nature and situation of the clefs with which they are marked; and if he should find any impropriety in the names which are given them, he may adopt and abbreviate others more agreeable to his ideas.

SYNCOPE. Syncope is a note which is protracted in two different times belonging partly to the one and partly to the other, or in two different bars; yet not so as entirely to occupy or fill up the two times, or the two bars. A note, for instance, which begins in the imperfect time of a bar, and which ends in the perfect time of the following, or which in the same bar begins in the imperfect part of one time and ends in the perfect part of the following, is syncopated. A note which of itself occupies one or two bars, whether the measure consists of two or three times, is not considered as syncopated: this is a consequence of the preceding definition. This note is said to be continued or protracted. In the end of the example Z, the ut of the first bar constituting three times is not syncopated, because it occupies two whole times. It is the same case with ma of the second bar, and with the ut of the fourth and fifth. These therefore are continued or protracted notes.

† Times and bars in music answer the very same end as punctuation in language. They determine the different periods of the movement, or the various degree of completion, which the sententia, expressed by that movement, has attained. Let us suppose, for instance, a composer in music intending to express grief or joy, in all its various gradations, from its first and finest shade of expression, to its acme or highest possible degree. We do not say that such a progress of any passion either has been or can be delineated in practice, yet it may serve to illustrate what we mean to explain. Upon this hypothesis, therefore, the degrees of the sententia will pass from less to more intense, as it tides to its most intense degree. The first of these gradations may be called a time, which is likewise the most convenient division of a bar or measure into its elementary or quaver parts, and may be deemed equivalent to a comma in a sentence; a bar denotes a degree still more sensible, and may be considered as having the force of a semiceloc; a strain brings the sententia to a tolerable degree of perfection, and may be reckoned equal to a colon: the full period is the end of the inititative piece. It must have been remarked by observers of measure in melody or harmony, that the notes of which a bar or measure consists, are not diversified by their different durations alone, but likewise by greater or lesser degrees of emphasis,
The most emphatic parts of a bar are called the second and third, which require the greater degree of importance. To prevent ambiguity or confusion of ideas, it is necessary to inform our readers that we have allowed the different measures by different quantities of duration. By confining both these ideas, the word "duration" is employed by Dr. Almer. The reader, therefore, will find it easy to mark the importance of a note in height. The time is employed by different degrees of duration. The notation of time is employed by different degrees of duration. The notation of time is employed by different degrees of duration. The notation of time is employed by different degrees of duration. The notation of time is employed by different degrees of duration.
Part II.

Principles of Composition.

247 Tonic and simple dominant.

In every other chord of the seventh the fundamental is called the simple dominant (art. 102.) Thus in the chord fol fi re fa, the fundamental fol is the tonic dominant, but in the other chords of the seventh, as ut mi fol fi, re fa la ut, &c., the fundamentals ut and re are simple dominants.

186. In every chord, whether perfect, or of the seventh, or of the sixth, if you have a mind that the third above the fundamental note should be major, though it is naturally minor, you must place a sharp above the fundamental note. For example, if I would mark the perfect major chord re fa la re, as the third fi above re is naturally minor, I place above re a sharp, as you may see in example IV. In the same manner the chord of the seventh re fa la ut, and the chord of the great sixth re fa la fi, is marked with a flat above re, and above the fi a 7 or a 5 (see V. and VI.)

On the contrary, when the third is naturally major, and if you should incline to render it minor, you must place above the fundamental note a fi. Thus the examples VII. VIII. IX. show the chords fol fi re fa, fol fi fi re fa, fol fi re fi re mi (TT).

CHAP. V. Of the Fundamental Bass.

189. Invent a modulation at your pleasure; and under this modulation let there be set a bass composed of different notes, of which some may carry a perfect chord, others that of the seventh, and others that of the great sixth, in such a manner that each note of the modulation which answers to each of the basses, may be one of those which enters into the chord of that note in the bass; this bass being composed according to the rules; which shall be immediately given, will be the fundamental bass of the modulation proposed. See Part I., where the nature and principles of the fundamental basses are explained.

Thus (Exam. XVIII.) you will find that this modulation, ut re mi fa fol fi la ut, has or may admit for its fundamental bass ut fol fi fa ut re fol ut.

In reality, the first note ut in the upper part is found in the chord of the first note ut in the bass, which chord is ut mi fol ut; the second note re is found in the chord fol fi re fa, which is the chord of the second note in the bass, &c., and the bass is composed only of notes which carry a perfect chord, or that of the seventh, or that of the great sixth. Moreover, it is formed according to the rules which we are now about to give.

CHAP. VI. Rules for the Fundamental Basses.

190. All the notes of the fundamental bass being only capable of carrying a perfect chord, or of the formation of this bass, the fundamental bass of the seventh, or that of the great sixth, is either tonic, or dominants, or sub-dominants; and the dominants may be either simple or tonic.

The fundamental bass ought always to begin with a tonic, as much as it is practicable. And now follow the rules for all the succeeding chords; rules which are evidently derived from the principles established in the First Part of this treatise. To be convinced of this, we shall find it only necessary to review the articles 34, 91, 122, 124, 126, 127.

RULE I.

191. In every chord of the tonic, or of the tonic dominant, it is necessary that at least one of the notes which form that chord should be found in the chord that precedes it.

RULE II.

192. In every chord of the simple dominant, it is necessary

(TT) We may only add, that there is no occasion for making these sharps or flats when they are originally placed at the clef. For instance, if the sharp be upon the clef of fa (see Exam. X.), one may satisfy himself with simply writing re, without a sharp to mark the perfect chord major of re, re fa la re. In the same manner, in the Example XI. where the flat is at the clef upon fi, one may satisfy himself with simply writing fol, to mark the perfect chord minor of fol fi re fol.

But if a case occurs where there is a sharp or a flat at the clef, if any one would wish to render the chord minor which is major, or vice versa, he must place above the fundamental note a fi or natural. Thus the Example XII. marks the minor chord re fa la re, and Example XIII. the major chord fol fi re fol. Frequently, in lieu of a natural, a flat is used to signify the minor chord, and a sharp to signify the major. Thus Example XIV. marks the minor chord re fa la re, and Example XV. the major chord fol fi re fol.

When in a chord of the great sixth, the dissonance, that is to say, the sixth, ought to be sharp, and when the sharp is not found at the clef, they write before or after the fi a fi; and if this sixth should be flat according to the clef, they write a fi.

In the same manner, if in a chord of the seventh of the tonic dominant, the dissonance, that is to say, the seventh, ought to be flat or natural, they write by the side of the seventh a fi or a fi. Many musicians, when a seventh from the simple dominant ought to be altered by a sharp or a natural, have likewise written by the side of the seventh a fi or a fi; but M. Rameau supposes these characters. The reason shall be given below, when we speak of chords by supposition.

If there be a sharp on the clef of fa, and if I should incline to mark the chord fol fi re fa, or the chord la ut mi fa, I would place before the seventh or the fi a fi or a fi.

In the same manner, if there be a flat on the clef at fi, and if I should incline to mark the chord ut mi fol fi, I would place before the seventh a fi or a fi, and so of the rest.
RULE III.

193. In every chord of the sub-dominant, at least one of its consonances must be found in the preceding chord. Thus, in the chord of the sub-dominant fe la ut re, it is necessary that fe, la, or ut, which are the consonances of the chord, should be found in the chord preceding. The distance re may either be found in it or not.

RULE IV.

194. Every simple or tonic dominant ought to descend by a fifth. In the first case, that is to say, when the dominant is simple, the note which follows can only be a dominant; in the second it may be any one you please; or, in other words, it may either be a tonic, a tonic dominant, a simple dominant, or a sub-dominant. It is necessary, however, that the conditions prescribed in the second rule should be observed, if it be a simple dominant.

This last reflection is necessary, as you will presently see. For let us assume the succession of the two chords la ut se, fol re fa la ut (see Exam. XIX.), this succession is by no means legitimate, though in it the dominant descends by a fifth; because the ut which forms the dissonance in the second chord, and which belongs to a simple dominant, is not in the preceding chord. But the succession will be admissible, if, without meddlin; with the second chord, one should take away the sharp carried by the ut in the first, or, if without meddlin; with the first chord, one should render ut or fa sharp in the second (uv); or in short, if one should simply render the re of the second chord a tonic dominant, in causing it to carry fa instead of fa natural (119. & 122.).

It is likewise by the same rule that we ought to reject the succession of the two following chords, re fa la ut, fol fi re fa re (uv); (see Exam. XX.).

RULE V.

195. Every sub-dominant ought to rise by a fifth; and the note which follows it may, at your pleasure, be either a tonic, a tonic dominant, or a sub-dominant.

Remark. Of the five fundamental rules which have now been given, instead of the three first, one may substitute the three following, which are nothing but consequences from them, and which you may pass unnoticed, if you think it proper.

RULE I.

If a note of the fundamental bass be a tonic, and rise by a fifth or a third to another note, that second note may be either a tonic (34. & 91.), see Examples XXI. and XXII. (xx); a tonic dominant (124.), see XXIII. and XXIV.; or a sub-dominant (124.), see XXV. and XXVI.; or, to express the rule more fully, that second note may be any one you please, except a dominant simple.

RULE II.

If a note of the fundamental bass be a tonic, and descend by a fifth or a third upon another note, this second note may be either a tonic (34. & 91.), see Exam. XXVII. and XXVIII.; or a tonic dominant, or a simple dominant, yet in such a manner that the rule of art. 192. may be observed (124.), see XXIX. XXX. XXXI. XXXII.; or a sub-dominant (124.), see XXXIII. and XXXIV.

The procedure of the bass ut mi b fol ut, fa la ut mi, from the tonic ut to the dominant fa (Ex. XXXV.), is excluded by art. 192.

RULE III.

If a note in the fundamental bass be a tonic, and descend by a fifth or a third upon another note, that note ought to be a dominant simple, or a simple dominant (101. & 122.). See XXXVI. and XXXVII. (yy.)

We must here advertise our readers, that the examples XXXVIII. XXXIX. XL. XLI. belong to the fourth rule above, art. 194; and the examples XLII. XLIII. XLIV. to the fifth rule above, art. 195. See the articles 34, 35, 121, 123, 124.

Remark. I.

196. The transition from a tonic dominant to a perfect and tonic is called an absolute repercussion, or a perfect cadence imperfect (73.); and the transition from a sub-dominant to a cadence, tonic is called an imperfect or irregular cadence (73.) what, and by what, and how employed.

The cadences are formed at the distance of four bars one from another, whilst the tonic then falls within the first time of the bar. See XLV. and XLVI.

Remark II.

197. We must avoid, as much as we can, syncopations in the fundamental bass; that, within the first time only of which a bar is constituted, the ear may be entertained with a harmony different from that which it is accustomed to the fundamental bass by license.
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had before perceived in the last time of the preceding task. "Never-theless, fyncopeation may be sometimes admitted in the fundamental bas, but it is by a licence (21).

**Chap. VII. Of the Rules which ought to be observed in the Treble with relation to the Fundamental Bas.**

214. Definition of treble.

198. The treble is nothing else but a modulation above the fundamental bas, and whole notes are found in the chords of that bas which corresponds with it (199). Thus in Ex. XVIII. the scale at re mi fa sol la, is a treble with respect to the fundamental bas ut sol fa ut re fol ut.

215. One note in the treble or bas may answer to several of its corresponding parts, and why.

1. It is obvious, that many notes of the treble may answer to one and the same note in the fundamental bas, when these notes belong to the chord of the same note in the fundamental bas. For example, this modulation ut re mi fa sol la may have for its fundamental bas the note ut alone, because the chord of that note comprehends the sounds ut, mi, sol, which are found in the treble.

2. In like manner, a single note in the treble may, for the same reason, answer to several notes in the bas.

**Rule I. for the Treble.**

200. If the note which forms the seventh in a chord of the simple dominant is found in the treble, the note which precedes it must be the very same. This is what we call a discord prepared (12). For instance, let us suppose that the note of the fundamental bas shall be re, bearing the chord of the simple dominant re fa la ut; and that this ut, which (art. 18. and 118.) is the dissonance, should be found in the treble; it is necessary that the note which goes before it in the treble should likewise be an ut.

201. And it is requisite to observe, that according to the rules which we have given for the fundamental bas, ut will always be found in the chord of that note in the fundamental bas which precedes the simple dominant re. See XLVIII. XLI. L. In the first example the dissonance is ut, in the second fol, and in the third mi; and these notes are already in the preceding chord (bbb).

**Rule II.**

202. If a note of the fundamental bas be a tonic dominant, or a simple dominant, and if the dissonance be found in the treble, this dissonance in the same treble ought to descend diatonically. But if the note...
of the bass be a sub-dominant, it ought to rise diatonically. This diﬀerence, which rises or descends diatonically, is what we have called a diﬀerence forced or refolved (129, 130). See L.II. L.III. L.IV.

205. One may likewise observe here, that, according to the rules for the fundamental bass which we have given, the note upon which the dissonance ought to descend or rise will always be found in the subse-
quent chord (ccc).

CHAP. VIII. Of the Continued Basses, and its Rules.

204. A continued or thorough bass, is nothing else but a fundamental bass whose chords are inverted. We invert a chord when we change the order of the notes which compose it. For example, if instead of the chord $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, I should say $\text{f} \text{e} \text{r} \text{i} \text{a} \text{f} \text{e} \text{r}$ or $\text{f} \text{a} \text{f} \text{e} \text{i} \text{r}$, &c. the chord is inverted. Let us see then, in the first place, all the possible ways in which a chord may be inverted.

**The ways in which a Perfect Chord may be Inverted.**

205. The perfect chord $\text{m} \text{i} \text{f} \text{a} \text{f} \text{u} \text{u}$ may be inverted in two different ways.

1. $\text{m} \text{i} \text{f} \text{a} \text{f} \text{u} \text{m}$, which we call a chord of the sixth, composed of a third, a sixth, and an octave, and in this case the note $\text{m}$ is marked with a 6. (See L.V.)

2. $\text{s} \text{i} \text{m} \text{a} \text{f} \text{u}$, which we call a chord of the sixth and fourth, composed of a fourth, a sixth, and an octave; and it is marked with a 2. (See L.VII.)

The perfect minor chord is inverted in the same manner.

**The ways in which the Chord of the Seventh may be Inverted.**

206. In the chord of the tonic dominant, as $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, the third major $\text{f} \text{i}$ above the fundamental note $\text{f} \text{a}$ is called a sensible note (77); and the inverted chord $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a} \text{f} \text{a}$, composed of a third, a false fifth, and sixth, is called the chord of the false fifth, and is marked with an 8 or a 6 (see L.VII. and L.IX.)

The chord $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, composed of a third, a fourth, and a sixth, is called the chord of the senible sixth, and marked with a 6 or a $\text{f} \text{a}$. In this chord thus figured, the third is minor, and the sixth major, as it is easy to be perceived. (See L.X.)

The chord $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, composed of a second, a tritone, and a sixth, is called the chord of the tritone, and is marked thus $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a} \text{f} \text{a}$, thus $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a} \text{f} \text{a}$ or thus $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a} \text{f} \text{a}$ (See L.XI.)

207. In the chord of the simple dominant $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, we find,

1. $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, a chord of the great fifth, which is composed of a third, a fifth, and a sixth, and which is figured with a $\text{f} \text{i}$. See L.XII. (fnd).

2. $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, a chord of the lesser sixth, which is figured with a 6. See L.XIV. (see).

3. $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a} \text{f} \text{a}$, a chord of the second, composed of a second, a fourth, and a sixth, and which is marked with a 2. See L.XII. (ff).

**The ways in which the Chord of the Sub-dominant may be Inverted.**

209. The continued bass is a fundamental bass, whose chords are only inverted in order to render it more in the taste of singers, and suitable to the voice. See L.XV. in which the fundamental bass which in itself is monotonous and little suited for singing, $\text{f} \text{i} \text{r} \text{e} \text{f} \text{a}$, produces, by inverting its chords, this continued
RULE I.

210. Every note which carries the chord of the false fifth, and which of consequence must be what we have called a *false* note, ought (77) to rise diatonically upon the note which follows it. Thus in example LXV, the note $j$, carrying the chord of the false fifth marked with an 8, rises diatonically upon $u$ (HHH).

RULE II.

211. Every note carrying the chord of the tritone of the fundamental bass, should descend diatonically upon the subsequent note. Thus in the same example LXV, $j$, which carries the chord of the tritone figured with a 4, descends diatonically upon $u$ (Art. 202).

RULE III.

212. The chord of the second is commonly put in practice upon notes which are syncopated in descending, because these notes are dissonances which ought to be prepared and resolved (200, 202). See the example LXVI, where the second $n$, which is syncopated, and which descends afterwards upon $f$, carries the chord of the second (111).

CHAP.
Broken cadence, how executed. 213. The broken cadence is executed by means of a dominant which rises diatonically upon another, or upon a tonic by a licence. See, in the example LXXIV.

214. The interrupted cadence is formed by a dominant which descends by a third upon another (136). See, in the example LXXV. fol mi (LLL).

These cadences ought to be permitted but rarely and with precaution.

2. Of Supposition.

215. When a dominant is preceded by a tonic in the fundamental bass, we add sometimes, in the continued balsa to the chord of that dominant, a new note which is a third or fifth below; and the chord which results from it in this continued balsa is called a chord by supposition.

For example, let us suppose, that in the fundamental bass we have a dominant fol carrying the chord of the seventh fol f re fa; let us add to this chord the note ut, which is a third below this dominant, and we shall have the total chord ut fol f re fa, or ut re f fol f, which is called a chord by supposition (MMM).

Of the different kinds of chords by supposition.

216. It is easy to perceive, that chords by supposition are of different kinds. For instance, the chord of the tonic fol f re fa gives:

1. By adding the fifth ut, the chord ut fol f re fa, called a chord of the seventh redundant, and composed of a fifth, seventh, ninth, and eleventh. It is figured with a 5, see LXXVI. (MM). This chord is not a dominant, of the same kind as the above, pradiced but upon the tonic. They sometimes leave out the sensible note, for reasons which we shall give more fully in the note 1ooq, upon the art. 219: it is then reduced to ut fa fol re, and marked with 5 or 6.

2. By adding the third mi, we shall have the chord mi fol f re fa, called a chord of the ninth, and composed of a third, fifth, seventh, and ninth. It is figured with a 7. This chord may be added to every third of the dominant. See LXXVII. (000).

3. If to a chord of the simple dominant, as re fa la ut, we should add the fifth fol, we would have the chord fol f re fa la ut, called a chord of the eleventh, and which is figured with a 5 or 6. (See LXXVIII.)

Observe.

217. When the dominant is not a tonic dominant, occasions may arise, when they often take away some notes from the chord. For when we examine, that in the example LXXIV. (LLL), the fourth and fifth notes of the fundamental balsa are all figurred, it is necessary, to render it practicable, that the fifth below the first tonic should be found in the chord of the tonic following, as here fa, a fifth below the first tonic ut, is found in the chord re fa la re, and in the chord f re fa f (37 and note a.)

Even without having recourse to this experiment, we may remark, that the note added beneath the fundamental found, causes that very fundamental found to be heard. For instance, if added beneath the fundamental folve, it causes the fol to be found. Thus fol is found in some measure to be implied in ut.

If the third added beneath the fundamental found be minor, for example, if to the chord fol f re fa, we add the third mi, the supposition is then no longer found on the experiment, which only gives the seventeenth major, or, what is the same thing, the third major beneath the fundamental found. In the same, the addition of the third minor must be considered as an extension of the rule, which in reality has no foundation in the chords emitted by a famous body, but is authorized by the fandition of the ear and by practical experiment.

(MMM) Many musicians figure this chord with a 5, M. Rameau suppresses this 5, and merely marks it to be the seventh redundant by a 7, or 7. But it may be said, how shall we distinguish this chord from the seventh major, which, as it would seem, ought to be marked with a 7, M. Rameau answers, that there is no danger of mistake, because in the seventh major, as the seventh ought to be prepared, it is found in the preceding chord; and thus the sharp subsisting already in the preceding chord, it would be useless to repeat it.

Thus re fole, according to M. Rameau, would indicate re fole la ut, fol f re fa. If we would change fa fole, of the second chord into fa, it would then be necessary to write re fol. In notes fifth as ut, whose natural seventh is major, the figure 7 preceded or followed by a sharp will sufficiently serve to distinguish the chord of the seventh redundant ut fol f re fa, from the simple chord of the seventh ut mi fol f, which is marked with a 7 alone. All this appears just and well founded.

(000) Supposition introduces into a chord dissonances which were not in it before. For instance, if to the chord mi fol f re, we should add the note of supposition ut descending by a third, it is plain that, besides the dissonance
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219. In this state the chord is simply composed of a third, fifth, and ninth, and is marked with a $9$. See LXXIX. ([prp])

218. What is more, in the chord of the simple dominant, as re fa la $ut$, when the fifth $fa$ is added, they frequently obliterate the sounds $fa$ and $la$, that too great a number of dissonances may be avoided, which reduces the chord to $fa$ ut $re$. This last is composed only of the fourth and the fifth. It is called a chord of the fourth, and it is figured with a $4$. (See LXXX.)

219. Sometimes they only remove the note $la$, and then the chord ought to be figured with $4$ or $6$. ([qqq])

220. Finally, in the minor mode, for example, in that of $la$, where the chord of the tonic dominant (109) is $mi fol$ $fa$ $re$ $si$; if we add to this chord the third $ut$ below, we shall have $ut mi fol$ $fa$ $re$, called the chord of the fifth redundant, and composed of a third, a fifth redundant, a seventh, and a ninth. It is figured with a $5$ or $4+5$. See LXXXI. (rrr.)

§ 3. Of the Chord of the Diminished Seventh.

221. In the minor mode, for instance, in that of $la$ a third $mi$ a fifth $re$ from $la$ is the tonic dominant (109), and carries the chord $mi fol$ $fa$ $re$, in which $fa$ is the sensible note. For this chord they sometimes substitute that other $jol$ $fa$ $re$ $fa$ (116), all composed of minor thirds; and which has for its fundamental found the sensible note $jol$. This chord is called a chord of the flat, or diminished seventh, and is figured with a $7$ in the fundamental bass, (see LXXXII.): but it is always considered as representing the chord of the tonic dominant.

222. This chord in the fundamental bass produces in the continued bass the following chords:

1. The chord $fa$ $fol$ $fa$ $re$, composed of a third, a fifth, and fifth major. They call it the chord of the seventh sensible and false fifth; and it is figured thus $7$ or $7+5$. (See LXXXIII.)

2. The chord $re$ $fa$ $fol$ $fa$, composed of a third, a tritone, and a sixth, they call it the chord of the tritone and third minor; and they mark it thus $5$. (See LXXXIV.)

3. The chord $fa$ $fol$ $fa$ $re$, composed of a second redundant, a tritone, and a sixth. They call it the chord of the second redundant, and they figure it thus $5+5$, or $5+4$. See LXXXV. (ss)."
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To add to the chord whose effect is to be produced, the notes must be such that the effect will be obtained.

1. By adding a seventh, the chord $\text{fa} \text{fa} \text{fa}$, composed of a fifth redundant, a seventh, a ninth, and an eleventh, which is the octave of the fourth, is called the chord of the fifth redundant and fourth, and marked $\text{fa} \text{fa}$ or $\text{fa} \text{fa}$. (See LXXXVI.)

2. By adding a minor seventh, we shall have the chord $\text{fa} \text{fa} \text{fa}$, composed of a seventh redundant, a ninth, an eleventh, and a thirteenth minor, which is the octave of the sixth minor. It is called the chord of the seventh redundant and sixth minor, and marked $\text{fa} \text{fa} \text{fa}$. (See LXXVII.)

In like manner, in a continued bass, the diatonic effect which it has to be produced is obtained by raising the note upon which it ought to have descended. This licence ought to be rarely practised.

In like manner, in a continued bass, the diatonic effect which it has to be produced is obtained by raising the note upon which it ought to have descended. This licence ought to be rarely practised.

Chap. XI. Containing the Method of finding the Fundamental Basses when the Continued Bases are figured.

226. To exercise yourself with greater ease in finding the fundamental basses, and to render it more familiar to you, it is necessary to observe how eminent masters have practised their works, and above all how M. Rameau has put the rules into practice. Now, as they never place any thing but the continued basses in their works, it becomes then necessary to know how to find the fundamental basses when the continued bass is figured. This problem may be easily solved by the following rules.

227. 1. Every note which has no figure in the continued bass, ought to be the same, and without a figure in the fundamental bass; it either is a tonic, or reckoned such, (uuu). We shall distinguish these two cases below. (See LVI. red. and LXIV. and the note z z z.)

2. Every note which in the continued bass carries a $\text{fa}$, ought in the fundamental bass to give its third below, and without a figure, (uuu). Every note which has no figure in the continued bass is figured. (See LXVII.)

3. Every note carried $\text{fa}$ gives in the fundamental bass its fifth below not figured. (See LVI.

4. Every note figured with a 7 or a 5, is the same in both basses, and with the same figure. (xxx.)

5. Every note figured with a 2 gives in the fundamental bass the diatonic note above figured with a 7. (See LXII. (yyy.)

6. Every note marked with a 4 gives in the fundamental bass a 7, and that a simple dominant, carrying the diatonic note above figured with a 7. (See LXIV.)

As the chord of the diminished seventh $\text{fa} \text{fa} \text{fa}$, and the chord of the tonic dominant $\text{fa} \text{fa} \text{fa}$, only differ one from the other by the notes mi and fa; one may form a diatonic modulation of these two notes, and then the fundamental bass does nothing but pass from the tonic dominant to the fundamental note, and from that note to the tonic dominant, till it arrives at the tonic. (See XCII.)

For the same reason, as the chord of the diminished seventh $\text{fa} \text{fa} \text{fa}$, and the chord $\text{fa} \text{fa} \text{fa}$, which carries the fifth of the tonic dominant, only differs by the notes fa and la, one may sometimes, while the treble modulates $\text{fa} \text{fa} \text{fa}$, ascend in the fundamental bass, from the bass note to the third above, provided one descend at last from thence to the tonic dominant, and from thence to the tonic; (see XCIII.) As to what remains, this and the preceding examples are licences.

(yyy) A note figured with a 2, gives likewise sometimes in the fundamental bass its fourth above, figured with a 6. For example, this continued bass $\text{fa} \text{fa} \text{fa}$ gives this fundamental bass $\text{fa} \text{fa} \text{fa}$; but in this case it is necessary that the note figured with a 6 should rise by a fifth, as we see here $\text{fa}$ rise to $\text{fa}$.
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Mental bas the diatonic note above, figured with a 7. (See LXI.)

7. Every note figured with an 8 gives its third below figured with a 7. (See LVII.)

8. Every note marked with a 6 gives the fifth below marked with a 7; (See LX.) and it is plain that the chord of the seventh, of which we treat in the three last articles, the third ought to be major, and the seventh minor, this chord the seventh being the chord of the tonic dominant. (See art. 102.)

9. Every note marked with a 9 gives its third above figured with a 7. (See LXXVII and LXXIX.)

10. Every note marked with a 2 gives the fifth above figured with a 7. (See LXXVIII.)

11. Every note marked with a + 5, or with a + 7, gives the third above figured with a 7. (See LXXXI.)

12. Every note marked with a 8 gives a fifth above figured with a 7, or with a 5. (See LXXXII.) It is the same case with the notes marked 7, 4, or 5, which shows a retrenchment, either in the complete chord of the eleventh, or in that of the seventh redundant.

13. Every note marked with a 4 gives a fifth above figured with a 7, or a 7. (See LXXX.)

14. Every note marked with a + 5 gives the third minor below, figured with a 7. (See LXXXIII.)

15. Every note marked with a + 6 gives the tritone above figured with a 7. (See LXXXIV.)

16. Every note marked with a + 2 gives the second redundant above, figured with a 7. (See LXXXV.)

17. Every note marked with a + 4 gives the fifth redundant above, figured with a 7. (See LXXXVI.)

18. Every note marked with a + 5 gives the seventh redundant above, figured with a 7. (See LXXXVII.)

Remark.

228. We have omitted two cases, which may cause some uncertainty.

The first is that where the note of the continued bass is figured with a 6. We now present the reason of the difficulty.

Suppose we should have the dominant seventh in the fundamental bass, the note which answers to it in the continued bass may be la carrying the figure 6 (See LXIV.); that is to say, the chord la re fa: now if we should have the sub-dominant fa in the fundamental bass with a 6; but it is necessary in that case that the note figured with a 6, may even here rise to a fifth. (See note xxi)

These variations in the fundamental bass, as well as the chord concerning which we now treat, as in the chord figured with a 7, and in the two others which shall afterwards be mentioned (art. 228 and 229), are caused by a deficiency in the figure proper for the chord of the sub-dominant, and for the different arrangements by which it is inverted.

M. Abbe Rouillé, to redress this deficiency, had invented a new manner of figuring the continued bass. His method is most simple for those who know the fundamental bass. It consists in expressing each chord by only signifyng the fundamental found with that letter of the scale by which it is denominated, to which is joined a 7 or 7, or a 6, in order to mark all the discords. Thus the fundamental chord of the seventh re fa la ut is expressed by a D; and the same chord, when it is inverted from that of the sub-dominant fa la ut re, is characterized by F; the chord of the second ut re fa la, inverted from the dominant re fa la ut, is likewise represented by D; and the same chord ut re fa la inverted from that of the sub-dominant fa la ut re is signified by F; the same is the same when the chords are differently inverted. By this means it would be impossible to mistake either with respect to the fundamental bass of a chord, or with respect to the note which forms its dissonance, or with respect to the nature and species of that discord.

(zzz) We may only add, that here and in the preceding articles, we suppose, that the continued bass is figured in the manner of M. Rameau. For it is proper to observe, that there are not, perhaps, two musicians who characterize their chords with the same figures; which produces a great inconvenience to the person who plays the accompaniments: but here we do not treat of accompaniments. For every reason, then, we should advise initiates to prefer the continued basses of M. Rameau to all the others, as by them they will most successfully study the fundamental bass.

It is even necessary to advert the reader, and I have already done it (note xxx), that M. Rameau only marks the letter sixth by a 5 without a line, when this letter sixth does not result from the chord of the tonic dominant; in such a manner that the 6 renders it uncertain whether in the fundamental bass we ought to choose the third or the fifth below; but it will be easy to see whether the third or the fifth is signified by that figure. This may be distinguished, 1. In observing which of the two notes is excluded by the rules of the fundamental bass. 2. If the two notes may with equal propriety be placed in the fundamental bass, the preference must be determined by the tone or mode of the treble in that particular passage. In the following chapter we shall give rules for determining the mode.

There is a chord of which we have not spoken in this enumeration, and which is called the chord of the fourth redundant. The chord is composed of a note, of its third major, of its redundant fourth or tritone, and its redundant sixth, as fa la si re. It is marked with a 6. It appears difficult to find a fundamental bass for this chord; nor is it indeed much in use amongst us. (See the note upon the art. 115.)
mental bars, this sub-dominant might produce in the
continued bars the same note $a_A$ figured with a 6.
When therefore one finds in the continued bars a note
marked with a 6, it appears at first uncertain whether
we should place in the fundamental bars the fifth
below marked with a 7, or the third below marked with
a 6.

229. The second case is that in which the con­tinued bars is figured with a $\frac{7}{2}$. For instance, if there
should be found $fa$ in the continued bars, one may be
ignorant whether he ought to infer in the fundamental
bars $fa$ marked with a 6, or $re$ figured with a 7.

230. You may easily extricate yourself from this
little difficulty, in leaving for an instant this uncertain
note in suspense, and in examining what is the suc­ceeding
note of the fundamental bars; for if that note be
in the present case a fifth above $fa$, that is to say,
if it is $ut$ in this case, and in this alone, he may place
$fa$ in the fundamental bars. It is a consequence of this
rule, that in the fundamental bars every sub-dominant
ought to rise by a fifth (193).

CHAP. XII. What is meant by being in a Mode or
Tone.

231. In the first part of this treatise (chap. vi.) we
have explained, how by the means of the note $ut$, and
of its two fifths $fol$ and $fa$, one in ascending, which
is called a tonic dominant, the scale $ut$ $re$ $mi$ $fa$ $fol$ $la$ $fi$ $ut$
may be found: the different founds which form this
scale compose what we call the major mode of $ut$,
because the third $mi$ above $ut$ is major. If therefore we
should have a modulation in the major mode of $ut$, no
other founds must enter into it than those which com­pose
this scale; in such a manner that if, for instance,
I should find $fa$ in this modulation, this $fa$ dis­covers
to me that I am not in the mode of $ut$, or at least
that, if I have been in it, I am no longer $fa$.

232. In the same manner, if I form this scale in
ascending $la$ $fi$ $ut$ $re$ $mi$ $fa$ $bol$ $la$, which is exactly
similar to the scale $ut$ $re$ $mi$ $fa$ $bol$ $la$ $fi$ $ut$ of the major
mode of $ut$, this scale, in which the third form $la$ to
$ut$ is major, shall be in the major mode of $la$; and if I
incline to be in the minor mode of $la$, I have nothing
to do but to substitute for $ut$ sharp $ut$ natural; so that
the major third $la$ $ut$ may become minor $la$ $ut$; I
shall have then

$la$ $fi$ $ut$ $re$ $mi$ $fa$ $bol$ $la$ $fi$ $ut$ $re$ $mi$ $fa$ $bol$,
which is (85) the scale of the minor mode of $la$ in ascen­ding; and the scale of the mode of $la$ in de­scending shall be (go)

$la$ $fol$ $fa$ $mi$ $ut$ $re$ $fi$ $la$,
in which the $fol$ and $fa$ are no longer sharp. For it is
a singularity peculiar to the minor mode, that its scale
is not the same in rising as in descending (89).

233. This is the reason why, when we wish to be­gin a piece in the major mode of $la$, we place three
sharps at the clef upon $fa$, $ut$, and $fol$; and on the
contrary, in the minor mode of $la$, we place none, be­cause
the minor mode of $la$, in descending, has neither
sharps nor flats.

234. As the scale contains twelve founds, each dis­tant from the other by the interval of a femitone, it
is obvious that each of these founds can produce both
in the major mode of $la$, where it is sharp a major and a minor mode, which constitute 24 modes
in the whole. Of these we shall immediately give the minor
a table, which may be very useful to discover the mode
in which we are.

A TABLE of the Different Modes.

Major Modes.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Of $ut$</th>
<th>Of $sol$</th>
<th>Of $re$</th>
<th>Of $la$</th>
<th>Of $mi$</th>
<th>Of $fi$</th>
<th>Of $fa$</th>
<th>Of $ut$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maj.</td>
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<td>$la$</td>
<td>$mi$</td>
<td>$fi$</td>
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<td>$fa$</td>
<td>$sol$</td>
<td>$re$</td>
</tr>
</tbody>
</table>

(1111) The major mode of $fa$, of $re$ or $re$, and of $sol$ or $lab$, are not much practised. In the opera
of Pyramus and Thisbe, p. 267, there is a passage in the scene, of which one part is the major mode of $fa$,
and the other in the major mode of $ut$, and there are fix sharps at the clef.

When a piece begins upon $ut$, there ought to be seven sharps placed at the clef; but it is more convenient
to place five flats, and to suppose the key $reb$, which is almost the same thing with $ut$. It is for this
reason that we substitute here the mode of $reb$ for that of $ut$.

It is still much more necessary to substitute the mode of $lab$ for that of $fol$; for the scale of the major mode
of $sol$ is

$fol$, $la$, $fi$, $ut$, $re$, $mi$, $fa$, $bol$,
in which you may see that there are at the same time both a $sol$ natural and a $fol$: it would then be necessary,
even at the same time, that upon $sol$ there should and should not be a sharp at the clef; which is shocking and
inconvenient. It is true that this inconvenience may be avoided by placing a sharp upon $sol$ at the clef, and by
marking the note $sol$ with a natural through the course of the music wherever it ought to be natural; but this
would become troublesome, above all if there should be occasion to transpose. In the article 236, we shall
give an account of transposition. One might likewise in this series, instead of $sol$ natural, which is the note
immediately before the last, substitute $fa$, that is to say, $fa$ twice sharp: which, however, is not absolutely
the same found with $sol$ natural, especially upon instruments whose scales are fixed, or whose intervals are
variable. But in that case two sharps may be placed at the clef upon $fa$, which would produce another incon­venience. But by substituting $lab$ for $fol$, the trouble is eluded.
Part II.

Principles of Composition.

Music.

\[ \text{Music.} \]

\[ \text{Music.} \]

Of ut

In descending, \( ftb \) lab fa mib re ut.

In rising, \( ut \) mi re mi fa fol la ut.

Of fol.

In descending, fol fa mib re ut ftb la fol.

In rising, fol la fb ut mi fa** fol.

Of re.

In descending, re ut ftb la fol fa mi re.

In rising, re mi fa fol la ut re mi fa**.

\[ \text{Music.} \]

\[ \text{Music.} \]

233. These are all the modes, as well major Modes as minor. Those which are crowded with sharps and crowded flats are little practiced, as being extremely difficult in execution.

236. From thence it follows,

1. That when there are neither sharps nor flats at the clef, it is a token that the piece begins in the major mode of ut, or in the minor mode of la.

2. That when there is one single sharp, it will always be placed upon fa, and that the piece begins in the major mode of fol, or the minor of mi, in such a manner that it may be sung as if there were no sharp, by finging \( \bar{f} \) instead of \( *f \), and in finging the tune as if it had been in another clef. For instance, let there be a sharp upon fa in the clef of fol upon the first line; one may then sing the tune as if there were no sharp. And instead of the clef of fol upon the first line, let there be the clef of ut for the fa, when changed into \( \bar{f} \), will require that the clef of fol should be changed to the clef of ut, as may be easily seen.

This it what we call transposition (\( \bar{f} \)).

237. It is evident, that when \( *f \) is changed into \( \bar{f} \), fol must be changed into ut, and mi into la. Thus by transposition, the air has the same melody as if it were in the major mode of ut, or in the minor mode of la.

Vol. XII.
M U S I C.

Chap. XIII. To find the Fundamental Bases of a given Modulation.

238. As we have reduced to a very small number the rules of the fundamental bass, and those which in the treble ought to be observed with relation to this bass, it should no longer be difficult to find the fundamental bass of a given modulation, may, frequently to find several; for every fundamental bass will be legitimate, when it is formed according to the rules which we have given (Chap. VI.), and that, besides the dissonances which the modulation may form with this first difficult, and why.

For the Sharps.
Suppose fo, re, la, mi, fi, fa, and change fa into ut if there is one sharp at the clefT, re into ut if there are two sharps, la into ut if there are three, &c.

For the Flats.
Suppose fi, re, la, mi, &c. and change fa into ut if there is only one flat at the clefT, fi into ut if there are two flats, mi into ut if there are three, &c.
Principles of Composition.

The diatonic scale, or gammus of the Greeks was la fa ut re mi fa, fol la (art. 49.) A method has likewise been invented of representing each of the sounds in this scale by a letter of the alphabet; la by A, fa by B, ut by C, &c. It is from hence that these forms of speaking proceed. Such a piece is upon A, re mi la, and its third minor; or, simply, it is upon A, re mi la, and its minor; such another piece upon C, with fol, ut, and its third major; or, simply, upon C, with fol, ut, and its major; to signify that the one is the mode of la minor, or that the other is in that of ut major; this latter manner of speaking is more concisely, and on this account it begins to become general.

They likewise call the key of ut fa F, the key of re fol G, &c. to denote the key of fa, the key of fol, &c.

They likewise take the A mi la, to give the A mi la; that is to say, to take the union of a certain note called la in the harpichord, which la is the same note that occupies the fifth line, or the highest line in the fifteenth fa. This la divides in the middle the two octaves which succeed (note n.) between the sol which occupies the first line in the key of fa upon that same line, and that sol which occupies the first line in the key of fa upon the fourth; and as it continues (if we may speak so) the middle station between the sharpest and lowest sounds, it has been chosen to be the sound with relation to which all the voices and instruments ought to be tuned in a concert (§).

Thus far our author; and though the note is no more than an illustration of the technical phraseology in his native language, we did not think it consistent with the facility of a translation to omit it. We have little reason to envious, and fill less to follow, the French in their abbreviatory forms of speech, the native energy of our tongue supercedes this necessity in a manner so effectual, that, in proportion as we endeavour to become facile, our style, without the smallest sacrifice of perspicuity, becomes more agreeable to the genius of our language; whereas, in French, acyclic definition is equally ambiguous and disagreeable. Of this we cannot give a more flagrant instance than the note upon which these observations are made, in its original. We must, however, follow the author's example, in reciting a few technical forms upon the same subject, which occur in our language, and which, if we are not mistaken, will be found equally concise, at the same time that they are more natural and intelligible. When we mean to express the fundamental key of that feries within the diatonic octave which any piece of music demands, we call that note the key. When we intend to signify its mode, whether major or minor, we denote the harmony sharp or flat. When in a concert we mean to try how instruments are in tune by that note upon which, according to the genius of each particular instrument, they may best agree in union, we declare the musicans who join us to found A.
Principles of Composition.

M U S I C.

Part II.

The major mode of UT.

Major mode of UT. ut mi fa re fa.

Tonic dominant.

Minor mode of LA. mi fol ut re.

Sub-dominant.

Major mode of UT. fa la ut re.

Minor mode of LA. re fa la fi.

The three sounds, the tonic, the tonic dominant, and the sub-dominant, contain in their chords all the notes which enter into the scale of the mode; so that when a melody is given, it may almost always be found which of these three sounds should be placed in the fundamental bafs, under any particular note of the upper part. Yet it sometimes happens that not one of these notes can be used. For example, let it be supposed that we are in the mode of UT, and that we find in the melody these two notes la fi in succession; if we confine ourselves to place in the fundamental bafs one of the three sounds ut fol fa, we shall find nothing for the sounds la and fi but this fundamental bafs fa fol; now such a succession as fa to fol is prohibited by the fifth rule for the fundamental bafs, according to which every sub-dominant, a fa, should rise by a fifth; so that fa can only be followed by ut in the fundamental bafs, and not by fol.

To remedy this, the chord of the sub-dominant fa la ut re must be inverted into a fundamental chord of the seventh, in this manner, re fa la ut, which has been called the double employment (art. 105.) because it is a secondary manner of employing the chord of the sub-

(EEE) It is certain that the minor mode of mi has an extremely natural connection with the mode of ut, as has been proven (art. 92.) both by arguments and by examples. It has likewise appeared in the note upon the art. 93. that the minor mode of re may be joined to the major mode of ut; and thus in a particular sense, this mode may be considered as relative to the mode of ut, but it is still less so than the major modes of fol and fa, or than those of la and mi minor, because we cannot immediately, and without licence, pass in a fundamental bafs from the perfect minor chord of ut to the perfect minor chord of re; and if you pass immediately from the major mode of ut to the minor mode of re in a fundamental bafs, it is by passing, for instance, from the tonic ut, or from mi fol ut, to the tonic dominant of re, carrying the chord la ut re mi fol, in which there are two sounds, mi fol, which are found in the preceding chord; or otherwise from ut mi fol ut to fol fi re mi, a chord of the sub-dominant in the minor mode of re, which chord has likewise two sounds, fol and mi, in common with that which went immediately before it.

(FFF) All these different manners of distinguish the modes ought, if we may speak so, to give mutual light and assistance one to the other. But it often happens, that one of these signs alone is not sufficient to determine the mode, and may even lead to error. For example, if a piece of music begins with these three notes, ut mi fol, we must not with too much precipitation conclude from thence that we are in the major mode of ut; although these three sounds, mi fol, be the principal and characteristic sounds in the mode of ut: we may be in the minor mode of mi, especially if the note mi should be long. You may see an example in the fourth act of Zoroaster, where the first air sung by the priests of Arianes begins thus with two times fol mi fol, each of these notes being a crotchet. The air is in the minor mode of fol, and not in the major mode of mi fol, as one would at first be tempted to believe. Now we may be sensible that it is in fol minor, by the relative modes which follow, and by the notes where the cadences fall.
Principles of Composition.

Part II.

MUSIC.

Principles of Composition.

By these means we give to the modulation la, this fundamental bass re sol, which procedure is agreeable to rules.

Here then are four chords, ut mi sol ut, sol fa re fa, fa la ut re, re fa la ut, which may be employed in the major mode of ut. We shall find in like manner, for the minor mode of la, four chords;

la ut mi la, mi sol si re, re la fa la.

And in this mode we sometimes change the last of these chords into re fa re la, substituting the fa for re. For instance, if we have this melody in the minor mode of la mi fa sol la, we would caufe the first note mi to carry the perfect chord la ut mi la, the second note fa to carry the chord of the seventh, re fa la, the third note sol to carry the chord of the tonic dominant mi sol si re, and in short, the last the perfect chord la ut mi la.

On the contrary, if this melody is given always in the minor mode la la sol la, the second la being syncopated, it might have the same bass as the modulation mi fa sol la, with this difference alone, that fa might be substituted for sol in the chord re fa la, the better to mark out the minor mode.

Besides these chords which we have just mentioned, and which may be regarded as the principal chords of the mode, there are a great many others; for example, the series of dominants,

ut la re sol ut fa mi la si re sol ut

which are terminated equally in the tonic ut, either entirely belong, or at least may be reckoned as belonging (gogo) to the mode of ut; because none of these dominants are tonic dominants, except sol, which is the tonic dominant of the mode of ut; and besides, because the chord of each of these dominants forms no other sounds than such as belong to the scale of ut.

But if I were to form this fundamental bass,

7 7 7 7 b

ut la re sol ut,

considering the last ut as a tonic dominant in this manner ut mi sol fa; the mode would then be changed at the second ut, and we should enter into the mode of fa, because the chord ut mi sol fa indicates the tonic dominant of the mode of fa; besides, it is evident that the mode is changed, because fa b does not belong to the scale of ut.

In the same manner, were I to form this fundamental bass

7 7 6

ut la re sol ut,

considering the last ut as a tonic dominant in this manner, ut mi sol la; this last ut would indicate the mode of sol, of which ut is the sub-dominant.

In like manner, still, if in the first series of dominants, I caused the first re to carry the third major, in this manner re fa la ut; this re having become a tonic dominant, would signify to me the major mode of sol, and the sol which should follow it, carrying the chord re fa, would relapse into the mode of ut, from whence we had departed.

Finally, in the same manner, if in this series of dominants, one should cause fa to carry fa for this manner, fa re fa la, this fa would show that we had departed from the mode ut, to enter into that of sol.

From hence it is easy to form this rule for discovering the changes of mode in the fundamental basses.

1. When we find a tonic in the fundamental bass, a rule for discovering the changes of mode.

2. When we find a sub-dominant, we are in the mode of that tonic; and the mode is major or minor, according as the perfect chord is major or minor.

3. When we find a tonic dominant, we are in the mode of the fifth below that tonic dominant. As the tonic dominant carries always the third major, one cannot be secure by the affiduosity of this dominant alone, whether the mode be major or minor; but it is only necessary for the composer to cast his eye upon the following note, which must be the tonic of the mode in which he is; by the third of this tonic he will discover whether the mode be major or minor.

243. Every change of the mode supposes a cadence; and when the mode changes in the fundamental bass, it is almost always either after the tonic of the mode in which we have been, or after the tonic dominant of that mode, considered then as a tonic by favour of a close which ought necessarily to be found in that place: Whence it happens that cadences in a melody for the most part preface a change of mode which ought to follow them.

244. All these rules, joined with the table of modes which we have given (art. 234.), will serve to discover in what mode we are in the middle of a piece, especially in the most effentiel passages, as cadences (mnmn).

I here subjoin the folioquy of Aranda, with the continued and fundamental basses. The changes of the mode will be easily distinguished in the fundamental basses.

(gogo) I have said, that they may be reckoned as belonging to this mode, for two reasons: 1. Because, properly speaking, there are only three chords which essentially and primitively belong to the mode of ut, viz. ut carrying the perfect chord, fa carrying the sub-dominant, and sol that of the tonic dominant, to which we may join the chord of the seventh, re fa la ut (art. 105.) but we here regard as extended the series of dominants in question, as belonging to the mode of ut, because it preserves in the ear the impression of that mode.

2. In a series of dominants, there are a great many of them which likewise belong to other modes; for instance, the simple dominant fa belongs naturally to the mode of sol, the simple dominant si to that of la, &c. Thus it is only improperly, and by way of extension, as I have already said, that we regard here these dominants as belonging to the mode of ut.

(mnmm) Two modes are so much more intimately relative as they contain a greater number of sounds common to both; for example, the minor mode of ut and the major mode of sol, or the major mode of ut and the minor of
Musical principles of composition.

550 Principles of Composition.

247. When the air is chromatic in ascending, one may form a fundamental bass by a series of tonics and of tonic dominants, which succeed one another alternately by the interval of a third in descending, and of a fourth in ascending. (See LXXXIX.)

248. With respect to the enharmonic, it is very rarely put in practice; and we have explained its formation in the first book, to which we refer our readers. We shall content ourselves with saying, that,

in the beautiful foliloquy of the fourth act of Dardanus, at the words

la re mel &c. "fatal places, &c." we find an example of the enharmonic; an example of the diatonic enharmonic in the trio of the Fatal Sisters, in Hippolitus and Arietta, at the words, Ou couru tu mat爿ements, "Whither, unhappy, dost thou run?" and that there are no examples of the chromatic enharmonic, at least in our French operas.

M. Rameau had imitated an earthquake by this species of music, in the second act of the Gallant Indians; but he informs us, that in 1735 he could not cause it to be executed by the band. The trio of the Fatal Sisters in Hippolitus has never been sung in the opera as it is composed. M. Rameau afferts, (and we have heard it elsewhere by people of taste, before whom the piece was performed), and the trial had succeeded when made by able hands that were not mercenary, and that its effect was astonishing.


249. In music, the name of design, or subject, is generally given to a particular air or melody, which the what composer intends should prevail through the piece; whether it is intended to express the meaning of words to which it may be set, or merely inspired by the impulse of taste and fancy. In this last case, design is distinguished into imitation and fugue.

250. Imitation consists in causing to be repeated the See Imi-melody of one or of several bars in one single part, or tation, in the whole harmony, and in any of the various modes in what, of la: on the contrary, two modes are left intimately relative as the number of sounds which they contain as common to both is smaller; for instance, the major mode of ut and the minor of fi, &c.

When you find yourself led away by the current of the modulation, that is to say, by the manner in which the fundamental bass is constituted, into a mode remote from that in which the piece was begun, you must continue in it but for a short time, because the ear is always impatient to return to the former mode.

(LLL) It is extremely proper to remark, that we have given the fundamental, the continued bass, and in general the modulation of this foliloquy, merely as a lesson in composition extremely suitable to beginners; not that we recommend the foliloquy in itself as a model of expression. Upon this last object what we have said may be seen in what we have written concerning the liberties to be taken in music, Vol. IV. p. 435, of our Literary Miscellany. It is precisely because this foliloquy is a proper lesson for initiates, that it would be a bad one for the mature and ingenious artist. The novice should learn tenaciously to observe his rules; the man of art and genius ought to know on what occasions and in what manner they may be violated when this expedient becomes necessary.

(LLLL) We may likewise give a chromatic melody in descending, a fundamental bass, into which may enter chords of the seventh and of the diminished seventh, which may succeed one another by the intervals of a fall fifth and a fifth redundant: thus in the Example XC, where the continued bass descends chromatically, it may easily be seen that the fundamental bass carries successively the chords of the seventh and of the seventh diminished, and that in this bass there is a fall fifth from re to sol &c, and a fifth redundant from sol &c to ut.

The reason of this licence is, as it appears to us, because the chord of the diminished seventh may be considered as representing (art. 221.) the chord of the tonic dominant; in such a manner that this fundamental bass

\[
\begin{align*}
7 & 7 & 7 & 7 & 7 & 7 \\
la & re & fol & ut & fa & fi & mi & la
\end{align*}
\]

(see Example XCI.) may be considered as representing (art. 116.) that which is written below,

\[
\begin{align*}
7 & 7 & 7 & 7 & 7 & 7 \\
la & re & mi & ut & fa & fi & mi & la
\end{align*}
\]

Now this last fundamental bass is formed according to the common rules, unless that there is a broken ca-
dence from re to mi, and an interrupted cadence from mi to ut, which are license (art. 213 and 214.)
Part II.

Principles of Composition.

• See Air, Canon, Fugue.

293. Principal rules for composing in several parts.

251. Imitation and fugue are sometimes conducted by rules merely deducible from tafte, which may be seen in the 332d and following pages of M. Rameau's Treatise on Harmony; where will likewise be found a detail of the rules for composition in several parts. The chief rules for composition in several parts are, that the discords should be found, as much as possible, prepared and resolved in the same part; that a discord should not be heard at the same time in several parts, because its harshness would disturb the ear; and that in no particular part there should be found two octaves or two fifths in succession (mmm) with respect to the bass. Musicians, however, do not hesitate sometimes to violate this precept, when taste or occasion require. In music, as in all the other fine arts, it is the business of the artist to assign and to observe rules; the province of men who are adorned with taste and genius is to find the exceptions.

Chap. XVI. Definitions of the Different Airs.

252. We shall finish this treatise by giving in a few words the characteristic distinctions of the different airs to which names have been given, as chacon, minuet, rigadoon, &c.

The minuet is a long piece of music, containing three times in each bar, of which the movement is regular, and the bars sensibly distinguished. It consists of several couplets which are varied as much as possible. Formerly the bass of the chacon was a confined bass, or regulated by a rhythmus terminating in 4 bars, and proceeding again by the same number; at present composers of this species no longer confine themselves to that practice. The chacon begins, for the most part, not with the perfect time, which is struck by the hand or foot, but with the imperfect, which passes while the hand or foot is elevated.

The villanelle is a chacon a little more lively, with its movement somewhat more brisk than the ordinary chacon.

The piafaccaille only differs from a chacon as it is more flow, more tender, and beginning for ordinary with a perfect time.

The minuet is an air in triple time, whose movement is regular, and neither extremely brisk nor flow, consisting of two parts or strains, which are each of them repeated; and for which reason they are called by the French reprise: each strain of the minuet begins with a time which is struck, and ought to consist of 4, of 8, or of 12 bars; so that the cadences may be easily distinguished, and recur at the end of each 4 bars.

The farabando is properly a flow minuet; and the courant a very flow farabando: this last is no longer in use. The piafaccaille is properly a very brisk minuet, which does not begin like the common minuet, with a stroke of the foot or hand; but in which each strain begins in the last of the three times of which the bar consists.

The loure is an air whose movement is flow, whose time is marked with \( \frac{4}{4} \), and where two of the times in which the bar consists are beaten; it generally begins with that in which the foot is raised. For ordinary the note in the middle of each time is shortened, and the first note of the same time pointed.

The jig is properly nothing else but a loure very brisk, and whose movement is extremely quick.

The forlana is a moderate movement, and in a mediocrity between the loure and the jig.

The rigadoon has two times in a bar, is composed of two strains, each to be repeated, and each consisting of 4, of 8, or of 12 bars: its movement is lively; each strain begins, not with a stroke of the foot, but at the last note of the second time.

The bourée is almost the same thing with the rigadoon.

The gavotte has two times in each bar, is composed of two strains, each to be repeated, and each consisting of 4, of 8, or of 12 bars: the movement is sometimes flow, sometimes brisk; but never extremely quick, nor very flow.

The tarentella has two times in each bar, is made of two strains, each to be repeated, and each consisting of 4, of 8, or of 12 bars, &c. Two of the times that make up each bar are beaten, and are very lively; and each strain generally begins in the second time.

The musette consists of two or three times in each bar; its movement is neither very quick nor very slow; and for its base it has often no more than a single note, which may be continued through the whole piece.

Appendix.

The treatise of D’Alembert, of which we have given a translation, is well entitled to the merit of accuracy; but perhaps a person who has not particularly studied the subject, may find difficulty in following the scientific deductions of that author. We subjoin, therefore, a few general observations on the philosophy of musical found, commonly called harmonic, which may perhaps convey the full portion of knowledge of the theory of music, with which one in search only of general information, and not a professed student of this particular science, would choose to rest satisfied.

The theory of musical found, which only in the beginning of the present century was ultimately established by mathematical demonstration, is no other than that which distinguished the ancient musical sect who

\( \text{mmm} \) Yet there may be two fifths in succession, provided the parts move in contrary directions, or, in other words, if the progress of one part be ascending, and the other descending; but in this case they are not properly two fifths, they are a fifth and a twelfth; for example, if one of the parts in descending should found fa re, and the other ut la in rising, ut is the fifth of fa, and la the twelfth of re.
Music

Musical Proportions

Pythagoras supposed the air to be the vehicle of sound, and the agitation of that element, occasioned by a similar agitation in the parts of the founting body, to be the cause of it. The vibrations of a string, or other rotund body, being communicated to the air, affected the auditory nerves with the sensation of sound, and this sound, he argued, was acute or grave in proportion as the vibrations were quick or slow.

He discovered by experiment, that of two strings equal in every thing but length, the shorter made the quicker vibrations, and emitted the acuter sound:—in other words, that the number of vibrations made in the same time, by two strings of different lengths, was inversely as those lengths; that is, the greater the length the smaller the number of vibrations in any given time. Thus found, considered in the vibrations that cause it, and the dimensions of the vibrating body, came to be reduced to quantity, and as such was the subject of calculation, and expressible by numbers.

For instance, the two sounds that form an octave could be expressed by the numbers 1 and 2, which would represent either the number of vibrations in a given time, or the length of the strings; and would mean, that the acuter sound vibrates twice, while the graver vibrates once; or that the string producing the lower sound is twice the length of that which gives the higher. If the vibrations were considered, the higher sound was as 2, the lower as 1; the reverse, if the length was allowed to. In the same manner, in the same fene, the 5th would be expressed by the ratio of 2 to 3, and the 4th by that of 3 to 2.

Aristoxenus, in opposition to the calculations of Pythagoras, held the ear to be the sole standard of musical proportions. That sense he accounted sufficiently accurate for musical, though not for mathematical, purposes; and it was in his opinion absurd to aim at an artificial accuracy in gratifying the ear beyond its own power of distinction. He therefore rejected the velocities, vibrations, and proportions of Pythagoras as foreign to the subject, so far as they subtitled artificial cause in the room of experience, and made music the object of intellect rather than of sense.

Music

Musical Proportions


MUSIMON, in natural history, the name of an animal esteemed a species of sheep, described by the ancients as common in Corfica, Sardinia, Barbary, and the north-east parts of Asia. It has been doubted whether the animal described under this name is now anywhere to be found in the world; and whether it was not, probably, a furred breed between two animals of different species, perhaps the sheep and goat.

Music

Musical Proportions

Of late, however, as has been already mentioned, the opinions of Pythagoras have been confirmed by absolute demonstration; and the following propositions, in relation to musical sound, have passed from conjecture to certainty.

Sound is generated by the vibrations of elastic bodies, which communicate the like vibrations to the air; and these again to our organs of hearing. This is evident, because sounding bodies communicate tremors to other bodies at a distance from them. The vibrating motion, for instance, of a musical string, excites motion in others, whose tension and quantity of matter displace their vibrations to keep time with the undulations of air propagated from it (the string first in motion.)

If the vibrations be isochronous, and the found musical, continuing at the same pitch, it is said to be acuter, sharper, or higher, than any other found whose vibrations are slower; and graver, flatter, or lower, than any other whose vibrations are quicker.

For while a musical string vibrates, its vibrations become quicker by increasing its tension or diminishing its length; its found at the same time will be more acuter: and, on the contrary, by diminishing its tension or increasing its length, the vibrations will become slower and the found graver.

The like alteration of the pitch of the sound will follow, by applying, by means of a weight, an equal degree of tension to a thicker or heavier and to a smaller or lighter string, both of the same length, as in the smaller string the mass of matter to be moved by the same force is less.

If several strings, however, different in length, density, and tension, vibrate altogether in equal times, their sounds will have all one and the same pitch, however they may differ in loudness or other quality. They are called unisons. The vibrations of unisons are isochronous.

The vibrations of a musical string, whether wider or narrower, are nearly isochronous. Otherwise, while the vibrations decrease in breadth till they cease, the pitch of the sound could not continue the same (which we perceive by experience it does), unless where the first vibrations are made very violently; in which case, the sound is a little acuter at the beginning than afterwards.

Lastly, the word vibration is understood to mean the time which passes between the departure of the vibrating body from any assigned place and its return to the same.

Music

Musical Proportions


MUSIMON, in natural history, the name of an animal esteemed a species of sheep, described by the ancients as common in Corfica, Sardinia, Barbary, and the north-east parts of Asia. It has been doubted whether the animal described under this name is now anywhere to be found in the world; and whether it was not, probably, a furred breed between two animals of different species, perhaps the sheep and goat.
MUSIC.

Plate CCCXXXII.

The diatonic scale of the Greeks.

\[ S_i \ U_t \ R_e \ M_i \ F_a \ S_o_l \ L_a \ S_i \ U_t \]

The fundamental basis.

The first scale of the minor mode.

\[ S_o_l \ L_a \ S_i \ U_t \ R_e \ M_i \ F_a \]

The fundamental basis.

The second scale of the minor mode.

\[ L_a \ S_i \ U_t \ R_e \ M_i \ M_i \ F_a \ S_o_l \ L_a \]

The fundamental basis.

The fundamental basis.

The fundamental basis.

The fundamental basis.
MUSIC

with two Times

Semibreve Minims Crotchets Quavers Pointed Note

Bar 1st B.2d B.3d B.4th B.5th

Bar 1st 2d 3d 4th 5th 5th 7th

Treble Part

to descend to descend or rise
by thirds by 5ths or 4ths
Cromatic modulation descending. Cromatic modulation ascending.

T.B. T.B. The treble

F.B. F.B. Fund. B.

Treble

Th B.

Fund. B.

Th B.

Fund. B.

Th B.

Fund. B.

Fund. B.
En fin, il est en ma puissance, ce fatal ennemi. Ce superbe vainqueur, le charme du sommeil le livre à ma vengeance. Je vais percer fon in visible cœur. Par lui, tous mes captifs sont fortis d'éclat.
MUSIC

Budget: Qu'il éprouve toute ma rage Quel trouble me fait-il Qui me fait héri-

Th.B.

F.B.

...
MUSIC

Th.B.

F.B.

Th.B.

F.B.

Th.B.

F.B.

dois me venger anjour d'huy! Ma col. le reste teint Quand j'aproche de luy.

Plus je le vois! plus ma vengeance est vaine; Mon bras tremblant te re-

fume a ma haine! Ah! quelle graue te de luy ra vir le jour! A ce jeune He
MUSIC

ros, tout ce de sur la terre: Qui croiroit quil fut ne feulement pour la guerre,

Th.B.

femelle etre fait pour l'Amour Ne puis je me venger a moins qu'il ne pe

Th.B.

riFFE. He ne suffi-til pas que l'Amour le pu nissfe. Puisqu'il n'a pu trou

Th.B.

F.B.
Translation. Intended to give such Readers as do not understand French, an idea of the Song.

At length the victim in my power I see,
This fatal year resigns him to my rage;
Subdued by sleep he lies, and leaves me free,
With chastening hand my fury to assuage.
That mighty heart invincible and fierce,
Which all my captives free'd from servile chains;
My rage inventive wanton in his pains.
Ha! in my soul what perturbation reigns!
What? would compassion in his favour plead?
Strike, hand. O heaven! what charm thy force restrains?
Obey my wrath. I sigh; yet let it bleed.
And is it thus my just revenge improves
The fair occasion to cajole my foe?
As I approach, a softer passion moves,
And all my boating fury melts in wo.
Trembling, relax'd, and faithless to my hate,
The dreadful task this coward arm declines.

How cruel thus to urge his infant fate,
Depriv'd of life amid his great designs!
In youth how blooming! what a heavenly grace,
Thro' all his form, refittles power displays!
How sweet the smile that dwells upon his face,
Relentless rage disarming whilst I gaze!
Thou' to the prowes of his conquering arms
Earth stood with all her hosts oppos'd in vain;
Yet is he form'd to spread more mild alarms,
And bind all nature in a softer chain.
Can then his blood, his precious blood alone
Extinguish all the vengeance in my heart?
Thou' till surviving, might he not atone.
For all the wrongs, I feel, by gentler smart?
Since all my charms, unfeeling, he defies,
Let Magic force his stubborn soul subdue;
Whilst I, inflexible to tears and sighs,
With hate (if I can hate) his peace pursue.
and so capacious, that young foxes often shelter themselves in the hollow of such as by accident fall off in the defects. See Ovis.

MUSIS (Agostino de), a noted engraver, better known by the name of Agostina Venetina, or in England by that of "Augustin the Venetian," but Mu-

fis was his proper family name. He was a native of Venice, and scholar of Marc Antonio Raimondi. It is not certain at what period he began his studies under

different masters, but the first dated print by Agostino appeared A. D. 1509, at which time, it is probable, his tutor still resided at Venice. After the death of Raphael, which happened in 1520, Agostino de Musis, and Marc de Ravenna, his fellow-
disciple, who had conjointly assisted each other, separated, and worked entirely upon their own account. It is uncertain at what time Agostino died; but his prints are not dated later than 1536. So that it may be reasonably supposed that he did not long survive that period. Agostino de Musis imitated the style of his master with great attention, and was, upon the whole, the most successful of all his scholars. In me-
nanical and mechanical execution with the graver, he has often excelled if not sometimes excelled him; but in point of taste, and in the purity and correctness of outline, he certainly fell greatly short of him. Ago-
sino's drawing had more of manner and stiffness; the heads of his figures are not so accurately marked; nor the other extremities expressed with equal truth.

MUSIVUM AURUM. See CHEMISTRY, n° 1224.

MUSK, a very strong-scented substance found under the belly of an East Indian animal. See MOSCHUS.

According to Tavernier, the best and greatest quantities of musk come from the kingdom of Bontan, from whence it is carried for sale to Patna, the chief town of Bengal. After killing the animal, the peafants cut off the bag, which is about the size of an egg, and is situated nearer the organs of generation than the navel. They next take out the musk, which has then the appearance of clotted blood. When they want to adulterate it, they put a mufh of the animal's blood and liver into the place of the musk they had extracted. In two or three years this mixture produces certain small animals which eat the good musk; so that, when opened, a great consumption is perceived. Others, after extracting a portion of the musk, put in small pieces of lead to augmen-
t the weight. The merchants who transport the musk to foreign countries are less averse to this trick than the farmers; because in this case none of the animals above-mentioned are produced. But the deceit is full worse to discover, when, on the skin taken from the belly of a young animal, they make little bags, which they few fo dexterously with threads of the same skin, that they resemble genuine bags. Those they fill with what they take out of the genuine bags, and some fraudulent mixture, which is extremely difficult for the merchants to detect. When the bags are sewed immediately on their being cut, without allowing any part of the odour to diSipate in the air, after they have abstracted as much of the musk as they think proper, if a person applies one of these bags to his nose, blood will be drawn by the mere force of the odour, which musk necessarily be weakened or diluted in order to render it agreeable without injuring the brain. Our author brought one of the animals with him to Paris, the odour of which was so strong, that it was impossible for him to keep it in his chamber. It made every head in the house giddy; and he was obliged to put it in a barn, where the servants at last cut away the bag: the skin, notwithstanding, always retained a portion of the odour. The largest musk-

bag seldom exceeds the size of a hen's egg, and cannot furnish above half an ounce of musk; three or four of them are sometimes necessary to afford a single ounce. In one of his voyages to Patna, Tavernier purchased 1663 bags, which weighed 1557 ounces and a half; and the musk, when taken out of the bags, weighed 452 ounces.

Musk affords the strongest of all known odours. A small bit of it perfumes a large quantity of matter. The odour of a small particle extends through a confider-

dable space. It is likewise so fixed and permanent, that at the end of several years it seems to have lost no part of its activity. When it comes to us, it is dry, with a kind of unctuousness, of a dark reddish brown or rusty blackish colour, in small round grains, with very few hard black cots, and perfectly free from any sandy or other visible foreign matter. If chewed, and rubbed with a knife on paper, it looks smooth, bright, yellowish, and free from bitterness. Laid on a red hot iron, it catches flame, and burns almost entirely away, leaving only an exceeding small quantity of light greyish ashes: if any earthly substances have been mixed with the musk, the quantity of the residuum will readily discover them.

Musk has a bitterish subacid taste; a fragrant smell, agreeable at a distance, but when smelt near to, so strong as to be disagreeable unless weakened by the admixture of other substances. If a small quantity be infused in spirit of wine in the cold for a few days, it imparts a deep, but not red tincture; this, though it discovers no great smell of the musk, is nevertheless strongly impregnated with its virtues; a single drop of it communicates to a whole quart of wine a rich musky flavour. The degree of flavour which a tincture drawn from a known quantity of musk communicates to vinous liquors, is perhaps one of the best criteria for judging the goodness of this commodity. Neumann informs us, that spirit of wine dissolves 10 parts out of 30 of musk, and that water takes up 12; that water elevates its smell in distillation, whilst pure spirit brings over nothing.

Musk is a medicine of great esteem in the eastern countries; among us, it has been for some time pretty much out of use, even as a perfume, on a supposition of its occaSioning vapours, &c. In weak females and persons of a sialent life, it appears, however, from late experience, to be, when properly managed, a remedy of good service even against those disorders which it has been fuppofed to produce. Dr Wall has communicated (in the Philosopb. Tranf. n° 474,) an account of some extraordinary effects of musk in convulsive and other diseases, which have too often baffled the force of medicine. The doctor observes, that the smell of perfumes is often of different, where the substance, taken inwardly and in considerable quantity produces the happiest effects; that two persons, labouring under a fubflitus tendicos, extreme anxiety, and wants of sleep, from the bite of a mad dog,
dog, by taking two doses of musk, each of which was 16 grains, were perfectly relieved from their complaints. He likewise observes, that convulsive hiccups, attended with the worst symptoms, were removed by about one or two of 10 grains, and that in some cases, where this medicine could not, on account of strong convulsions, be administered to the patient by the mouth, it proved of service when injected as a glibter. He likewise adds, that under the quantity of six grains, he never found much effect from it; but that, taken to 10 grains and upwards, it never fails to produce a mild diaphoreis, without all heating or giving any uneasiness: that, on the contrary, it eases pain, rafties the spirits; and that, after the sweat breaks out, the patient usually falls into a refreshing sleep: that he never met with any hysterical person, how averse foever to perfumes, but could take it, in the form of a bolus, without inconvenience. To this paper is annexed an account of some farther extraordinary effects of musk, observed by another gentleman. Repeated experience has since confirmed its efficacy in these disorders. The dose has sometimes been increased, particularly in convulsive disorders, to the quantity of half a dram every three or four hours, with two or three spoonfuls of musk julep between. The julep is the only official preparation of it. It is combined with opium in tetanus, and with mercury in rabies canina.

Musk-Animal. See Moschus.
Musk-Ox. See Bos.
Musk-Rat, in zoology. See Castor.

MUSKET, or MUSQUET, properly a fire-arms borne on the shoulder, and used in war; to be fired by the application of a lighted match.

The length of the barrel is fixed to three feet eight inches from the muzzle to the touch-pan, and its bore is to be such as may receive a bullet of 14 in a pound, and its diameter differs not above one 50th part from that of the bullet.

Muskets were anciently borne in the field by the infantry; and were used in England so lately as the beginning of the civil wars. At present they are little used except in the defence of places, fences or firelocks having taken their place and name.

MUSKETOON, a kind of short thick musket, whose bore is the 38th part of its length: it carries five ounces of iron, or seven and a half of lead, with an equal quantity of powder. This is the stoutest kind of blunderbusses.

MUSLIN, a fine sort of cotton cloth, which bears a downy knot on its surface. There are several sorts of muslins brought from the East Indies, and more particularly from Bengal: such as doreas, betelles, malmuls, tanjebes, &c. Muslin is now manufactured in Britain, and brought to very great perfection.

MUSONIUS, (Caius Ricius), a Stoic philosopher of the second century, was banished into the island of Cyzic, under the reign of Nero, for criticizing the manners of that prince; but was recalled by the emperor Vespasian. He was the friend of Apollonius Tyaneus, and the letters that passed between them are still extant.

MUSQUETO. See Culex.

MUSULMAN, or MUSULMAN, a title by which the Mahometans distinguish themselves; signifying, in the Turkish language, “true believer, or orthodox.” Musulman See Mahometan.

In Arabic, the word is written Moslem, Moslem, or Mosliman. The appellation was first given to the Saracens, as is observed by Leunclavius. There are two kinds of Mahometans, very averse to each other; the one called Sonnites, and the other Shiites. The Sonnites follow the interpretation of the Alcoran given by Omar; the Shiites are the followers of Ali. The subjects of the king of Persia are Shiites; and those of the grand signior, Sonnites. See Sonna, and Alcoran.

Some authors will have it, that the word Musulman signifies fared, that is, predestinated; and that the Mahometans give themselves the appellation, as believing they are all predestinated to salvation—Martinius is more particular as to the origin of the name; which he derives from the Arabic χρος, μουλαμ, “faved, snatched out of danger”: the Mahometans, he observes, establishing their religion by fire and sword, massacred all those who would not embrace it, and granted life to all that did, calling them Moul­stan, q. d. erpeti & periculo: whence the word, in course of time, became the distinguishing title of all those of that sect, who have affixed to it the signification of true believers.

MUST, Mustum, sweet wine newly pressed from the grape; or the new liquor pressed from the fruit before it has worked or fermented. See Wine.

MUST of Rhenish wine. This is a liquor that, tho' drank by some, is found extremely to affect the brain; for not having passed the natural effervescence which it would have been subject to, in the making of wine, itsarts are locked up till the heat of the stomach setting them to work, they raise their effervescence there, and send up abundance of subtle vapours to the brain. The Rhenish must is of two kinds, being made either with or without boiling. That made without boiling is only put up so close in the vessel that it cannot work; this is called jumna-wine. The other boiling is thus prepared: they take strong vessels not quite filled, and putting them into a cellar, they make a fire mild at first, but increased by degrees, and afterwards they gradually leffen it again, that the boiling may cease of itself. This operation is finished in 36 or 40 hours, according to the size of the vessel; and the wine-boilers, instead of common candles, which would melt by the heat, use thin pieces of split beech-wood. These also serve for a double purpose; not only lighting them, but giving them notice of the boiling being enough; before that time, the quantity of vapours thrown up make them burn dim; but as soon as it is finifhed, the vapours ascend in less quantity, and the lights burn brisk and clear. About seven or eight days after this boiling, the must begins to work, and after this working it is called wine. They have also another kind of Rhenish must which is thus prepared: they boil the liquor to half the quantity, and put into it the medicinal ingredients they are most fond of; such as orange-peel, elecampane-root, and Juniper berries, or the like; being thus medicated, the whole works much more slowly than it otherwise would.

If the boiled must, by too violent an effervescence, cast out its lees, it will on this become rapid and dead, unless this separation is stopped by some fatty sub­stance,
MUS

MUSTARD. See SNAPE.

MUSTARD-Seed, is one of the strongest of the pungent, stimulans, diuretic medicines, that operate without exciting much heat. It is sometimes, taken unbruised, to the quantity of a spoonful at a time, in paralytic, cachectic, and febils, disorders. It is applied also as an external stimulant, to benumbed and paralytic limbs; to parts affected with fixed rheumatic pains; and to the soles of the feet, in the low rate of acute diseases, for raising the pulse; in this intention, a mixture of equal parts of the powdered seeds and crumbles of bread, with the addition of a little bruised garlic, are made into a cataplasm with a sufficient quantity of vinegar. See SNAPE.

MUSTARD-feed yields upon expression, a considerable quantity of oil, which is by some recommended externally against rheumatisms and pulleys, though it has nothing of that quality by which the seeds themselves prove useful in those disorders; the oil being mild and insipid as that of olives, and the pungency of the seed remaining entire in the cake left after expression; nor is any considerable part of the pungent matter extracted by redified spirit. The bruised seeds give out readily to water nearly the whole of their active matter; added to boiling milk they curdle it, and communicate their pungency to the whey. The powder of mustard-feed may be made into the conquest of a loch with warm water, in which a little sea salt has been dissolved. Of this a common-spoonful, sometimes two, diluted with tepid water, are given on an empty stomach; it operates as well as an emetic, and proves an excellent remedy in most nervous disorders, according to Dr Monro, in Med. Eff. Edinb. vol. ii. art. 19. p. 303. note.

MUSTELA, the OTTER and WEESEL; a genus of quadrupeds of the order of fere. There are six cutting teeth in each jaw; those of the upper jaw, crest, sharp-pointed, and distinct: of the lower jaw, blunter, huddled together, and two placed within the line of the reil: The tongue is smooth.

Plate eccxan.

1. The lutris, or sea-otter, having hairy feet and a hairy tail. The length from nose to tail is about three feet long, and the tail is about 13 inches; the body and the limbs are black, except the fore-part of the head, which is white or grey; the largest individual weighs from 70 to 80 pounds; the fur is very thick, long, black, and glossy, sometimes varying to silvery, with a soft down beneath. The sea-otter inhabits the coasts of North-west America and Eastern Asia, and the intermediate islands. It lives mostly in the sea, and swims with great facility: frequenting shallows which abound in sea-weeds, and feeding on lobsters, fish, jetie or cuttle-fish, and shell-fish. It is a harmless animal; very affectionate to its young, infomuch that it will pine to death at the loss of them, and die on the very spot where they have been taken from it.

Before the young can swim, the dams carry them in their paws, lying in the water on their backs; they swim often on their back, their sides, and even in a perpendicular posture; are very sportive; embrace, and kiss each other; they breed but once a year, and have but one young at a time, suckle it for a year, and bring it on shore. They are dull-fighted, but quick-scented; and run very swiftly on land. They are hunted for their skins, which are of great value; being sold to the Chinese for 70 to 80 rubles a-piece; each skin weighs 3/4 lib. The young are reckoned very delicate meat, scarce to be distinguished from a sucking lamb. The cry of this creature is nearly similar to a young dog; and it is sometimes interrupted by another cry similar to that of the fisk or fox-tailed monkey. It may be nourished with the flour of manioc diluted in water.

2. The lutra, or common otter, has naked feet, and the tail is about half the length of the body. It is in general about two and a half feet long, from the top of the nose to the base of the tail. The fur is of a deep brown colour, with two small white spots on each side of the nose, and one beneath the chin. This animal inhabits Europe, North America, and Asia as far south as Peridia. It frequents fresh water rivers, lakes, and fish-ponds; and preys on fish, frogs, and fresh-water crustaceous animals, being exceedingly destructive to fish-ponds. The otter procreates in February, and the female brings forth three or four young ones in May: the male calls the female by a soft musing noise. The otter shows great sagacity in forming its habitation; it burrows under ground on the banks of some river or lake: it always makes the entrance of its hole under water; working upwards to the surface of the earth and forming, before it reaches the top, several holes or lodges, that in case of high floods, it may have a retreat; for no animal affects lying drier at top: it makes a minute orifice for the admission of air. It is further observed, that this animal, the more effectually to conceal its retreat, contrives to make even this little air-hole in the middle of some thick bulk. Our author also informs us, that, the otter is capable of being tamed; that he will follow his master like a dog and even fish for him, and return with his prey. Though the otter does not caft his hair, his skin is browner, and sells dearer in winter than in summer; and makes a very fine fur. His flesh has a disagreeable sly taste. His retreats exhal a noxious odour from the remains of putrid fishes: and his own body has a bad smell. The dogs chase the otter spontaneously, and easily apprehend him when at a distance from water or from his hole. But, when feized, he defends himself, bites the dogs most cruelly, and sometimes with such force as to break their legs bones, and never quits his hold but with life. The beaver, however, who is not a very strong animal, pursues the otters, and will not allow them to live on the same banks with himself.

3. The lutreola, or small otter, has very broad hairy feet, and a white mouth: and seldom exceeds a foot in length. The body is of a tawny and dusky colour mixed together; the fur having two series of hairs, the shorter of which are yellowish and the long black. This animal inhabits Poland, Finland, Russia, and Siberia; frequenting marshy places, and preying on
MUS [ 556 ]

Muller.

It is caught with dogs and traps, and is exceedingly fomid; but its fur is very valuable, being esteemed next in beauty to that of the fable.

4. The canadenfis, or Canadian otter, is of a black colour, and the fur is smooth. It has a long taper tail, and inhabits Canada and other parts of North America.

5. The guianaenfis, or small Guiana otter, with the hind-feet webbed, the toes of the fore-feet unconnected, and a long taper naked tail inhabits Cayenne, and probably other parts of South America. It is only about seven inches long from the nose to the rump; the tail is near seven; the upper parts of the head and body are marked with large brownish black spots, exacly correponding on both fides, and the intervals are of a yellowy grey colour; all the under parts of the body and head, and the fore-parts of the fore-legs are white, and there is a white spot over each eye: the ears are large and round; and the mouth is garnished with long whifkers. Buffon informs us that there are three species of otters common in Cayenne.

6. The zibellina, or fable, has a great refemblance to the martins, from which it differs in having a longer head; longer ears, surrounded by a yellow margin: longer and more elegant fur; the feet more thickly clothed with hair; and the tail shorter than the hind-legs when extended, while that of the martins is much longer. The colour of the hair is cincrus on the bottom, and black at the tips; the chin is cincrus, sometimes white, yellowish, or spotted; the mouth is garnished with long whifkers; and the feet are large, with white claws. It inhabits the northern parts of Asia.
Kmile iflands, and formerly in Mullclla. Alia and commonly of a yellowifh colour; the male is whitifh with white fon in the fpring; and bring forth three, four, or five times they will form neifs in the trees, and skip with great agility from one to the other: they are very lively, and much in motion during the night. Gme- 
lin tells us, that after eating, they generally sleep half an hour or an hour, when they may be pulhed, flaken, and even pricked, without awaking. During the night they are excelfively active and reflelts. A tame one kept by Gmelin was acclutoned to rise up on its hind-legs on sight of a cat, in order to prepare for the combat: in the woods they are much infefled by wild cats. During summer the fables prey on eraines, weafels, and squifforels, but efpecially on hares; in winter, on birds; in autumn, on whortleberries, cranberries, and the berries of the service-tree; but during this laft feafon their skins are at the world; that diet caufing their skins to itch, and to rub off their fur againift the trees. They bring forth at the end of March or beginning of April; and have from three to five at a time, which they fuckle for four or five weeks. In spring, after shedding the coat, the male goes six weeks with young. Some of them de- 
vour their young as soon as they are brought forth, inftantly come again in feafon, and have three litters, which generally confift of five or six, and oftentimes of seven, eight, or nine. They are employed for hunting rabbits; and as in this country they are apt to degenerate, Warreners are in use to crofs the breed, procuring an intercoufe between a female ferret and a male pole, by leaving the former, when in feafon, near the haunts of the latter: The produce is of a much darker colour than the ferret, having a great remlenfence to the pole-cat. This animal is by nature a mortal enemy to the rabbit. Whenever a dead rab- 
bbit is for the firft time prefented to a young ferret, he flies upon it, and bites it with fury; but if it be alive, he eifizes it by the throat or the nofe, and fucks its blood. When let into the burrows of rabbits, he is muzzled, that he may not kill them in their holes, but only oblige them to come out, in order to be caught in the nets. If the ferret is left in without a mufle, he is in danger of being loft: for, after fuck- 
ing the blood of the rabbit, he fallsaffe; and even fmoaking the hole is not acertain method of recalling him; because the holes have often feveral entries which communicate with each other, and the ferret retires into one of thoile when incommended with the fhock. Boys likewife ufe the ferret for catching birds in the holes of walls, or of old trees. The ferret, though eafily tamed, and rendered docile, is extremely infedible; his odour is always difagreeable; but when he is irritat- 
ed, it becomes much more offenfeive. His eyes are lively, and his aspet is inflammatory; all his move- ments are nimble; and he is at the fame time fo vi- 
gorous, that he can eafily matter a rabbit, though at least four times larger than himfelf.

7. The putorous, or pole-cat, is of a dirty yellow colour, with white muzzle and ears. He inhabits moft parts of Europe, and in the temperate climates of Afticca Ruflia; and has a great remlenfence to the martifn in temperament, mufles, diftribution, and figure. Like the latter, he approaches our habitations, mounts on the roofs, takes up his abode in hay-lofts, barns, and unfrequened places, from which he ifues during the night only in queft of prey. He burrows under ground, forming a fhallow retreat about two yards in length, generally terminating under the roots of some large tree. He makes greater havoc among the poultry than the martifn, cuttng of the head of all the fowls, and then carrying them off one by one to his magazine. If, as frequently happens, he cannot carry them off entire, on account of the finallifes of the entry to his hole, he eats the brains, and takes only the hands along with him. He is likewise very fond of honey, attacks the hives in winter, and forces the bees to abandon them. The females come in feafon in the fpring; and bring forth three, four, or five at a time. In the defarts of Afticca Ruflia, pole-cats are efpecially found, efpecially in winter, of a white colour; they are likewife found beyond lake Baikali with white or yellowifh rumps, boned with black. It is exceedingly fetid, like feveral other efpecies of this genus, efpecially the martifn and fable, giving out from the anus a moft offenfive vapour when frightenfed. The male is moftly of a yellowifh tinge, having a whitifh muzzle, while the muzzle of the female is commonly of a yellowifh dirty white.

8. The fryo, or ferret, has red and fiery eyes; the colour of the whole body is of a very pale yellow; the length from nose to tail is about 14 inches, the tail five. In its wild state it inhabits Africa; from thence it was brought into Spain, in order to free that country from multitudes of rabbits with which it was overrun; and from Spain the rest of Europe has been supplied. This creature is incapable of bearing the cold, and cannot subsift even in France unless in a do- 
matic state. The ferret is not in our climates endow- ed with the fame capacity of finding his subfistence as other wild animals, but must be carefully nourifhed within doors, and cannot effit in the fields; for those who are lost in the burrows of rabbits never multiply, but probably perish during the winter. Like other domellic animals, it varies in colour. The female ferret is lefs than the male; and when in feafon, we are affured, he is fo extremely ardent, that the dies if her defires are not gratified. Ferrets are brought up in caids or boxes, where they are furnished with beds of hemp or flax. They sleep almoft continually. Whenever they awake they search eagerly for food; and bran, bread, milk, &c. are commonly given them. They produce twice every year; and the female goes fix weeks with young. Some of them de- vour their young as soon as they are brought forth, in- 
stantly come again in feafon, and have three litters, which generally confift of five or six, and oftentimes of seven, eight, or nine. They are employed for hunting rabbits; and as in this country they are apt to degenerate, Warreners are in use to crofs the breed, procuring an intercoufe between a female ferret and a male pole, by leaving the former, when in feafon, near the haunts of the latter: The produce is of a much darker colour than the ferret, having a great remlenfence to the pole-cat. This animal is by nature a mortal enemy to the rabbit. Whenever a dead rab- 
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gorous, that he can eafily matter a rabbit, though at least four times larger than himfelf.

9. The carmatica, or Sarmatian weafel, is of a brownifh black colour, spotted and striped irregularly with obscure yellow, and is about 14 inches in length, exclusive of the tail, which is five inches in length. It resembles the pole cat, but has a narrower head, a more lengthened body, a long tail, and shorter hair, except on the feet and tail; inhabits Polanad, efpecially Vol- 
ynia, in the deferts of Ruflia between the Volga and Tanais, the mountains of Caucaflus, Georgia, and Bu- 
charia,
The Mus cardia. This is a most voracious animal, which feeds on marmots, rats, mice, jerboas, birds, and other small animals. It procreates in spring, and after eight weeks the female which has eight teats, brings forth from four to eight young ones. It lives in holes, sometimes of its own burrowing, but mostly in those which have been made by other animals, and is exceedingly fecund.

The vulgaris, or common weasel,found, or M. Buffon informs us, that a peasant in one of the provinces of Barbary, in the more northern parts of Russia and Sweden, particularly in Westphalia, it becomes white in winter like the ermine; but even in this state it is easily distinguishable from the latter, being a great deal smaller. The body and head not exceeding seven inches long, and the tail two inches and a half. It is very destructive to young birds, poultry, and young rabbits; and is besides a great devourer of eggs. It does not eat its prey on the place; but after killing it by one bite near the head, carries it off to its young, or to its retreat. It preys also on moles, as appears by its being sometimes caught in mole-traps.

This species is much more domestic than any of the rest, and frequents out-houses, barns, and granaries. It clears its haunts in a short time from mice and rats, being a much greater enemy to them than the cat itself. In summer, however, they retire farther from houses, especially into low grounds, about mills, along rivulets, concealing themselves among brushe wood, in order to surprise birds; and often take up their abode in old willows, where the female brings forth her young. She prepares for them a bed of straw, leaves, and other herbage, and litters in the spring, bringing from six to eight or more at a time. The young are born blind; but soon acquire sight and strength sufficient to follow their mothers. Their motion consists of unequal and precipitate leaps; and when they want to mount a tree, they make a sudden bound, by which they are at once elevated several feet high. They leap in the same manner when they attempt to seize a bird. These creatures, as well as the polecat and ferret, have a disagreeable odour, which is stronger in summer than in winter; and when purged or irritated, their smell is felt at a considerable distance. They move always with caution and silence, and never cry but when they are hurt. Their cry is sharp, rough, and very expressive of resentment. As their own odour is offensive, they seem not to be sensible of a bad smell in other bodies. M. Buffon informs us, that a peasant in his neighborhood took three new-littered weasels out of the carcase of a wolf that had been hung up on a tree by the hind-feet. The wolf was almost entirely putrid, and the female weasel had made a nest of leaves and herbage for her young in the thorax of this putrid carcase. The weasel may be perfectly tamed, and rendered as carefree and frolicksome as a dog or squirrel. The method of taming them is to stroke them often and gently over the back; and to threaten, and even to beat them when they bite. In the domestic state their odour is never offensive but when irritated. They are fed with milk, boiled flesh, and water.

The erminea, or ermine, has the tail tip with black, and has been distinguished by authors into two varieties, the float and the white ermine, though the difference seems chiefly to depend on climate and the season of the year; the float of a pale tawny brown or reddish yellow colour in summer, becoming the white ermine of winter in cold countries. They inhabit the north of Europe, Asia, and America, and as far as the northern parts of Peru and China; living in heaps of stones on the banks of rivers, in the hollows of trees, and particularly in forests, especially those of beech, preying on squirrels and lêmings. In manners and food this animal resembles the common weasel, but does not frequent houses, haunting chiefly in woods and hedges, especially such as border on brooks or rivulets. In general appearance it comes very near to the martin, but is shorter in the body, being scarcely ten inches long from nose to rump, and the tail about five and a half; the hair is likewise shorter and less fibbing than in that animal. In the northern regions, the fur of the ermine becomes entirely white during winter, except the outer half of the tail, which remains black. The skin is reckoned valuable, and sells in Siberia from two to three pounds Sterling a hundred; but in ancient times it was in much greater request than now. In summer, the upper part of the body is of a pale tawny brown colour; the edges of the ears, and ends of the toes, are yellowish white; the throat, breast, and belly are white; in winter in the more temperate regions, it is sometimes mottled with brown and white; but in more severe winters becomes entirely white; the farther north and the more rigorous the climate, the white is the purer; those of Britain generally retain a yellowish tinge. In Peru and other more southern parts, it is brown the whole year. In Siberia they burrow in the fields, and are taken in traps baited with flesh. In Norway they are either shot with blunt arrows, or taken in traps made of two flat stones, one being propped up with a stick, to which is fastened a baited string, which when the animals nibble, the stone falls down and crushes them to death. The Laplanders take them in the same manner, only instead of stones make use of two logs of wood.

There are about 12 other species of the weasel tribe described by authors.—A beautiful species of weasel, as it is called by some authors and universally considered by the Arabs, is described by Mr. Bruce in his appendix under the name of Edeenne. It is about ten inches long from the snout to the tail; the tail near five inches and a quarter, and about half an inch of it black at the tip. From the point of the fore-shouder to the point of the fore-toe it is two inches and seven eighths; from the occiput to the point of the nose, two inches and a half; and the ears are three inches and three eights in length; and about an inch and a half in breadth, with the cavities very large. They are doubled and have a plait on the outside; the border of the inside is thick and covered with white soft hair, the middle part being bare and of a rose or pink colour. The pupil of the eye


**MUS**

Eye is large and black, surrounded with a deep blue iris; the mustachios are thick and strong; the tip of the nose is very sharp, black, and polished. There are four grinders on each side of the mouth, six fore-teeth in each jaw, and the upper jaw projected beyond the lower one. The canine teeth are large, long, and very sharp pointed; the legs small and the feet broad, with four toes armed with short, black, sharp retractile claws; those on the fore-feet being sharper than those behind. The whole body of the animal is of a dirty white, approaching to cream-colour; the hair of the belly rather whiter, longer, and softer than the rest, with a number of paps upon it.

Mr Bruce obtained one of these animals for two sequins, by means of a janifary, who had it from a Turkish foot-soldier just returned from Biscara, a southern district of Mauritania Cafenariensis, now called the Province of Contflantia. According to his account, they are not uncommon in this district, though more frequently to be met with in the neighbouring date-territories of Beni Mezab and Werglab, the residence of the ancient Melano-Gestuli. In the Werglab the animals are hunted for their skins, which are sold at Mecca, and afterwards exported to India. Mr Bruce kept this one for several months at his country-house near Algiers, that he might learn its manners. Its favourite food he tells us was dates or other sweet fruit, yet it is also very fond of eggs. It devoured those of pigeons and small birds with great avidity when first brought to him; but did not seem to know how to manage hen's eggs, though when they were broken to him he ate the contents with as great avidity as the others. When hungry, he would eat bread, especially with honey or sugar. His attention was greatly engrossed by the sight of any bird flying across the room where he was, or confined in a cage near him, and could not be diverted from viewing it by placing biscuit before him; so that it seems probable, that he preys upon them in his wild state. He was extremely impatient of having his ears touched; so that it was with much difficulty that they could be measured; and, on account of this impatience, it was found impossible to count the protuberances or paps on his belly. He seemed very much frightened at the sight of a cat; and endeavoured to hide himself, though he did not appear to meditate any defence. On this occasion also he lowered his ears, which at other times he kept erect. Notwithstanding his impatience, he would suffer himself, though with difficulty, to be handled in the day-time; but in the night he was extremely refractory, always endeavouring to make his escape; and though he did not attempt the wire, yet with his sharp teeth he would soon have made his way through a wooden one, as two others which they attempted to bring along with him actually did. These animals are very swift of foot. They build their nests in trees, particularly the palms, of which they eat the fruit; feeding also on locusts and other insects, and perhaps sometimes preying upon small birds. Mr Bruce has a long criticism on Dr Sparmann for pretending that one Mr Brander was the discoverer of this animal, whereas he says that he himself gave it to Mr Brander. This is the same animal with that

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**MUT**

Plate CXX. Its exact place in the zoological system has not yet been ascertained.

**MUSTER,** in a military sense, a review of troops under arms, to see if they be complete and in good order; to take an account of their numbers, the condition they are in, viewing their arms and accoutrements, &c.

**Muster-Muster-general, or Commiffary-general of the Musters**; one who takes account of every regiment, their number, horses, arms, &c. reviews them, sees the horses be well mounted, and all the men well armed and accoutred, &c.

**Muster-Rolls,** lists of soldiers in each company, troop, or regiment, by which they are paid, and the strength of the army is known.

**Mutability** is opposed to immutability. See **Immutability.**

**Mutation,** the act of changing, or sometimes the change itself.

**Mutation,** in the ancient music, is applied to the changes or alterations that happen in the order of the sounds which compose the melody.

**Mutationes,** among the Romans, postages, or places where the public couriers were supplied with fresh horses.—The *mutationes* were wholly designed for the use of these couriers, or messengers of State; in which respect they differ from *manifesti.*

**Mutchkin,** a liquid measure used in Scotland; it contains four gills, and is the fourth part of a Scotch pint.

**Mute,** in a general sense, signifies a person that cannot speak, or has not the use of speech.

**Mute,** in law, a person thatstands dumb or speechless, when he ought to answer, or to plead. See **Arraignment.**

**Mute,** in grammar, a letter which yields no sound without the addition of a vowel. The simple conso-nants are ordinarily distinguished into mutes and liquids, or semi-vowels. See the articles **Consonant, Liquid, &c.**

The mutes in the Greek alphabet are nine, three of which, viz. ή, ξ, ο, are termed **tenuis;** three θ, ϑ, ρ, termed **medio;** and three ι, υ, ο, termed **aspire.** See the article **Aspirate, &c.**

The mutes of the Latin alphabet are also nine, viz. B, C, D, G, H, K, P, Q, T.

**Mutilation,** the retrenching or cutting away any member of the body.

This word is also extended to statues and buildings, where any part is wanting, or the projection of any member, as a cornice or an impost, is broken off. It is sometimes also used in a more immediate manner for calibration: (See **Castration and Eunuch.**) The practice of this sort of mutilation is of various kinds: The Hottentots are said to cut away one testicle from their children, upon supposition that they are thereby made lighter and more active for running. In other countries poor people completely mutilate their boys, to prevent the misery and want which would attend their offspring. Those who have nothing in view but the improvement of a vain talent, or the formation of a voice which disfigures nature, as was the case formerly in Italy, are contented with cutting away the testicles. But in some countries of Asia, especially among the Turks and in part of Africa, those whom
jealousy inspires with distrust, would not think their wives fit in the custody of such eunuchs: They employ no slaves in their seraglio who have not been deprived of all the external parts of generation.

Amputation is not the only means of accomplishing this end. Formerly, the growth of the testicles was prevented, and their organization destroyed, by simple rubbing, while the child was put into a warm bath made of a decoction of plants. Some pretend that by this species of castration the life is in no danger. Amputation of the testicles is not attended with much danger; but complete amputation of the external parts of generation is often fatal. This operation can only be performed on children from seven to ten years of age. Eunuchs of this kind, owing to the danger attending the operation, cost in Turkey five or fix times more than others. Chardin relates, that this operation is so painful and dangerous after 15 years of age, that hardly a fourth part of those by whom it is undergone escape with life. Pietro della Valle, on the contrary, informs us, that in Persia those who suffer this cruel and dangerous operation as a punishment for rapes and other crimes of this kind, are easily cured though far advanced in life; and that nothing but ashes is applied to the wound.

There are eunuchs at Constantinople, throughout all Turkey, and in Persia, of a grey complexion; they come for the most part from the kingdom of Golconda, the peninsula on this side the Ganges, the kingdoms of Affan, Aracan, Pegu, and Malabar. Those from the gulph of Bengal are of an olive colour. There are some white eunuchs who come from Georgia and Ciscaflia, but their number is small. The black eunuchs come from Africa, and especially from Ethiopia. These, in proportion to their horrible appearance, are the more esteemed and soft dearer. It appears that a very considerable trade is carried on in this species of men; for Tavernier informs us, that when he was in the kingdom of Golconda, in the year 1657, 22,000 eunuchs were made in it. In that country they are sold at the fair.

Eunuchs, who have been deprived only of their testicles, continue to feel a titillation in what remains, and to have the external sign even more frequently than other men. But the part which remains is very small, and continues almost in the same state in which it was when the operation was performed during childhood.

If the different kinds of Eunuchs are examined with attention, it will be found almost universally, that castration and its consequences have produced greater or less changes in their shape and appearance, independent of its physical effects.

Eunuchs, says Mr. Withof, are timid, irresolute, fearful, foplicious, and unsteady: And this seems to hold generally, though not universally, or without exceptions; see the article Eunuch). The reason is, that their blood has not received all the necessary preparation in passing through the spermatic vessels. Thus being deprived of the properties of males, they participate of the dispositions of females, and their very soul is of an intermediate sex. They are not, however, without advantages: They become larger and fatter than other men; but they sometimes grow to a drolling size. Though oily substances are more abundant in eunuchs, they are likewise less subject to gout and to madness than men who have a greater quantity of blood and of splanchnic humour. The abundant circulation of oily liquor prevents roughness or inequalities in the trachea or palate. This, joined to the flexility of the epiglottis and of the other organs of the voice, makes it honourable and extensible, and at the same time so sweet, that it is almost impossible for eunuchs to pronounce distinctly the letter R. Is this factitious advantage a sufficient consolation to these unhappy men for the barbarity of those who have dared to sacrifice nature at the shrine of avarice? Is it impossible to reflect on all the motives for making eunuchs without a sigh of pity and regret: and yet it must not be supposed that this abominable cruelty is always infallibly attended with that advantage which is sometimes expected from it. Of 2000 victims to the luxury and extravagant caprices of the art, hardly three are found who unite good talents with good organs. The other languishing and inactive wretches, are outcasts from both sexes, paralytic members in the community, an useless burden upon the earth, by which they are supported and nourished. But let us pay the tribute which is due to that virtuous pontiff Pope Clement VIII. who, listening to the voice of modesty and humanity, persuaded and abolished this detestable and infamous practice. Mutiny he declared was the most abominable and disgraceful of crimes.

MUTILLA, in zoology, a genus of animals belonging to the order of insects hymenoptera. There are 10 species; the most remarkable of which is the occidentalis, or velvet ant, an inhabitant of North America. It has six legs, with short crooked antennae; the abdomen large, with a black split crossing the lower part of it, and another black spot at the joining of the thorax; excepting which, the whole body and head resembles crimson-velvet. The trunk or shell of the body is of such a strong and hard texture, that though trod upon by men and cattle they produce no harm. They have a long sting in their tails, which caufes inflammation and great pain for half an hour to those who are stinged by them; which usually happens to negroes and others that go barefooted. They are mostly seen running very nimbly on sandy roads in the hottest summer-weather; and always single. What they feed on, in what manner they breed, and where they secure themselves in winter, is unknown.

MUTINA (anc. geog.) a noble city of the Cipadan, made a Roman colony in the same year with Parma, situated between the rivers Gabellus and Scultenna, on the Via Aemilia. Here D. Brutus, being besieged by Antony, was relieved by the confuls Hirtius and Papia. The Greeks called it Mutina; except Polybius, in whom it is Mutine; and in Polyennus Mutina, after the Roman manner.—Now Modena, a city of Lombardy, and capital of a cognominal duchy. E. Long. 11. 20. N. Lat. 44. 45.

MUTINY, in a military sense, to rise against authority.—Any officer or soldier who shall presume to use traitorous or disrespectful words against the State or Executive power.

"Any officer or soldier who shall behave himself with
MUTY

with contempt or disrespect towards the general or other commander in chief of the forces, he shall speak words tending to their hurt or dishonour, is guilty of mutiny.

Any officer or soldier who shall begin, excite, cause, or join in, any mutiny or sedition, in the troops, company, or regiment, to which he belongs, or in any other troop or company in the service, or on any party, post, detachment, or guard, on any pretence whatsoever, is guilty of mutiny.

Any officer or soldier who, being present at any mutiny or sedition, does not use his utmost endeavours to suppress the same, or coming to the knowledge of any mutiny, or intended mutiny, does not without delay give information to his commanding officer, is guilty of mutiny.

Any officer or soldier who shall strike his superior officer, or draw, or offer to draw, or shall lift up any weapon, or offer any violence against him, being in the execution of his office, on any pretence whatsoever, or shall disobey any lawful command of his superior officer, is guilty of mutiny.

Mutius refus'd to continue his country; he told himfelf. Being ordered that he should have his freedom and return to his family.

Mutius obtained the furname (Caius), furnamed Godrus, and afterwards Scevola was one of the illuftrious Roman family of the Mutians, and rendered his name famous in the war between Porfenna king of Tufcany and the Romans. That prince refolving to refire the family of Tarquin the Proud, went to befiege Rome 507 B.C. Mutius refolved to fervice himself for the safety of his country; and boldly entering the enemy's camp, killed Porfenna's secretary, whom he took for Porfenna himself. Being feized and brought before Porfenna, he told him boldly, that 300 young men like himfelf had sworn to murder him; but since this hand has miffed thee, continued he, it must be punifhed; then putting his right hand on the burning coal, he let it burn with fuch a confufion as confounded the beholders. The king, amazed at the intrepidity of this young Roman, ordered that he should have his freedom and return to Rome, and foon after concluded a peace with the Romans. From this action Mutius obtained the furname of Scevola, "or left-handed," which was enjoyed by his family.

Mutius Scevola (2), furnamed the Augur, was an excellent civilian, and instructed Cioero in the laws. He was made praetor in Afta; was afterwards conful, and performed very important services for the republic.

He ought not to be confounded with Quintus Mutius Scevola, another excellent civilian, who was praetor in Afta, tribune of the people, and at length conful, 95 B.C. He governed Afta with fuch prudence and equity, that his example was propofed to the governours who were lent into the provinces. Cioero fays, "that he was the moft eloquent orator of all the ci­

MUTY

quires a very nice intermediate state, which it seems to enjoy in temperate climates; for although northern countries supply what are reckoned the best cattle, it is in the rich southern pastures that they are brought to perfection. Now the sheep can be brought almost to the fame perfection in the bleak northern regions as in the southern countries.

MUTUAL, a relative term, denoting something that is reciprocal between two or more persons.

Thus we say, mutual affiance, mutual con­

There are mutual or reciprocal duties, offices, &c. between superiors and inferiors; as the State and its Citizens the master and his servants, &c.

VAUGelas makes a distinction between mutual and reciprocal; mutual, according to him, is understood of what is between two only; and reciprocal, of what is between more than two; but this distinction is little regarded in common life.

MUTULE, in architecture, a kind of square 모­

ition set under the cornice of the Doric order.

MUTUNUS, or Mutivus (fap. hirc.); — deity among the Romans, much the fame as the Priapus of the Greeks. The Roman matrons, and particularly newly married women, disgraced themselves by the offene ceremonies which custom obliged them to observe before the statue of this impure deity.

MUZZLE of a Gun or Mortar, the extremity at which the powder and ball is put in; and hence the muzzle-ring is the metallic circle or moulding that furrounds the mouth of the piece.

MYA, the Gaper, in zoology; a genus belonging to the order of vermes tectae, the characters of which are thefe. It has a bivalve shell gaping at one end; the hinge, for the most part, furnished with a thick, strong, and broad tooth, not inferred into the opposite valve. Its animal is an Ascidia. The most remarkable species are:

1. The decilius, or sloting mya, has a brittle, half-transparent shell, with a line slightly prominent near the open, and sloping downwards. It inhabits the rivers of Europe. It is in fcnt about the Hebrides; the fifth eaten there by the gentry.

2. The mya pictorum has an oval brittle shell, with a single longitudinal tooth like a lamina in one shell, and two in the other; the breadth is a little above two inches, the length one. It inhabits rivers. The shells are used to put water-colours in, whence the name. Otters feed on this and the other fresh-water shells.

3. The margaritifera, or pearl mya, has a very thick, coarfe, opaque shell; often much decorticated; oblong, bending inward on one side, or arcuated; black on the outside; usual breadth from five to six inches, length two and a quarter. It inhabits great rivers, especially those which water the mountainous parts of Great Britain. This shell is noted for producing quantities of pearl. There have been regular fisheries for the sake of this precious article in several English rivers. Sixteen have been found within one shell. They are the disease of the fish, analogous to the stone in the human body. On being squeezed, they will eject the pearl, and oftentimes spontaneously in the hand of the swimmer. The river Conway was noted for them in the days of Cambden. A notion also prevails, that Sir Richard Wynne of Gwydir chamberlain to Catha-
raine queen to Charles II, presented her majesty with a pearl (taken in this river) which is to this day honoured with a place in the regal crown. They are called by the Welch cregen dilwir, or "deluge shells," as if left there by the flood. The 1st in Cumberland was also productive of them. The famous circumnavigator, Sir John Hawkins, had a patent for fishing in that river. He had observed pearls plentiful in the straits of Magellan, and flattered himself with being enriched by procuring them within his own island. In the last century, several of great size were got in the rivers of the counties of Tyrone and Donegal in Ireland. One that weighed 36 carats was valued at 401. but being foul, lost much of its worth. Other single pearls were sold for 41. 10s. and even for 101. The last was sold a second time to Lady Glenely, who put it into a necklace, and refused 801. for it from the duchess of Ormond. Suetonius reports, that Cæsar was induced to undertake his British expedition for the sake of their pearls; and that they were so large that it was necessa-ry to use the hand to try the weight of a single one. Mr Pennant supposes that Cæsar only heard this by report; and that the crystalline balls called mineral pearl, were mistaken for them. We believe that Cæsar was disappointed of his hope; yet we are told that he brought home a buckler made with Bri-tish pearl, which he dedicated to, and hung up in, the temple of Venus Genetrix: a proper offering to the goddess of beauty, who sprung from the sea. It may not be improper to mention, that notwithstanding the classicals honour English pearl with their notice, yet they report them to have been small and ill-coloured, an imputation that in general they are still liable to. Pliniy says, that a red small kind was found about the Thracian Bosporus, in a shell called mya; but does not give any mark to ascertain the species.

Linneas made a remarkable discovery relating to the generation of pearls in this fish.—It is a fish that will bear removal remarkably well; and it is said, that in some places they form refurvs for the purpose of keeping it, and taking out the pearl, which, in a certain period of time, will be again renewed. From observations on the growth of their shells, and the number of their annual laminæ or scales, it is supposed the fish will attain a very great age; 50 or 60 years are imagined to be a moderate computation. The discovery turned on a method which Linnaeus found, of putting these shell-fish into a state of producing pearls at his pleasure; though the final effect did not take place for several years: He says, that in five or six years after the operation, the pearl would have acquired the size of a vetch. We are unacquainted with the means by which he accomplished this extraordinary operation; but it was probably published at the time, and considered as important, since it is certain that the author was rewarded with a munificent premium from the states of the kingdom on this account. We regret that we cannot speak more fully on this head; but may observe, that it is probable, from a paper published many years afterwards in the Berlin Acts, that the method was effected in injuring the shell externally, perhaps by a perforation; as it has been observed, that these concretions in shell-fish are found on the inside, exactly opposite to perforations and injuries made from without by ferpule and other animals.

MYAGNUM, GOLo of PLEASURE, in botany; Myagrum A genus of the ficutulosa order, belonging to the te-tradynamia class of plants; and in the natural method ranking under the 39th order, Situgae. The ficutulosa is terminated by an oblong style; the cell generally monoperaous. There are five species; but the only remarkable one is the fativum, which grows naturally in corn-fields in the south of France and Italy, and also in some parts of Britain. It is an annual plant, with an upright stalk, a foot and a half high, sending out two or four side-branches, which grow erect; the flowers grow in loose spikes at the end of the branches, standing upon short foxtails an inch long; they are composed of four small yellowish petals, placed in form of a cross; these are succeeded by oval capsules, which are bordered and crowned at the top with the style of the flower, having two cells filled with red seeds—This is cultivated in Germany for the sake of the expressed oil of the seeds, which the inhabitants use for medicinal, culinary, and economical purposes. The seeds are a favourite food with geese. Horses, goats, sheep, and cows, eat the plant.

MYCALE, a city and mountain of Caria; also a promontory of Asia opposite Samos, celebrated for a battle which was fought there between the Greeks and Persians about the year of Rome 275. The Persians were about 100,000 men, who had just returned from the unsuccessful expedition of Xerxes in Greece.—They had drawn their ships to the shore, and fortified themselves strongly, as if determined to support a siege. They suffered the Greeks to disembark from their fleet without the least molestation, and were soon obliged to give way before the cool and resolute intrepidity of an inferior number of men. The Greeks obtained a complete victory, slaughtered some thousands of the enemy, burned their camp, and failed back to Samos with an immense booty, in which were 70 cheffs of money.

MYCENÆ (anc. geog.) a town of Argolis, in Peloponnesus. The kingdom of the Argives was divided into two portions by Acritus and his brother Protus. Argos and Mycenæ were their capitals.—These, as belonging to the same family, and distant only about 50 fladia or fix miles and a quarter from each other, had one tutelary deity, Juno, and were jointly proprietors of her temple, the Heraeum, which was near Mycenæ. It was here that Agamemnon reigned. He enlarged his dominions by his valour and good fortune, and possessed, besides Mycenæ, the region about Corinth and Sicyon, and that called afterwards Achaia. On his return from Troy, he was slain with his companions at a banquet. Mycenæ then declined; and under the Heraclide was made subject to Argos. (See ARGOS and ARGIA.) The Mycenæans sending 80 men, partook with the Lacedemonians in the glory acquired at Thermopylae. The jealousy of the Argives produced the destruction of their city, which was abandoned after a siege, and laid waste in the first year of the 78th Olympiad, or 466 years before Christ. Some part of the wall remained in the second century, with a gate, on which were lions, a fountain, the subterraneous edifices where Atreus and his sons had deposited their treasures, and, among other sepulchral monuments, one of Agamemnon, and one of his fellow-fighters and sufferers.

MYCETITES DISCOIDES, in natural history, a name
The bill is dusky, almost straight above, and gibbous near the fore head; the under mandible swelled beneath; and there being but one well on the island. There are a great number of churches and chapels, with some monasteries. The drefs of the women in this island is very remarkable, and as different from that of the other islands as that of those islanders is different from the drefs of the other European ladies. Their heads are adorned with lively coloured turbans; their garments are a short white shirt plaited before and behind, which reaches to their knees; they have white linen-drawers; and red, green, yellow, or blue turbans; order Mercury, because water, especially in summer, there being but one well on the island. There are a great number of churches and chapels, with some monasteries. The dres of the women in this island is very remarkable, and as different from that of the other islands as that of those islanders is different from the dres of the other European ladies. Their heads are adorned with lively coloured turbans; their garments are a short white shirt plaited before and behind, which reaches to their knees; they have white linen-drawers; and red, green, yellow, or blue turbans, with various coloured flippers. An ordinary suit for the better fort will cost 200 crowns.

MYCNE (anc. geog.) one of the islands called Cyclades, near Delos, under which the last of the Centaurs slain by Hercules are feigned to lie buried. Hence the proverb, Omnia fab unam Myconum congrere, applied to an injudicious or unnatural farrago. Myconii, people noted for baldness. Hence Myconius, a bald perfon. According to Strabo, the inhabitants became bald at the age of 20 or 25; and Pliny says that the children were always born without hair. The island was poor, and the inhabitants very avaricious; whence Archilocho reproached a certain Pericles, that he came to a feast like a Myconian, that is, without previous invitation. Now called Mycone, an island in the Archipelago. E. Long. 25° 6'. Lat. 37°.

MYCTERIA, the Jabiru, in ornithology; a genus of birds belonging to the order of Grallae. The bill is long, bending upwards, and acute; the nostrils are small and linear; there is no tongue; and the feet have four toes. There are two species: 1. The American, or American jabiru, is about the size of a turkey. The bill is long, stout, and of a black colour; the whole plumage is white, except the head, and about two thirds of the neck, which are bare of feathers and of a blackish colour; the remainder is bare, and of a fine red; on the hind-head are a few greyish feathers; the legs are strong, of a great length, and covered with black scales; wings and tail even at the end. This bird is found in all the Savannas of Cayenne, Guiana, and other parts of South America.

MYCOS (a name given by Dr. Woodward to those kinds of toadstool bodies which the generality of writers had called, after Dr Plott, porpites. These are usually small, and of a roundish, but flattened figure; they are hollowed on one side with a sort of umbilicus, and flinted on the other, they are found on the ploughed lands in Oxfordshire, and some other of the midland counties, and in other places, buried in the solid strata of stone; they are sometimes yellowish, sometimes brownish, and are from the breadth of an inch to a fourth part or less of that size; when broken, they are usually found to confift of a kind of flar, not unlike that of which the shelly coats of the echinates, or the lapides incerti, and other flines of echinidae in their toadstool flate; and in some of them the ridges and flaves are thick set with little knobs and tubercles. The bills in some of these is flat, as it is in others rising in form of a circular elevation from the umbilicus, and others have a circular groove in the same place.

MYCONE, an island on the Archipelago, situated in E. Long. 25° 51'. N. Lat. 37° 28'. It is about 36 miles in circuit, and has a town of the same name, containing about 3000 inhabitants. The people of this island are said to be the best sailors in the Archipelago, and have about 150 vessels of different sizes. The island yields a sufficient quantity of barley for the inhabitants, and produces abundance of figs, and some olives; but there is a scarcity of water, especially in summer, there being but one well on the island. There are a great number of churches and chapels, with some monasteries. The dres of the women in this island is very remarkable, and as different from that of the other islands as that of those islanders is different from the dres of the other European ladies. Their heads are adorned with lively coloured turbans; their garments are a short white shirt plaited before and behind, which reaches to their knees; they have white linen-drawers; and red, green, yellow, or blue flappers, with various coloured flippers. An ordinary suit for the better fort will cost 200 crowns.
MYOIDES, in the heathen mythology, a name sometimes given to Jupiter, but more frequently to Juno, to whom a bull was sacrificed, in order to make him protective in driving away the flies that infested the Olympic games.

MALAE (anc. geog.) a Greek city situated on an island of the same name, on the north-east side of the island. Mylae, or Myliness, once people. A town built by those of Zanci (Strabo). Mylaeus, the epithet, as MYLAUS Campus mentioned by Polybius. Now called Mylazo a port town of Sicily, in the Val di Nomentana. E. Long. 15° 5'. Lat. 38° 36'.

MULAEY, or MYLASSA, a noble city of Caria in Asia Minor, situated at the distance of about three leagues from the Sinus Carinensis. It was the capital of Hecatomnus king of Caria, and father of Mausolus. Pliny speaks of Menander king of Caria, and says that the Rhodians preferred with the greatest care his portrait painted by Appelles; but it was not in honour of this Menander that a Corinthian pillar was erected at Mylae, which still exists, and which bears the inscription:

"The people erected this pillar in honour of Menander, the son of Uliades, and grandson of Euthydemus, the benefactor of his country, and whose ancestors rendered great services also." Euthydemus, the grandfather of this Menander, lived in the time of Julius Caesar and Augustus. Caria was taken by Mithridates, and afterwards by Labienus, whose father had been one of Caesar's generals. Hybris, whose eloquence and valour defeated intimated him to a distinguished rank among his countrymen, in vain encouraged them to make a more obstinate defence while it was besieged by the latter. He himself was obliged to yield to necessity, and to take refuge at Rhodes; but rarely had the conqueror quitted the city, when Hybris returned and restored liberty to his country.

Not content with rendering this service, he also destroyed the power of a dangerous citizen, whose riches and talents rendered him a necessary evil. Euthydemus, often banished, and often recalled, always too powerful in a state the independence of which he threatened, saw his ambition checked by the zeal and activity of Hybris. The Romans left to Mylae that protection which it rendered itself so worthy, by the great efforts it made to preserve it. Pliny calls it Mylae libera. Strabo informs us, that it was one of the most magnificent cities of antiquity, and one of those the temples, porticoes, and other public monuments of which were highly admired. A quarry of white marble in the neighbourhood furnished it with abundance of materials for erecting these edifices.

The Mylaites had two temples dedicated to Jupiter, one situated in the city, which was named Olyg, and another built on a mountain, at the distance of 60 leagues. The latter was dedicated to Jupiter Stratus, Jupiter the Warrior. His statue, which was very ancient, inspired great veneration; people came from all quarters to implore his protection; and for the greater accommodation of his 

The houses are numerous, but chiefly of plaster, and mean, with trees interspersed. The air is accounted bad; and scorpions abound as formerly, entering often at the doors and windows, and lurking in the rooms. The plain is surrounded by lofty mountains, and cultivated. Round the town are ranges of broken columns, the remnants of porticoes, now with rubbish bounding the vineyards. A large portion of the plain is covered with scattered fragments, and with pieces of ordinary aqueducts; besides inscriptions, mostly ruined and illegible. Some altars dedicated to Hecatomnus have been discovered. Of all the ancient temples which formerly ornamented this city, one only escaped the power of time, the hind seal of the early Christians, and the barbarous usurpation of the Mahometans. This monument was dedicated to Augustus and the divinity of Rome. When Pisocke visited Melia to, it was perfect and entire; but at present no traces of it remain, except a few fragments, which have been employed to construct a Turkish mosque.

MYLOGLOSSUM, in anatomy. See Anatomy, Table of the Muscles.

MYOHYOIDAE. Ibid.

MYNSICHT (Hadrian), physician to the duke of Mekenburgh and several other German princes, was distinguished for his knowledge of chemistry, at the beginning of the 17th century. He published a work entitled Armentarium Medico-Chiruricum, which has undergone various editions. In this work he gives a description of several medicines, of the virtues of which he is not always to be depended upon. To him we are indebted for a knowledge of the fable de dubus or the Acanthum, which is still in use.

MYOLOGY, formed of μυς, μυς, "a muscle," and λευκος, "discoluric!"), in anatomy, a description of the muscles; or the knowledge of what relates to the muscles of the human body. See Anatomy, Table of the Muscles.

MYOMANCY, a kind of divination, or method of foretelling future events by means of mice. Some authors hold myomancy to be one of the most ancient kinds of divination; and think it is on this account that Isai. lxvii. 17. reckons mice among the abominable things of the idolators. But, besides that it is not certain that the Hebrew word יבכ used by the prophet signifies a mouse, it is evident it is not the divination by that animal, be it what it will, that is spoken of, but the eating it.

MYOPIA, SHORT-SIGHTEDNESS: a species of vision wherein objects are seen only at small distances. See Medicine, N° 361.

MYOSOTIS, SCORPION-GRASS: A genus of the monotypia order, belonging to the pentandria clas of plants; and in the natural method ranking under the 45th order, Affinisfolia. The corolla is silver-shaped, quinqueloba, and emarginated; the throat fluted by small arches. There are four species; of which the most remarkable is the scorpioides, or Venuil grass. This is a native of Britain, growing naturally in dry fields, and on the margins of springs and rills. It hath naked seeds, and the points of the leaves callous. It varies considerably in different situations. In dry places the plant and flowers are smaller; in moist ones both are larger, and sometimes hairy. The blossoms vary
MYO [565]  M Y R

**Myosurus** vary from a full blue to a very pale one, and sometimes a yellow; and appear in a long spirally twisted spike. When it grows in the water, and its taint and smell is thereby rendered less observable, fleer will sometimes eat it, but it is generally fatal to them. Cows, horses, fowes, and goats refuse it.

**Myosurus**, in botany: A genus of the polygynous order, belonging to the dianthia class of plants; and in the natural method ranking under the 16th order of *Myriacae*. The caryophyllaeus, the leaves and flower at the base; there are five fubulate nectaria reforming petals; the seeds are numerous.

**Po**. 

**Plate CCCXVIII.** The *Dormouse*, in zoology; a genus of quadrupeds belonging to the order of glires. There are two toe-teeth in each jaw; the upper ones cuneated, the under compressed; the whiskers are long, the tail is hairy and round, growing thicker towards the extremity; the fore and hind legs are of equal length, and the fore-feet have four toes.

1. The *gla*, or hoary dormouse, is of a pale ash-colour on the upper parts of the body, and whitish on the under; and is about the size of the common squirrel, but thicker in the body. It inhabits France and the south of Europe, and the south-west of Russia about the Volga of Samara. This animal, which is the *squirre* of Aristotle, *mus-tigris* of Oppian, and *gla* of Pliny, was held in great esteem by the ancient Romans as a luxurious delicacy: they were, fed in places called *gliraria*, constructed for the purpose, and they are eaten chiefly by the modern Italians. It forms a nest in the hollow of some tree, in which it sleeps all day; feeds in the night on nuts, walnuts, the feeds of rats, but has the fame disagreeable odour with the domestic rat.

2. The *nitella*, or garden dormouse, is of a tawny colour on the upper parts of the body, and whitish ash, tinged with yellow on the under; has a black circle round each eye, and a black spot behind each ear; and is five inches long, besides the tail, which measures four. It inhabits the south parts of Europe and Russia, where it lives chiefly in gardens, though it sometimes is found in houfes. They are very destructive to fruit, particularly peaches, which they seem to prefer to every other kind. They also eat peaches, apricots, and plums; and when soft fruits are not to be had, they will eat almonds, filberts, nuts, and even leguminous plants. Of these they carry off great quantities into their retreats which they dig in the earth, and particularly in well cultivated gardens; for in old orchards they are often found in hollow trees, where they make beds of herbs, mosses, and leaves. Eight or ten of them are frequently found in the same place, all benumbed, and rolled up in the midst of their provision of fruits and nuts. They copulate in spring, and bring forth in summer. The litter consists of five or six young, who grow very quickly, but are not fertile till the next year. Their flesh is not eatable but has the same disagreeable odour with the domestic rat.

3. The *mustcardim*, or common dormouse, is about the size of the domestic mouse, but of a plumper appearance; the nose is more blunt; the head, sides, belly, and tail, are of a tawny red colour, the throat white. Dormice inhabit woods, or very thick hedges; forming their nests in the hollow of some low tree, or near the bottom of a close thrush; they form little magazines of nuts, and eat in an upright posture like the squirrel. The consumption of their hoard, however, during the rigour of the feast is but small; for they sleep most of the time, retiring into their holes; at the approach of winter they roll themselves up, and become torpid. Sometimes they experience a short revival in a warm sunny day, when they take a little food, and relapse into their former state. These animals seldom appear far from their retreats, or in any open place; for which reason they seem less common in Britain than they really are. They make their nests of moss, grafts, and dead leaves; and bring usually three or four young at a time.

**Myrapalus** (Nicolas), was a physician of Alexandria, to whom we are under great obligations for the pains he took to collect into a kind of pharmacopeia, all the compound medicines which lie scattered in the works of the Greeks and Arabian writers. His work was accomplished before the beginning of the 14th century; and though written in barbarous Greek, continued for a long time to be the rule of pharmaceutical preparations in Europe. A translation of it into Latin by Leonard Fussich is entitled *De Medicamentorum, in S. Hieronymi quadriginta et octo digestum*. There are a great many editions of this work; the best is that of Hartman Beverus; Nuremberg, 1658, 8vo.

**Myriad**, a term sometimes used to denote ten thousand.

**Mykica, Gals, or Sweat-willow**, in botany: A genus of the tetrandria order, belonging to the dioecia class of plants; and in the natural method ranking under the fifth order, *Amentaceae*. The scale of the male catkin is in the form of a crescent, without any corolla. The scale of the female catkin the same: there is no corolla; but two styles, and a monoliferous berry.

1. The gale, Dutch myrtle, or sweet-willow, grows naturally upon bogs in many places both of Scotland and England. It rife about four feet high, with many shrubby stalks, which divide into several slender branches, garnished with flat pear-shaped leaves of a light yellowish green, smooth and a little sawed at their points. The female flowers or catkins are produced from the sides of the branches, growing upon separate plants from the female, which are succeeded by clusters of small berries, each having a single seed. It flowers in July, and ripens in autumn. When transplanted into shrubberies, the most left parts must be alligned to it.

The leaves, flowers, and seeds of this plant, have a strong fragrant smell, and a bitter taste. They are said to be used among the common people for destroying moths and cutaneous insects, being accounted an enemy to insects of every kind; internally, in infirmities, as a stimulant and vermifuge; and as a subltitute to hops for preserving malt liquors, which they render more inebriating, and of consequence less flatulous: it is said that this quality is destroyed by boiling.
MYRICA.  2. The cerifera, wax-bearing myrica, or candleberry myrtle, is a native of North America. It is a small tree, about ten or twelve feet high, with crooked stems branching forth near the ground irregularly. The leaves grow irregularly on them all round; sometimes by pairs, sometimes alternately but generally at unequal distances. They are of a lanceolate figure; and some are serrated at the top, while others have their edges wholly entire. They stand on very short footstalks; having their upper surface smooth, and of a shinning green colour, while their under is of a more dusky hue. The branches of the old plants shed their leaves in the autumn; but the young plants raified from seeds retain them the greatest part of the winter so as during that season to have the appearance of an evergreen. But this beauty will not be lasting, for they shed their leaves proportionally earlier as the plants get older. There are both male and female trees of this sort; the flowers are small, of a whitish colour, and make no figure; neither does the fruit that succeeds the female, which is a small, dry, blue berry, though produced in clusters, make any show. So that it is from the leaves this tree receives its beauty and value; for these being bruised as well as the bark of the young shoots emit the most refreshing and delightful fragrance, that is exceeded by no myrtle, or any other aromatic shrub.

There is a variety of this species of lower growth, with shorter but broader leaves, and of equal fragrance. This grows commonly in Carolina; where the inhabitants collect from its berries a wax of which they make candles, and which occasions its being called the candleberry tree. It delights in a moist soil.

—The wax is procured in the following manner: In November and December, when the berries are ripe, a man with his family will remove from home to some island or sand-bank near the sea, where these trees most abound, taking with them kettles to boil the berries in. He builds a hut with palmetto leaves for the shelter of himself and family during his residence there which is commonly four or five weeks. The man does the trees, while the children strip off the berries into a porridge-pot; and having put water to them, they boil them till the oil floats, which is then skimmed off into another vessel. This is repeated till no more oil appears. When cold, this hardens to a paste, and yields a grateful smell.

MYRIOPHILLUM, in botany: A genus of the polyandria order, belonging to the monoeica class of plants; and in the natural method ranking under the 15th order, Lauraceae. The male calyx is tetraphyllous; there is no corolla; the stamens are eight in number. The female calyx is tetraphyllous; the pistil four; there is no style; and four naked seeds.

MYRISTICA, the Nutmeg tree, in botany, A genus of plants belonging to the class dicotyledon, and order syngensia, in the New Genera Plantarum of Linnaeus by Sprecher; and of the natural order Lauri, in his fourth class Monocotyledones. —The male calyx is monophyllous, strong, and parted into three lacinii of an oval shape, and ending in a point, it has no corolla. In the middle of the receptacle rises a column of the height of the calyx: to the upper part of which the anthers are attached. They vary in number from three to twelve or thirteen. —The female calyx and corolla as in the male, on a different tree. The germ of the ovum is drawn, the style short, with a bifid stigma; the lacinii of which are oval and spreading —The fruit is of that sort called drupa. It is fleshy, round, sometimes unilocular, sometimes bivalved, and bursts when ripe at the side. The seed is enveloped with a fleshy and fleshy membraneous fleshy envelope, which divides into filaments (this, in one of the species is the mace of the hours). The seed or nutmeg is round or oval shaped, unilocular, and contains a small kernel variegated on the surface by the fibres running in the form of a screw.

Species. There are five species of this genus according
MYRIFICA, according to some authors, but several of those being only varieties, may be reduced to three, viz.,

1. Myrifica fatica, or wild nutmeg; this grows in Tobago, and rises to the height of an apple-tree; has oblong, lanceolated, downy leaves, and hairy fruit — the nutmeg of which is aromatic, but when given inwardly is narcotic, and occasion drunkmens, delirium, and madness, for a time. See a figure in Guerraer de Sent and Frid. T. 41. f. 3-4.

2. The myrifica, feibiera, (Pirola Sibifera Aublet, page 904. Tab. 345.) A tree frequent in Guiana, rising to 40 or even to 60 feet high; on wounding the trunk of which, a thick, acrid, red juice runs out. Aublet says nothing of the nutmegs being aromatic; he only observes, that a yellow fat is obtained from them, which serves many economical and medical purposes, and that the natives make candles of it.

3. The myrifica, mofchata, or nutmeg, attains the height of 6 to 8 feet, and produces numerous branches which rise together in storys, and covered with bark, which of the trunk is a reddish brown, but that of the young branches is of a bright green colour: the leaves are nearly elliptical, pointed, undulated, obliquely nervet, on the upper side of a bright green, on the under whitish, and flant alternately upon footstalks: the flowers are small, and hang upon slender peduncles, proceeding from the axil of the leaves: they are both male and female upon separate trees.

M. Schwartz, who has carefully examined this as well as the two first species, preferred in spirits, places them among the monodelphas.

The nutmeg has been suppos'd to be the Conacum of Theophrastus, but there seems little foundation for this opinion; nor can it with more probability be thought to be the Chryseololmum of Galen. Our first knowledge of it was evidently derived from the Arabsians; by Avicenna it was called jayfiban, or jayfband, which signifies nut of baa. Kundah. Both figures and described this tree; but the figure given by him is so imperfect, and the description so confused, that Linnaeus, who gave it the generic name myrifica, was unable to assign its proper character. Sonnerat's account of the myfcedar is still more erroneous; and the younger Linnaeus was unfortunately misled by this author, placing the myrifica in the clafs Polyandria, and describing the corolla as consisting of five petals. Thunberg who examined the flower of the nutmeg, places it in the clafs Monocla; and according to this description, the male flower has but one filament, surrounded at the upper part by the anther, and as the filaments are short and slender, and the anther united, this mistake might easily arise. M. De La Marck informs us, that he received several branches of the myrifica, both in flower and fruit, from the Isle of France, where a nutmeg-tree, which was introduced by Monsieur Poivre in 1770, is now very large, and continually producing flowers and fruit. From these branches, which were sent from Mons. Cere, director of the king's garden in that island, Mons. De La Marck has been enabled to describe and figure this and other species of the myrifica with tolerable accuracy; and that we have profited by his labours, will appear from the annexed figure, of which the following is an explanation:

Fig. a. A spur with fructification. The drups of the natural size, and bursting open. Fig. b. The full-grown fruit cut lengthways. Fig. c. Another section of the same. Fig. d. The nutmeg enveloped with its covering the mace. Fig. e. The fatty membrane or mace spread out. Fig. f. The nutmeg of its natural size. Fig. g. The same with its external tegument removed at one end. Fig. h. The mace with its outer tegument entirely removed. Fig. i. A transverse section of the nutmeg. Fig. j, k, and l. Sprigs of the Myrifica mofhata in flower, with a leaf of the natural size, and a representation of the calyx and column in the flower.

The seeds or kernels called nutmegas are well known, as they have been long used both for culinary and medical purposes. Dilluted with water, they yield a large quantity of essentail oil, ressembling in flavour the spice itself; after the distillation, an infipid fæaceous matter is found swimming on the water; the decocion infipidifies, gives an extract of anbious, very lightly bitter taste, and with little or no astringency. Rectified spirit extracts the whole virtue of nutmegs by infusion, and elevates very little of it in distillation; hence the spirituous extract possesses the flavour of the spice in an eminent degree.

Nutmegs, when heated, yield to the press a confidereable quantity of limpid yellow oil, which on cooling concretes into a fæaceous consistence. In the shops we meet with three forts of unctuous substances, called oil of mace, though really expressed from the nutmeg. The belt is brought from the East Indies in flone jars; this is of a thick consistence, of the colour of mace, and has an agreeable fragrant fmecl, the second fort, which is paler coloured, and much inferior in quality, comes from Holland in folid masses, generally flat, and of a square figure; the third, which is the worth of all, and usually called common oil of mace, is an artificial composition of fæven, palm oil, and the like, flavoured with a little genuine oil of nutmeg.

Method of gathering and preparing Nutmeg. When the fruit is ripe, the natives ascend the trees, and gather it by pulling the branches to them with long hooks. Some are employed in opening them immediately, and in taking off the green shell or frith-rind, which is laid together in a heap in the woods, where in time it putrefies. As soon as the putrefaction has taken place, there spring up a kind of mushrooms, called boleti mofchetani, of a blackifh colour, and much valued by the natives, who consider them as delicate eating. When the nuts are stripped of their frith-rind they are carried home, and the mace is carefully taken off with a fmall knife. The mace, which is of a beautiful red, but afterwards assumes a darkifh or reddish colour, is laid to dry in the fun for the space of a day, and is then removed to a place left exposed to the rays, where it remains for eight days, that it may toren a little. They afterwards moisten it with water, to prevent it from drying too much, or from losing its oil. They are careful, however, not to employ too much water, lest it should become putrid, and be devoured by the worms. It is last of all that is put into flmall bags, and squeezed very close. Mace must not be confounded with mace. See the word Mace.

The nuts, which are still covered with their ligneous shell, are for three days exposed to the sun, and afterwards...
afterwards dried before a fire till they emit a found
when they are shaken; they then beat them with
small flicks in order to remove their shell, which flies
off in pieces. These nuts are distributed into three
parcels; the first of which contains the largest and most
beautiful, which are destined to be brought to Eu-
rope; the second contains such as are reserved for the
use of the inhabitants; and the third contains the small-
est, which are irregular or unripe. These are burnt;
and part of the elk is employed for procuring oil by
preliminary. A pound of them commonly gives three
ounces of oil, which has the consistence of tallow, and
has entirely the taste of nutmeg. Both the nut and
mace, when distilled, afford an essential, transparent,
and volatile oil, of an excellent flavour.

The nutmegs which have been thus selected would
soon corrupt if they were not watered, or rather
pickled, with lime-water made from calcined shell-fish,
which dilute with salt-water till it attain the
confidence of tallow, and. has entirely the taste of nutmeg. Both the nut
and mace, when distilled, afford an essential, transparent,
and volatile oil, of an excellent flavour.

In the island of Banda, the fruit of the nutmeg-tree
is preserved entire in the following manner: When it
is almost ripe, but previous to its opening, it is boiled
in water and pierced with a needle. They next lay
it in water to soak for ten days, till it be- loit its four
and sharp taffe. They then boil it gently in a syrop
of sugar, to which, if they with it to be hard, a lime
is added. This operation is repeated for a few
times, and each time the syrup is renewed. The fruit
when thus preserved is put for the
whole of Europe, and of great part of

The medicinal qualities of nutmeg are supposed to
be aromatic, astringent, and referoxent; and
with a view to the last mentioned effects, it has been
much used in diuretics and dyuretics. To many
people the aromatic flavour of nutmeg is very agree-
able; they however should be cautious not to use it in
to large quantities, as it is apt to affect the head, and
even to manifest an hypnotic power in such a degree
as to prove extremely dangerous. Bonitus speaks of
this as a frequent occurrence in India; and Dr Cullen
relates a remarkable instance of this soporific effect
of the nutmeg, which fell under his own observation,
and hence concludes, that in apoplectic and paralytic
cases this spice may be very improper. He observes,
that a person by mistake took too drachmas or a little
more of powdered nutmeg: he felt it warm in his stom-
ach, without any uneasiness; but in about an hour
after he had taken it he was seized with a drowsiness,
which gradually increased to a complete stupor and
insensibility; and not long after he was found fallen
from his chair, lying on the floor of his chamber in
the state mentioned. Being laid a-bed he fell asleep;
but waking a little from time to time, he was quite
delicious; and he thus continued alternately sleeping
and delirious for several hours. By degrees, however,
both these symptoms diminished; so that in about six
hours from the time of taking the nutmeg he was
pretty well recovered from both. Although he still
complained of headache, and some drowsiness, he slept
naturally and quietly the following night, and next
day was quite in his ordinary health.

Remarks on the Trade of Nutmeg. Nutmeg-trees grow
in several islands in the eastern oceans. The wood-pigeon
of the Moluccas is intentionally a great planter of
these trees, and disseminates them in places where a nation,
powerful by its commerce, thinks it in its interest
that they should be rooted out and destroyed. The
Dutch, who unawares planted a forest mount of
flavors, have appropriated to themselves the
confectionary of nutmeg, as well as that of cloves and cinnamon,
growing in the island of Ternat, Ceylon, &c., either by
night of conquest or by paying subsidies to the
rulers, who find them much more profitable than
the former produce of their trees. It is nevertheless
ture, that they have prevailed upon or compelled the
inhabitants of the Moluccas to cut down and root out
all the clove-trees, which they have preserved only in
the islands of Ambon and Ternate, which are in a
great measure subject to them. We know for certain,
that the Dutch pay 18,000 rix dollars yearly to the
king of Ternate, by way of tribute or gift, in order
recompense him for the loss of his clove trees in the
other Molucca islands; and that they are moreover
bound by treaty to take at 34 d. a pound, all the
cloves brought by the natives of Ambon to their
magazines. They have likewise succeeded to
destroy the cinnamon every where except in the
island of Ceylon, which is in their possession.
The spice is the caye with white pepper, &c., so that the
trade of the whole of Europe, and of great part of
Asia in this species of commodity, passes through their
hands.
the loth of June 1760, M. Beaumare law at Amsterdam, near the Admirality, a fire, the fuel of which was valued at 8,000,000 of livres; and as much was to be burned on the day following. The feet of the spectators were bathed in the effulgent oil of their substances; but no person was allowed to gather any of it, much less to take any of the pieces which were in the fire.

Some years before, upon a similar occasion, and at the same place, a poor man who had taken up some nutmegs which had rolled out of the fire, was, as M. Beaumare was informed, seized and condemned to immediate execution. We will only add, that notwithstanding the jealousy of the Dutch, and the pain they take to preserve the files of cloves wholly to themselves, they have never been able to prevent their own officers in several parts of India from embezzeing and selling considerable quantities of them. M. de Jaucourt informs us, that in order to defraud the company, they sell them to the vecchils of other nations with which they meet at sea, and moisten the remainder with water, that they may still have the number of quinmals of which their cargo consisted. The quantity sold may amount to 10 quintals in 100 before it can be perceived by the clerks of the magazines at Batavia, where they are received.

We are informed by M. Romé de Lille, who has lately arrived from India, that the English draw a great deal of cinnamon, pepper, and cloves, from the island of Sumatra. The staple for this commodity, which gives great offence to the Dutch, is at the factory of Bengoolen. We have likewise seen a specimen of pretty good cinnamon raised at Martinico; the French, to prevent the exportation of splend for this commodity, which gi...
MYR [570]

The abdomen is of an oblong form, and consists of eight segments; the wings are diaphanous, adorned with a net-work of black fibres, charged with several blackish brown spots. The larva of this insect is very fond of ants, which it hunts after, whence its name. The larve proceed from the egg which the perfect insect had deposited in very fine dry sand, in a place sheltered from rain, either within a crevice of a wall or of the ground, or at the foot of a wall generally exposed to the south sun. There they are hatched, and make their usual abode. Their colour is grey, and their body, which is covered with small protuberances, is of an oval form. Its posterior extremity terminates in a point, and is of use to sink itself down into the sand; for it only walks retrogressively, though furnished with six feet. Before the head is placed a dentated forceps, sharp and hollow within, with which the creature catches flies and other insects, but especially ants. This forceps serves as a mouth or rostrum, as well as for an offensive weapon. The animal's retrospective march not allowing it to run after the insects on which it is fed, it uses a stragam. It dives down into the sand, and turning about in a circle, hollows out concentric furrows, gradually deeper and deeper, calling at a distance with its horns the sand it takes from that place. At length it manages to dig a hole in shape like a funnel, at the bottom of which it takes its flattening, concealed in the sand, nothing but the open extended forceps appearing above it. Mischief overtakes every insect that happens to fall into that hole. The myrmelio who is apprised of it by the Granis of sand rolling down to the bottom, overwhelms him with a shower of dust, which it ejects with its horns, then drags the insect to the bottom of the hole, where it fetizes him with its forceps and sucks its vitals. It does not even spare other myrmelions who in their motions to and fro chance to fall into it. When the larva is come to its full growth, it digs no more holes; it moves backwards and forwards tracing irregular furrows on the sand, and at length spins itself a cocoon, shaped like a ball, the outward part of which is formed of the sand in which it lived, and the inward is lined with fine white silk. Within this cocoon it turns to a chrysalis, which is curved into a semi-circle, and wherein may be distinguished all the parts of the perfect insect that is to issue from it. It is more oblong than the larva, but much shorter than the perfect insect. After a certain period the chrysalis casts off its shell, turns to a winged insect, and flies through the hole in order to take its flight. The perfect insect is very scarce, but is sometimes met with in sandy places, and near rivulets.

MYRMIDONS (MYRMIDONES), in antiquity; a people on the southern borders of Thessaly, who accompanied Achilles to the Trojan war. They received their name from Myrmidon, a son of Jupiter and Eurymedusa, who married one of the daughters of Aeolus son of Helen. His son Actor married Migea, the daughter of Aepus. He gave his name to his subjects, who dwelt near the river Peneus in Thessaly. According to some, the Myrmidons received their name from their having arisen from ants or plumes, upon a prayer put up for that purpose by king Aeolus to Jupiter, after his kingdom had been depopulated by a severe pestilence. According to Strabo, they received it from their industry, because they imitated the diligence of the ants, and like them were indefatigable, and were continually employed in cultivating the earth.

MYRMILLONES, were gladiators of a certain kind at Rome, who fought against the Retiarii. Their arms were a sword, head-piece and shield. On the top of the head-piece they wore a fillet embossed, called MARSAPES, whence their name is by some supposed to be derived. The Retiarii, in their engagements, made use of a net, in which they endeavoured to entangle their adversaries, and flung during the fight, "Non te pote, plicem pote; quid me fugis, Galile?" I aim not at thee, but I aim at thy fish; why dost thou shun me, O Gaul?" The myrmillones were called Galli, because they wore Gallic armour. They were also named Saturi. This kind of gladiators was suppressed by Caligula. See GLADIATORS, RETIARI, &c.

MYROBALANS, a kind of medicinal fruit brought from the Indies, of which there are five kinds.
1. The citrine, of a yellowish red colour, hard, oblong, and the size of an olive. 2. The black, or Indian myrobolan, of the bigness of an acorn, wrinkled, and without a stone. 3. Chebulic myrobolan, which are of the size of a date, pointed at the end, and of a yellowish brown. 4. Emblic, which are round, rough, the size of a gall, and of a dark brown. 5. Balleritic, which are hard, round, of the size of an ordinary prune, less angular than the rest, and yellow. They are all slightly purgative and astringent. The word comes from the Greek μυρο, "ointment," and βαλλειος, "acorn," as being in the form of acorns, and used in medicine.

MYRON, an excellent Grecian satyr, flourished 442 B.C. The cow he represented in brass was an admirable piece of workmanship, and was the occasion of many fine epigrams in Greek.

MYROXYLON, in botany: a genus of the monogynia order, belonging to the decandria class's of plants. The calyx is campanulate; the superior petal larger than the rest; the germ is longer than the corolla; the legumen monospermous. There is but one species, the peruifera, a native of Peru and the warmer parts of America. It is this shrub that yields the balsam of Peru, which is said to be extracted from it by coccion in water. This balsam, as brought to us is nearly of the consistence of thin honey, of a reddish brown colour inclining to black, an agreeable aromatic smell, and a very hot biting taste. Distilled with water, it yields a small quantity of a fragrant essential oil of a reddish colour, and in a flowing state, without addition, a yellowish red oil. Balsam of Peru is a very warm aromatic medicine, considerably hotter and more acrid than copaiva. Its principal effects are to warm the habit, to strengthen the nervous system, and attenuate vitilic humours. Hence its use in some kinds of aitmas, gonorrhoeas, dysenteries, suppressions of the uterine discharges, and other disorders proceeding from a debility of the solids or a sluggishness and inactivity of the juices. It is also employed externally, for cleansing and healing wounds and ulcers, and sometimes against pains and rheumatic pains.

There is another sort of balsam of Peru of a white colour,
Myrrh, or the mineral, is a gummy-refrinite concrete juice, obtained from an oriental tree of which we have as yet no certain account. It comes over to us in globes or drops, of various colours and magnitudes. The best is of a somewhat transparent, friable, in some degree undeutous to the touch, of an uniform brownish or reddish-yellow colour, often streaked internally with whitish semicircular or irregular veins; of a moderately strong, not disagreeable smell; and a lightly pungent, very bitter taste, accompanied with aromatic flavour, but not sufficient to prevent its being nauseous to the palate. There are sometimes found among it hard shining pieces, of a pale yellowish colour, resembling gum-arabic, of no taste or smell: sometimes mallees of bdellium, darker coloured, more opaque, internally softer than the myrrh, and differing from it both in smell and taste: sometimes an unction gum-refine, of a moderately strong somewhat ungrateful smell, and a bitterish very durable taste, obviously different both from those of bdellium and myrrh: sometimes likewise, as Cartheyer observes, hard compact dark coloured tears, less aromatic than myrrh, of an offensive smell; and a most ungrateful bitterness, so as, when kept for some time in the mouth, to provoke reaching, though so refined, that little of them is dissipated by the saliva. Great care is therefore requisite in the choice of this drug.

We have, as already observed, no certain information concerning the tree from which this substance flows; we are only told that the myrrh-tree, or plant, is a native of Abexim in Ethiopia, and is named bedeia by the Arabs. It is affirmed by some that the myrrh we have at present is not equal in quality to that of the ancients, and has not that exquisite smell which all authors ascribe to the latter. They aromatized their most delicious wines with it; and it was preferred as a very valuable perfume to our Lord while he lay in the manger (a). But to this it may be easily answered, that there is no disputing about perfumes any more than about tastes and colours. Men are equally changeable with regard to smells, of which we have striking examples in musk and civet (b). The ancients reckoned two kinds of myrrh: the one liqud,
The true Troglodite myrrh will be entirely lost; and the erroneous descriptions of the ancient Greeks will lead posterity, as it has done us, to form many mistaken conjectures concerning the nature of the myrrh of the ancients.

Though the Troglodite myrrh was superior to every species of Arabian myrrh, the Greeks plainly perceived that it was not all of the same quality. Pliny and Theophrastus affirm, that this difference was owing to the trees, some of which were wild, and others improved by culture: but this is a mere conjecture; for the truth is that none of them are cultivated. The quality of the drug formerly depended, and must still depend, on the age and foundness of the tree, on the way of making the incision, and on the season of the year, and the natives do not bring so great a price by the second as by the first myrrh of the first year. When the rains have ceased, that is from April to June: and the myrrh is produced in July and August. At each return of the season, the sap continues to run in the course to which it has been accustomed; but the tropical rains, which are very violent, and which last for six months, convey so much filth and water into the incision, that by the second year the tree begins to rot at that place; so that the myrrh is of a secondary quality, and at Cairo does not bring so great a price by a third as the myrrh of the first year. That which issues from incisions near the roots and in the trunks of old trees is of the second growth and quality, and sometimes worse; but it is reckoned good myrrh in the shops of Italy everywhere except Venice. It is of a red blackish colour, dirty, solid, and heavy. It loses very little of its weight by being long kept, and can scarcely be distinguished from that of Arabia Felix. The third and worst kind is that which flows from old incisions formerly made in old trees, or which not having been at first observed, has remained a whole year upon the tree. It is black, heavy, and of an earthy colour: it has little smell and bitterness, and is probably the canculus of the ancients.

Myrrh newly gathered has always a strong smell of rancid oil; and when put into water, globules of an oily substance are detached from it, which rise and swim on the surface. This oiliness does not arise from the myrrh, but from being put by the natives into goats' skins, which they anointed with butter to make them tight. It is kept in these skins, and thus carried to market: so that instead of being a fault, as some suppose, it is a proof that the myrrh is newly gathered; which is the best property that myrrh of the first kind can have. Besides, this oily covering must have retained the volatile particles of the fresh myrrh, which escape in such abundance as frequently to occasion a considerable diminution in the weight.

(c) Pliny speaks of the Sarsi as a recent or liquid myrrh: and Dioscorides, chap. 67, says nearly the same thing. Mr Bruce is of opinion (but we think he is mistaken), that the ancient Greeks and Romans, who lay at so great a distance, could never have it in that state; because he was a native of the myrrh country, and covered with the erroneous descriptions of the ancient Greeks will lead posterity, as it has done us, to form many mistaken conjectures concerning the nature of the myrrh of the ancients.

To prevent this juice from hardening, or at least in a very small degree it is sufficient to exclude it from the contrast of the air immediately after its issuing from the tree; and by these means its aromatic nature will be much better preserved. The medical effects of this aromatic bitter are to warm
warm and strengthen the vices; it frequently occasion
flows a mild diaphoretic, and promotes the fluid secre
tions in general. Hence it serves serviceable in l
guid cases, diaphoretic from a simple inactivity,
those female disorders which proceed from a cold, mu
ous, sluggish indigestion of the humours, suppress
tions of the uterine discharges, catarrhal disorders,
and where the lungs and thorax are oppressed by vi
ey fever.

Myrrh is likewise supposed in a peculiar man
er to refit putrefaction in all parts of the body; and
in this light it stands recommended in malignant, putrid,
and putrid fevers, and in the small-pox; in which
last it is said to accelerate the eruption.

The present practice does not seem to expect any
peculiar virtue from myrrh; and it is now perhaps less
employed than formerly. Some late writers, however,
and particularly Dr. Simons, in his treatise on Con
sumptions, have bestowed very high encomiums on it,
even in cases of tuberculous phthisis; and although it
can by no means be represented as a remedy much to
be depended on, yet there is reason to believe that it
has been serviceable in some cases.

Rectified spirit extracts the fine aromatic flavour and
bitterness of this drug, and does not elevate any thing
of either in evaporation; the gummy substance left by
this menstruum has a disagreeable taste, with scarcely
any of the peculiar flavour of the myrrh: this part
dilutes in water, except some impurities which re
main. In distillation with water, a considerable
quantity of a ponderous essential oil arises, resembling in
flavour the original drug. Myrrh is the balls of an
official tincture. It enters the pilulae ex aloe et myr
rha, the pilulae gummii, and pilulae floridicae, and
some other formule. But for obtaining its full effects,
it must be given in doses of half a dram or upwards; and
it is thought to be advantageously united with a pro
portion of nitre, cream of tartar, or some other refri
gerant salt.

MYRURHINE, or Murrine. See Murrine.

MYRSINE, in botany: A genus of the mono
gynia order, belonging to the pantandria class of plants;
and in the natural method ranked under the 18th order,
Bicorne. The corolla is semiquinquefid and connivent,
the stamens filling the corolla: the berry quinquefo
cular and pentamerous.

MYRTIFORM, in anatomy, an appellation giv
en to several parts, from their resembling myrtle-berries.

MYRTIS, a Greek woman who distingui
shed herself by her poetical talents. She flourished about 500
years before the Christian era, and infringed the cele
brated Corinna in the severest rules of criticism.
Pindar himself, as some report, was also one of her
pupils.

MYRTLE, in botany. See Myrtus.

MYRTOM, a part of the Augean sea, ly
ing between Eubea, Peloponnese, and Attica. It
receives this name from Myrtos a woman, or from
Myrtos a small island in the neighbourhood, or from
Myrtus the son of Mercury who was drowned there,
etc.

MYRTUS (anc. geog.), a small island near Cary
thus in Eubea, which gave name to the Mare Myrt
toun. Others, according to Paulaniers, derive the ap
pellation from Myrio; the name of a woman. Strabo
extends this sea between Crete, Argia, and Attica.

Paulaniers beginning it at Eubea, joins it at Hel-
...
Myrtus, or myrtle, hath a narrow, sharp-pointed leaves, crinkled at intervals. These are all beautiful evergreen shrubs of exceeding fragrance; exotics originally of the southern parts of Europe, and of Asia and Africa, and consequently in this country require shelter of a greenhouse in winter; all of which, though rather of the small-leaved kind, have their foliage closely placed, and remain all the year, and are very floriferous in summer; and when there is a collection of the different sorts, they afford an agreeable source of variety with each other. They therefore claim universal esteem as principal greenhouse plants, especially as they are easily raised from cuttings, and of such easy culture, as to be attainable in every garden where there is any sort of greenhouse, or garden frames furnished with glass for protecting them in winter from frost, but some of the broad-leaved sorts are so hardy as to succeed in the full ground, against a south wall and other warm exposures, all the year, by only allowing them shelter of mats occasionally in severe frosty weather; so that a few of these sorts may also be exhibited in a warm situation in the shrubbery: observing, however, all the sorts are principally to be considered greenhouse plants, and a due portion of them must always remain in pots to move to that department in winter. 

2. The pimento, pimento, Jamaica pepper, or allspice tree, grows above 50 feet in height and two in circumference; the branches near the top are much divided and thickly beset with leaves, which by their continual verdure always give the tree a beautiful appearance; the bark is very smooth externally, and of a grey colour; the leaves vary in shape and in size, but are commonly about four inches long, veined, ashy-grey and elliptical, and of a deep shining green colour: the flowers are produced in bunches or panicles, and stand upon subdividing or trichotomous stalks, which usually terminate the branches; the calyx is cut into four roundish segments; the petals are all four, white, small, reflex, oval, and placed opposite to each other between the segments of the calyx; the filaments are numerous, longer than the petals, spreading, of a greenish white colour, and rise from the calyx and upper part of the germs; the anther are roundish, and of a pale yellow colour; the style is smooth, simple and erect; the stigma is obtuse; the germs become a round succulent berry, containing two kidney-shaped fleshy seeds. This tree is a native of New Spain and the West India islands. In Jamaica it grows very plentifully; and in June, July, and August, puts forth its flowers, which with every part of the tree breathes an aromatic fragrance. The berries when ripe are of a dark purple colour, and full of a sweet pulp, which the birds devour greedily, and mashing the seeds, afterwards propagate these trees in all parts of the woods. It is thought that the seeds passing through them, in this manner undergo some fermentation, which fits them better for vegetating than those gathered immediately from the tree. 

The pimento is a most beautiful odoriferous evergreen, and exhibits a fine variety in the flowers at all seasons. It was first introduced and cultivated in England by Mr. Philip Miller in 1739. With respect to flowering, all the varieties of the myrtus communis flower there in July and August, most of which are very floriferous. The broad-leaved Roman kind in particular is often covered with flowers, which in some of the sorts are succeeded here by berries ripening in winter. The pimento also flowers in the flow with great beauty and luxuriance. The flowers of most of the sorts are small, but numerous; and are all formed each of five oval petals and many filaments. As all these plants require protection in this country, they must be kept always in pots, for moving to the proper places of shelter, according to their nature; the myrtus communis’s and varieties to the greenhouse in winter, the pimento and other delicate kinds to the flow, to remain all the year; therefore let all the sorts be potted in light rich earth; and as they advance in growth, shift them into larger pots, managing the myrtles as other green house shrubs, and the flow-kinds as other woody exotics of the flower.

Properties, &c. The leaves and flowers of common upright myrtle have an astringent quality, and are used for cleansing the skin, fixing the teeth when loosened by the scurvy, and strengthening the fibres. From the flowers and young tops is drawn a distilled water that is detereive, astringent, cosmetic, and used in gargles. A decoction of the flowers and leaves is applied in ointments. The berries have a binding detereive quality; and the chemical oil obtained from them is excellent for the hair, and used in pomatum and ointment and other external beautifiers of the face and skin. As an internal medicine, these berries have little or no merit.

In the Dictionnaire portatif d’Histoire Naturelle, a fact is related, which, if true, tends to show the strongly astringent quality of myrtle. “Myrtle. (says he) is likewise the base of a pomade called pomade de la Comtesse, and well known on account of an extraordinary historical fact. One of those gay youths who flutter about the toilets of the fair happened one day to be left alone in the flowerhouse of the graces. With eager curiosity he examined the purfumes, the smelling bottles, the perfumed powder, the essences, and the cosmetics. To give more of the vermillion and greater pliancy to his lips, and to remove some disagreeable eruption, he lightly spread with his indifferent finger the fatal pomade, looks at himself in the glass, and contemplates his beauty with admiration. The lady enters; he wishes to speak, but his lips contracted, and he could only stammer. ‘The lady looked at him with astonishment; at length calling her eyes on the toilet, she discovered by the open pot the cause of the mischief, and enjoyed a hearty laugh at the expense of her admirer, whose confusion announced his indiscretion.’

Pimento berries are chiefly imported into Britain from Jamaica; whence the name Jamaica pepper. It is also called allspice, from its taste and flavour being supposed to resemble those of many different spices mixed together. It is one of the staple articles of Jamaica; where the pimento walks are upon a large scale, some of them covering several acres of ground. When the berries arrive at their full growth, but before they begin to ripen, they are picked from the branches, and exposed to the sun for several days, till they are sufficiently dried; this operation is to be conducted with great care, observing that on the first and second day’s exposure
the colour and rattling of
~
Mylia
from the
distillation
ferous as to
chief cities were Cyzicum, Lampacbus, &c. The
de of Apollo, to
extract. Pimento
ferent
or
on this account is not unfrequently employed with
active
oil of cloves, or rather a
spice,
of an
mixture
and nutmegs. To redhilt spirit it imparts, by maceration
or
digested, the whole of its virtue; in distillation it
gives over very little to this menstruum, nearly all its
active matter remaining concentrated in the impregnated
extract. Pimento can scarcely be considered as a
medicine: it is, however, an agreeable aromatic, and
on this account is not unfrequently employed with dif-
ferent drugs, requiring such a grateful adjunct. Both
the pharmacopoeias direct an aqueous and spirituous
distillation to be made from these berries, and the
Edinburgh college order also the oleum officinale piperis
farnacensis.

MYSIA, a country of Asia Minor, generally di-
vided into Major and Minor. Mylia Minor was bounded
on the north and west by the Propontis and Bi-
thynia, and Phrygia on the southern and eastern bor-
ders. Mylia Major had Asia on the south, Aegean
on the west, and Phrygia on the north and east. Its
chief cities were Cysicum, Lampsacus, &c. The
inhabitants were once very warlike; but they greatly
degenerated, and the words Mylenum ultima was em-
phatically used to signify a person of no merit. The
ancients generally hired them to attend their funerals as
mourners, because they were naturally melancholy
and inclined to shed tears. They were once governed
by monarchs. They are supposed to be descended from
the Myrians of Europe, a nation who inhabited that part of Thrace which was situated between Mount
Haemus and the Danube.

The wife of a native of Sparta, one of the seven wife
women of Greece. When Anacharsis consulted the or-
acle of Apollo, to know which was the wisest man in
Greece, he received for answer, he is now plough-
ing his fields. This was Mylon.

MYSORE, or MYSORE DOMINIONS, a kingdom
of Asia in the East Indies, consisting of the follow-
ing territories usurped or subdued by the late Hyder
Ali, and transmitted to his son Tippoo Saib the pre-
rent sultan.

1. Myfore Proper, or Seringapatam (from its cap-
it), forming the independent state of a Hindoo
rajah, for near 200 years from its dismemberment, as
a province of the Bejcanur empire, fell into the hands
of Hyder Ali Khan about the year 1763, by cutting
off the Delaway, or regent usurper of the govern-
ment, and seizing the reins of administration himself;
but without leaving even the shadow of any authority
to a nominal rajah of his own creation, excepting in
the formularies of justice or finance, and preferring
on one side of the pagoda coin the impression of two
divinities of the Hindoos, while the other
was made to bear the initial letter of his proper name
Hyder. The whole country now again reduced in-
to the form of a province dependent on the New My-
orean dominion of a Mussulman in the person of Tipp-
oo, is bounded on the west by the Balagaut hills of
Koork, and those called Anemally, bordering the whole
coast of Malabar; on the east it fronts with the
Carnatic Payengaut and its dependencies along the
Coromandel coast; and, on the north, with the pargau-
ns of Serah, Bangalore, and Cojur, belonging to
the Carnatic Balagaut-Bejapour, in a longitudinal
line little short of 20 English miles. From this lat-
ter boundary, in a form nearly triangular, it stretches
240 miles towards the north, where it terminates in a
point at the extremity of Dindigul, near the pafs of
Goodalore, through the Anemally hills, on the con-
finies of Travancore, and within 100 miles of Cape
Comorin. It partakes of the two great divisions of
country known in the Decan by the terms Balagaut
and Payengaut, or upper and lower region. The
former, comprehending the districts immediately de-
pendent on the capital, and 43 hundred forts, chiefly
on eminences, is but indifferently watered by the
everal branches of the Caveri, at 10 great distance
from its source; and much therefore, as in con-
sequence of an elevated situation, precluded from
foreign commerce, with scarcely any internal industry,
be comparatively poor, as it is productive only of the
smaller grains of joary and Bajary, or a species of
Indian corn, with the different kinds of vetches com-
mon to India; from all which, however, a nett reve-
rue, in money or kind, of seven lacks of hoon or paga-
das, being about 21 lacks of rupees, is computed to be
forth coming to the state, after defraying the ordinary
charges of collection, which here as in the reft of Hin-
dofian, confift chiefly of an establishment of village
peons or militia, reckoned 40,000 in number, for the
whole province of Myfore suppos'd to contain 15,400
square geographic miles. The latter, or Payengaut
division, making scarcely a third of this extensive
area, is better known to us under the name of Coim-
batore, including the Difticts of Caroor, Darampour,
Dongar, Namul, on both sides of the Caveri, and the
valley of Dindigul, on the south, and the great pads
of Palligautcherry towards Malabar on the west: it is
extremely fertile and well cultivated; therefore, in
proportion to its extent, more productive of revenue
than the Balagaut territory, being estimated nett at
19 lacks of rupees. The rajahs of Koork, and other
Palygars among the Gau's, from Biddenore south to
Dindigul, occupy independently a considerable tract
of country within the general description of Tippoo's
dominions; but which being inaccessible to regular
troops by hills or impervious woods, the Myorean
power hath never been able to conquer, further than
to facilitate the catching of a few elephants, yearly by
means of the natives.

2. Biddenore, or Ikeri, now Hydernagur, on the
diftolution of the Carnatic empire, of which it was a
part, became an independent state under its Naiks of
the race of Vencapatuppy, after which it fell under
the divided female government of different rannies or
queens, and so continued until conquered wholly by
Hyder between the years 1763-5. This country is
also divided into Alagaut and Payengaut; the latter
stretching
Hyderabad, stretching 140 miles along the sea-coast from Declah, or the river Cangrecora, being the northern frontier of Malabar, north to Honawar or Onore, on the confines of Soonda, in different breadths of plain territory, from 40 to 50 miles, but which may in all form an area of 3200 square miles, full retaining the ancient name of Canara, and including the ports of Mangalore, Barcolore, Onore, &c. The former or elevated division beyond the Supramany Gaults, and immediately dependent on the capital Bedenore, Hanampon, &c. is of great indefinite extent inland, on both sides of the Tumbhûdra; perhaps twice more considerable in size, though not proportionally so in value, to the maritime border. Both divisions, however, allowing for a revenue establishment of about 22,000 village peons, are assessed for seven lacks of Ikeri pagodas, which, at four rupees each, make a clear income to the exchequer of 28 lacks of rupees.

3. Soonda, in circumstances of history or final conquest, might be placed under the preceding head; as also from a similarity in its geographical description, with only the difference of being on a much smaller scale. The Payengaut, from the district of Onore to the frontiers of Goa, along a sea-coast of 60 miles, cannot comprehend above 1100 square miles of territory, in which the port of Carwar may be considered the capital; while a much larger extent must be allowed for that portion of the district beyond the Gaults to the easterly. The whole revenue, however, of both divisions, does not exceed two lacks of pagodas, or eight lacks of rupees.

4. Malabar. The country under this description, and conquered by Hyder in 1765-6, exclusive of Kook, is altogether Payengaut; stretching along the shore from Declah south to Cochín about 200 miles, and comprehending, in an area of perhaps 6000 square miles, the Samary’s territory of Calicut, with the petty states of Cartinad, Cotiotie, Cherica, or Cananore, on the north, and the tributary kingdom of Cochín on the south—the whole divided into about 16 lacks of rupees; and because the amount thus stated may comprehended be allowed for that portion of the district beyond the Gaults to the eastward. The whole revenue, however, of both divisions, does not exceed two lacks of pagodas, or eight lacks of rupees.

5. Barah Mhal, or twelve gunnaiss, was one of the earliest conquered annexations of Hyder to the Myoren dominion, though in the war of 1768 it was over-run and for a while in possession of the company’s troops. The whole circuit or district of Judgee, composed of heights and valleys on the confines of the Balangan and Payengaut Carnatics, being one of the seven dependencies of Giejee subjunct to the Mogul in 1698, was then subdivided into 17 gunnaiss, and assessed for a gross revenue of 1,757,717 rupees. Of these subdivisions, Amboor, Saiutgur, &c. remain to the Payengaut: the rest in the hands of Tippoo, may comprehend, exclusive of the poligari of Shili Naick, about 1800 square miles; but the net revenue of the same territory, after defraying the ordinary expenses of collection, does not exceed five lacks of rupees at present.

These five provinces of the Myoren empire, with the districts of Bangalore, Colar, &c. of the Carnatic-Balangan Bejapoory, formed the whole of Hyder’s dominion in the war 1768; and were calculated then to yield in all a net income of 119 lacks and a half of rupees, allowing an establishment of 115,000 village peons to enforce the collections, and maintain internal peace.

6. Petty states of Hindoo rajahs, situated on the west and north of the Hendery and Tumbhûdra rivers, to the confines of Goa, and the Merhatta territories of Toorgul, Raibaug, and Merith, forming the jager of Perferam Bow beyond the southern branch of the Kifnàh. Some of these rajahships had been entirely conquered by the Mogul; but the most considerable of them never were subdued by any Mufulman power until Hyder’s conquest of them between the years 1774-7, though different districts from each may have been dismembered for a while by the Mogul deputies of the Carnatic-Balangan Bejapoory, and therefore annexed in the accounts of the revenue of that circuit. The frontier forts, and dependencies, of Goojunder-gur, Darwar, Badamy, &c. near the southern branch of the Kifnàh towards the Merhatta dominion, composed at one time the jager of Ragenaut Row, and have frequently changed their masters. They fell ultimately to Tippoo at the peace of 1784, but he was forced to pay chout for them to the Pethwa. On the whole, all these states, of great indefinite extent and extremely poor, yield only a precarious revenue of 16 lacks of rupees to the Myoren.

7. Carnatic Balangan Bejapoory, confiding, under the Mogul, of one circuit of the same name, and of which the capital was Serah. It comprehended 51 gunnaiss, of which Bangalore, Colar, &c. on the south, were seized by Hyder, immediately when he possessed himself of Myoren; but Anantpour, Penckonda, &c. on the north, with the rest of the Merhatta state of Gooty, did not fall into his hands until the year 1776, when he overcame and made prisoner the proprietor Morarow, who had rendered signal service to the English in the preceding Myoren war. The whole circuit was rated at a jumma kaamil, or total gross revenue on the king’s books, of 43,916,396 rupees; but the accuracy of this valuation is much to be doubted: because it does not appear from the registers of the fobah of Bejapoory that the Mogul government ever ascertained the办好 or village collections of either of the Carnatics, or went into greater detail than to fix the standard allowance of the different gunnaiss; and because the amount thus stated seems too large a receipt from a country naturally so poor and destitute of commerce, probably in all its dimensions not exceeding 16,000 square miles, and which was so liable to internal disturbances or foreign invasion, that notwithstanding the number of strong holds to be found in it, every town required and has its own particular fortification. However this may be, the revenue actually forthcoming to Hyder in 1778, after defraying charges of collection and an establishment of about 30,000 village peons, was only 3,205,306 rupees.

8. Carnatic-Balangan Hydrabad, comprehending the five circars of Sidhout, Kalmam, Ganjeccottah, Gootty, and Gorrumbonda, which were subdivided into 66 gunnaiss, rated by the Moguls kaamins 4,707,506 rupees: but from this amount is to be deducted the aggregate valuation of the gunnaiss or Chittoore, &c. now annexed to the Payengaut, together with the establishment of the diamond-mines of Ganjecottah,
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MYSTERIES.

RELIGION, in its original form, was simple and intelligible. It was intended for the instruction and edification of all ranks of men; and of consequence its doctrines were on a level with vulgar capacities. The Jewish dispensation was openly professed: nothing was performed in secret; every article was plain, open, and accessible. The divine author of the Christian economy commanded his disciples to preach his doctrine in the most public manner: "What ye have heard in secret (says he) preach openly; and what I have taught you in private teach ye publicly, and proclaim it on the housetops." Such are the charms of truth, and such the character of that religion which came down from heaven, that they, as it were,
Mysteries.

We have already observed, that the avarice and ambition of the pagan priesthood probably gave birth to the institution of the mysteries. To this observation we may now add, that the ministers of that superstitious thing possibly imagine, that some articles of the ritual were too profound to be comprehended by the vulgar; others, too sacred to be communicated to a description of men whom the institutions of civil society had placed in a situation not only subordinate but even contemptible. It was imagined, that things sacred and venerable would have contrived a taint and pollution by an intercourse with forbid and unctored souls. These appear to us the most probable motives for making that odious and pernicious distinction between the popular religion and that contained in the sacred and mysterious ritual.

The learned Bishop Warburton is positive, that the mysteries of the Pagan religion were the invention of legislators and other great personages, whom fortune or their own merit had placed at the head of the most civil societies which were formed in the earliest ages in different parts of the world. It is with reluctance, and indeed with diffidence, that we presume to differ in our sentiments from such respectable authority. Whatever hypothesis this prelate had once adopted, so extensive was his reading, and so exuberant his intellectual resources, that he found little difficulty in defending it by an appearance of plausibility, if not of rational argumentation. The large quotations he has adduced from Plato and Cicero, do indeed prove that the sages and legislators of antiquity sometimes availed themselves of the influence derived from the doctrines of the mysteries, and from the authority they acquired by the opinion of their having been initiated in them; but that those men were the inventors and fabricators of them, is a position for which his quotations do not furnish the most slender presumption. At the same time, we think it not altogether certain, that the doctrine of a divine providence, and a future state of rewards and punishments, were revealed in the mysteries with all the clearness and cogency which is pretended by his Lordship.

But granting that the fabric was raised by the hands of sages and legislators, we imagine it would be rather difficult to discover with exactness that description of men could propose to derive from the enterprise. The institution was evidently, and indeed confessedly, devised to conceal from the vulgar the million of heterogeneous doctrines and maxims, which, had they known and embraced them, would have contributed most effectually to disperse them to submit to those wise regulations which their governors and legislators wished most ardently to establish. Experience has taught, that nothing has a more commanding influence on the minds of the vulgar, than those very dogmas, which, according to the Bishop, were communicated to the initiates. A conviction of the Unity of the Deity, of his wisdom, power, goodness, omnipresence, &c., the steady belief of the immorality of the human soul, and of a future state of rewards and punishments, have in all ages, and in all countries, proved the firmest supports of legal authority. The very same doctrines, in the dawn of Christianity, contributed to all other methods the most effectually to tame and civilize the savage.

were, "delight in the light, and lift up their voice in the streets, and cry in the chief places of concourse."

But such is the depravity of the nature of man, that the noblest institutions degenerate in his hands. Religion itself, originally pure, simple, and amiable, under his management has often been transformed into pollution, perplexity, and deformity. The ministers of religion, whose province it was to guard the sacred deposit, and to secure it from foreign and spurious intermixtures, have generally been the first innovators, and the first and most industrious agents in corrupting its integrity and tarnishing its beauty. Avarice and ambition prompted that class of men to deviate from the original plainness and simplicity of religious institutions, and to introduce articles, rites and usages, which might furnish them with opportunities of gratifying these unhallowed and incontinent passions. Hence diffinctions unknown to pure and undefiled religion were fabricated, and that heavenly institution, heretofore one, simple, indivisible, was divided into two partitions: the one popular and public: the other dark, secret, and mysterious. The latter of these we intend as the subject of this article.

The English word mystery is derived from the Greek μυστήριον; and in its modern acceptance imports some thing above human intelligence, something awfully mysterious, and more frequently by his apostles, especially St Paul. In these cases, it generally signifies those doctrines of Christianity which the Jews, prior to the advent of the Messiah, either did not or could not understand. The favourite doctrines of the Trinity in Unity, and the Unity in Trinity; the union of two natures in one and the same person, &c. were generally called mysteries, because they were thought infinitely above human comprehension. All these significations are out of the question at present. Our intention in this article is to lay before our readers the fullest and fairest account we have been able to collect, of those μυστήρια, or σωφρόνες, rites, of the pagan superstitition, which were carefully concealed from the knowledge of the vulgar, and which are universally known under the denomination of mysteries.

The word μυστήριον is evidently deduced from μυς, but the origin of this last term is not altogether so obvious. The etymologies of it exhibited by the learned are various; some of them absurd and inconsistent, others foolish and futile. Instead of fatiguing our readers with a detail of these, which would be equally unentertaining and uninterseting, we shall only produce one, which to us appears to come nearest the truth. The mysteries under consideration at present were certainly imported into Greece from the East. In those regions, then, we ought of course to look for the etymology of the word. μυστήριον, in Hebrew, signifies "any place or thing hidden or concealed." As this word implies a kind of definition of the nature of the thing intended, and as it is one of the excellencies of original languages to apply vocables with this propriety, we find ourselves strongly inclined to affign the word μυστήριον as the root of the form μυστήριον, μυθάρκη.
Mysteries.

Mysteries of Eleusis, as revealed publicly in Crete.

Of all the legislators of antiquity, the Cretan alone was prudent enough to see and adopt this rational plan. Diodorus the Sicilian informs us, that the mysteries of Eleusis, Samothrace, &c., which were elsewhere buried in profound darkness, were among the Cretans taught publicly, and communicated to all the world.

Minos, however, was a successful legislator; and his interpolations with Jupiter Idaeus extended his influence and established his authority. He was not under the necessity of calling in the mysteries to his assistance; on the contrary, it is highly probable that the universal knowledge of the doctrines of the mysteries among his countrymen contributed in a considerable degree to facilitate his labour, and ensure his success.

The divine Author of the Christian economy, viewed in the light of a human legislator, saw the propriety of this procedure. Nothing was concealed in his institutions; nothing was veiled with mystery, or buried in darkness. The success was answerable to the wisdom of the plan. The million flocked to the evangelical standard: the gospel was preached to the poor, to the illiterate and the vulgar; and the means of mankind eagerly embraced its maxims. Wherever it prevailed, it produced civilization, morality, sobriety, loyalty, and every other private and social virtue.

Upon the supposition that the mysteries had contained and inculcated the principles and practices which the prelate supposes they did, the civilizers of mankind, legislators, magistrates, and princes, ought to have combined to make them public for the sake of their own tranquillity, and the more effectual support of their authority and influence.

Upon the whole, we are inclined to believe that the mysteries were the offspring of Egyptian priestcraft. They were instituted with a view to aggravate the order of men, to extend their influence, and enlarge their revenues. To accomplish those selfish projects, they applied every engine towards befotting the multitude with superflition and enthusiasm. They taught them to believe, that themselves were the distinguished favourites of heaven; and that celestial doctrines had been revealed to them, too holy to be communicated to the profane rabble, and too sublime to be comprehended by vulgar capacities. It is, we confess, exceedingly probable, that after the mysteries were instituted, and had acquired an excited reputation in the world, legislators, magistrates, judges, and potentates, joined in the imposture, with the same views and from the same principles. Princes and legislators, who found their advantage in overawing and adopting the multitude, readily adopted a plan which they could find so artfully fabricated to answer those very purposes. They had interest enough with the face-dotal (a) myriapogues, to induce them to allow them to participate in those venerable rites which had already established the authority of that description of men in whose hands they were deposited. The views of both parties were exactly congenial. The reception, the administration, and dependence of the million, were the ultimate objects of their ambition respectively.

Priests and princes were actuated by the same spirit. The combination was advantageous, and of consequence harmonious. For these reasons we have taken the liberty of differing from his lordship of Gloucester with respect to the persons who first instituted the secret mysteries of the Pagan religion.

Another writer, of considerable reputation in the Hypothetically republic of letters, is of opinion, that the mysteries of Mithras were entirely commemorative, that they were instituted with a view to preserve the remembrance of heroes and great men, who had been deified in consideration of their martial exploits, useful inventions, public virtues, and especially in consequence of the benefits by them conferred on their contemporaries.

According to him, the (c) mysteries of Mithras were established for this very purpose. It would be no difficult matter to prove that the Persian deity of that name was the fun, and that his name and insignia jointly ascertain the truth of this assertion. The same writer extends this observation to the mysteries of the Egyptians, Phcenicians, Greeks, Hetruscan; and in a word, to all the institutions of that species throughout the world. In opposition to this singular opinion, it may be argued that with some show of reason, that the mean and inessential method of preserving the memory of great and illustrious men generally adopted, was the establishing festivals, celebrating games, offering sacrifices, singing hymns, dances, &c. We can recollect no secret mysteries instituted for that purpose at least in their original import. If any usage of the commemorative kind was introduced, it was superinduced at some period posterior to the primary institution. At the same time, upon the supposition that the orgia of Bacchus were the same with those of the Egyptian Osiris, and that the mysteries of Ceres exhibited at Eleusis were copied from those of the Egyptian Isis, and allowing that the former was the fun, and the latter the moon; it will be difficult to find out the human persons which exploits, adventures, inventions,

(a) The Germans, Russians, and Scandinavians, who were never thoroughly civilized till the gospel was preached among them.

(b) The myriapogues were the ministers who added the chief part in celebrating the mysteries.

inventions, &c. were intended to be immortalized by those institutions. Upon the whole, the mysteries were performed in secret; they were intended to be communicated only to a few; of course, had they been instituted with a view to immortalize the memory of heroes and great men, the authors would have added the most foolish and inconsistent part imaginably.—Instead of transmitting the fame of their heroes with eclat to posterity, they would by this procedure have configned it to eternal oblivion.

We must then recur to our first position. The mysteries were the offspring of bigotry and priestcraft; they originated in Egypt, the native land of idolatry. In that country the priesthood ruled preeminent. The kings were ingrained into their body before they could ascend the throne. They were professor of a third part of all the land of Egypt. The facerdotal function was confined to one tribe, and was transmitted unalienably from father to son. All the orientals, but more especially the Egyptians, delighted in mysterious and allegorical doctrines. Every maxim of morality, every tenet of theology, every dogma of philosophy, was wrapt up in a veil of allegory and mysticisms. This propensity, no doubt, confpired with ambition and avarice to diffuse them to a dark and mysterious system of religion. Besides, the Egyptians were a gloomy race of men; they delighted in dark and solitary. Their sacred rites were generally celebrated with melancholy airs, weeping, and lamentation. This gloomy and unfaithful bias of mind must have stimulated them to a congenial mode of worship. In Egypt then we are to search for the origin of the mysteries. Both the nature of the institution and the genius of the people confirm this position; and historians, both ancient and modern, are agreed in admitting the certainty of the fact.

13. The Oris of Egypt, every body knows, was the original Bacchus; as the Isis of the fame country was the Ceres of the Greeks. The rites of Oris were performed with loud shrieks and lamentations when he was put into the coffin; and with the most extravagant mirth, when he was in a manner raised from the dead, or supposed to be found again. Their hymns were upon the whole always composed in melancholy affecting strains; and conforted of lamentations for the loss of Oris, the mystic flight of Bacchus, the wandering of Isis, and the sufferings of the gods. The Canaanites, who were a kindred tribe of the Mizrains or Egyptians, imitated them in their sacred rites. At Byblis, Berytus, Sidon, and afterwards at Tyre, they used particularly mournful dirges for the death of Adonis or Tammuz, who was the fame with the Egyptian Oris, i.e., the sun. The Egyptians, then, naturally inclined to gloom and severity, instituted a mode of worship congenial with their natural disposition of mind. The recells of the sun towards the southern hemisphere, was the death of Oris; the wanderings of Isis in search of her husband and brother, allegorically imported the longings of the earth for the return of the fruitful influence of the solar heat.

When that luminary returned towards the summer solstice, and grain, trees, fruits, herbs, and flowers adorned the face of nature, another festival was celebrated of a very different complexion from that of the former. In this season all Egypt was dissolved in the most extravagant mirth and folly. During the celebration of those festivals, the priests formed allegorical representations of the sun and the earth (n). They personified the one and the other, and allegorized their motions, aspects, relations, sympathies, accedes, recedes, &c. into real adventures, peregrinations, sufferings, contests, battles, victories, defeats, and so forth. These, in process of time, were held up to the vulgar as real occurrences; and these in a few ages became the most essential articles of the popular creed. From this source were derived the conquests of Dionysus or Bacchus, so beautifully exhibited by Nonnus in his Dionysiaca; the wanderings of Isis, wonderfully adorned by Azuchus; and the labours of Hercules, afterwards usurped by the Greeks.

Whether the Egyptians deified mortal men in the earliest ages has been much controverted. Jablentians deified departed heroes. Diocletianus affures us that they paid their monarchs a kind of divine adoration, even in their lifetime. Plutarch tells us plainly that some of opinion that. Plutarch, Isis, Oris, Horus, Anubis, Typhon, were once mortal personages, who were exalted into demons after their death. The Sicilian, in his history of Isis and Oris, Pan, Hermes, &c, plainly represents them as human personages; and informs us, that the Egyptians imagined, that after their decease they transmigrated into particular stars. From these authorities, we are inclined to believe that the Egyptians, as well as the other pagans, did actually deify persons who had distinguished themselves in their days of nature by prowess, wisdom, useful arts, and inventions. This was a constant practice among the Greeks, who probably learned it from the people in question.

The exploits of these heroes had been disguised by allegorical traditions and hieroglyphical representations. They had been magnified beyond all dimensions, in order to ascribe to them and to commemorate the objects of worship. The important events in the history of these heroes had been interlarded with the most extravagant fables, in order to gratify their propensity towards the marvellous. All these stories were developed in the mysteries. The catechumens (p) were informed of every particular relating to the birth, the life, the exploits, the adventures, the misfortunes, and decease of those demi-gods, and when, and by what means, they had attained to the high rank of divinities. At the same time we think it highly probable, that those demi-gods were represented in their state of exaltation and heavenly splendour. The magicians of Egypt were abundantly qualified for exhibiting angels in machines. The sons of virtuous men, who had not been eminent enough to merit the honour of deification, were shown in all the perfection of Elyan felicity; and perhaps the

\[(n) I\text{i}s, \text{among the Egyptians, sometimes signified the moon, and sometimes the earth.}\]
\[(p) \text{Catechumens were pupils who were learning the elements of any science.}\]
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the souls of tyrants, and of the children of (f) Typhon, were shown in Tartarus, suffering all the extremes of infernal punishment. From these exhibitions the mystagogues might naturally enough take occasion to read their pupils suitable lectures on the happy tendency of a virtuous conduct, and the diabolous and misery consequent upon a contrary course. They might set before them immortal renown, delineation, and elyium, on the one hand, and eternal infamy and misery on the other. This will probably be deemed the chief advantage accruing from this institution.

Besides the communications above mentioned, the catechumens were taught many secrets of physiology, of the nature of the phenomena of the world. This De Nat. Deorum* every where affirms, especially in his last book towards the end. Plutarch too informs us, that many of the Greek philosophers were of opinion, that most of the Egyptian fables were allegorical details of physical operations. Eusebius acquaints us §§ that the physiology, not only of the Greeks, but likewise of the barbarians, was nothing else but a kind of science of nature, a concealed and dark theology, involved in fable and fiction, whose hidden mysteries were so veiled over with enigmas and allegories, that the ignorant million were as little capable of comprehending what was said as what was suppressed in fable. This, says he, is apparent from the poems of Orpheus and the fables of the Phrygians and Egyptians. Dionysius of Halicarnassus likewise observes ¥ that the fables of the Greeks detail the operations of nature by allegories. Proclus § makes the fable observation concerning the people in question. The Egyptians, says he, taught the latent operations of nature by fables.

These physiological secrets were no doubt expounded to the initiated; and that the Egyptian priests were deeply skilled in physiological science, can scarce be questioned, if we believe that Janes and Jambres rivalled Moses with their enchantments. The preceding detail comprehends all that was revealed to the Egyptians in the original Egyptian mysteries. What articles might have been introduced afterwards we cannot pretend to determine.

Be that as it may, one thing is certain, namely that the vulgar were excluded from all those choice secrets, which were carefully reserved for the nobility and sacerdotal tribes. To them it was given to know the mysteries of the kingdom of darkness; but to those who were without, all was mystery and parable. While the laity fed on huffs, the clergy and quality feasted on royal dainties. The priests who had deciphered these allegories understood their original import, and bequeathed it as an inestimable legacy to their children. Here then we have the primary object of the mysteries, namely, to develop to the initiated the original and rational import of those allegorical and mythical doctrines which were tendered to the uninitiated, wrapped up in impenetrable allegory and obscurity.

To the former, these were communicated and explained: The latter were obliged to stand at an awful distance, and retire as the Procul, O procul astra profani, thundered in their ears.

These allegorical traditions originated in Egypt, (see Mythology). It was the general bias of the oriental genius. The Egyptians, however, according to the most authentic accounts (c), were the greatest proficients in that science. The original subject of these institutions were, we imagine, the articles we have specified above; but in progress of time, according to the natural course of things, numerous improvements were made, and many new rites, ceremonies, usages, and even doctrines were superinduced, which were utterly unknown to the original hierophants (h). Simplicity is for the most part one of the distinguishing characters of a new institution; but succeeding architects generally imagine that something is still wanting to complete the beauty, the regularity, the uniformity, the magnificence, and perhaps the convenience of the structure. Hence, at length, it comes to be so overloaded with adventitious drapery, that its primary elegance and symmetry is altogether defaced. This was the case with the earliest Egyptian mysteries. Their subject was at first simple and easy to be comprehended; in time it became complex, intricate, and unintelligible.

In order to celebrate those mysteries with the greater secrecy, their temples were so constructed as to favour the artifice of the priests. The rites, in which they used to execute their sacred functions, and to perform the rites and ceremonies of their religion, were subterraneous apartments, contrived with such wonderful skill and dexterity, that every thing that appeared in them breathed an air of solemn secrecy. Their walls were covered with hieroglyphic paintings and sculpture, and the altar was situated in the centre of the apartment. Modern* travellers have of late years discovered some vestiges of them, and bear witness to Shaw, For- the above description of those dark abodes (i). In cock's, &c. those subterraneous mansions, which the priests of that ingenious nation had planned, with the most consummate skill, the kings, princes, and great men of the state, encountered the dangers and hardships contrived to prove their prudence, fortitude, patience, abstinence &c. Those were appointed to try their merit; and by these the hierophants were enabled to decide whether or not they were duly qualified for receiving that benefit. Upon those occasions we may believe, abundance of those magical tricks were exhibited, for which the magicians of Egypt were so much celebrated among the ancients. The strange and astonishing sights, the alternate successions of light and dark, the hideous spectres exposed to view, the frightful howlings echoing through their infernal domes, the scenes of Tartarus and

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(f) Typhon was the evil genius, or devil of the Egyptians.

(c) As early as the age of Joseph, the Egyptians were skilled in the interpretations of dreams, divinations, &c. and in the age of Moses they were become wise men, magicians, &c.

(h) Hierophant imports a priest employed in explaining the doctrines, rites, &c. communicated to the initiates.

(i) See an excellent description of those subterraneous abodes, and of the process of probation carried on there, in a French romance, intitled The life of Setes.
and Elysium, exhibited alternately and in quick succession, must have made a deep and lasting impression on the mind of the instructed votary (x). These scenes we shall describe more fully in the sequel.

From the scenes exhibited in celebrating the Egyptian mysteries, especially those of Isis and Osiris, the Greeks seem to have copied their ideas of the infernal regions, and the subterranean mansions of departed souls. Many colonies of Egyptians settled in Greece. From these the mysteries (1), or most early bards of Greece, learned them imperfectly. Of course, we find Homer's account of the infernal regions, and of the state of departed souls, lame and incoherent. Succeeding bards obtained more full and more definite information. Euripides and Aristo-phanes seem to have paved the way for the prince of Roman poets, Plato* and some of the other philosophers have shown by their descriptions or allusions, that the whole apparatus of Tartarus and Elysium had become a hackneyed topic some centuries before Virgil was born. This incomparable poet borrowed his ideas from Homer, Aristophanes, Euripides, Plato, &c. These, under his plastic hand, in the first Aeneid, grew into a system beautiful, regular, uniform, and consistent. The materials he has employed were created to his hand; he had only to collect, polish, arrange, and connect them.—

The sentiments collected from the Platonic philosophy, and the inimitable episode copied from the annals of Rome, by the masterly skill which he has displayed in the application of them, form the chief excellencies of the piece. For the rest, he could well dispense with going to Elysium (m): every old women in Athens and Rome could repeat them.

Mysteries brought from Egypt into Persia and Greece

Egypt was then the native land of mysteries as well as of idolatry. Every god and goddess respectively had their mysteries; but as those of Isis and Osiris were the most celebrated, they of course became principal objects of pursuit as well as of imitation to the neighbouring nations. These, as is generally believed, were carried into Persia by Zoroastres, or Zorod, by whom they were consecrated to Mithras. On these we shall make some observations on the sequel.—Orpheus imported them into Thrace; Cadmus brought them into Baotia, where they were sacred to Bacchus. Inachus celebrated them at Argos in honour of Juno, the same with Isis (n); Cyneis in Cyprus, where they were dedicated to Venus. In Phrygia they were sacred to Cybele, the mother of the gods.

Our learned readers, who will probably reflect that the Egyptians were in ancient times inhospitable to strangers, will perhaps be surprised that this foolish and jealous people were so ready to communicate the secrets of their religion to foreigners. But they will please to recollect, that a great part of Greece was planted with colonies from Egypt, Phcenicia, Palatine, &c. This we could easily prove, did the bounds prescribed us admit such a digression. Orpheus, if not an Egyptian, was at least an oriental extraction. Inachus, Cadmus, and Melampus, are universally allowed to have been Egyptians. Frechthaus, in whose reign the Eleusinian mysteries were established, was an Egyptian by birth, or at least sprung from Egyptian ancestors. The Egyptians, then, in those early ages, did not view the Greeks in the light of aliens, but as a people nearly related either to themselves or the Phcenicians, who were their brethren. Upon this connection we imagine it was, that in later times most of the fages of Greece, especially Athens, found so hospitable a reception among that people. They probably viewed them in the light of propagandists; apolies and willing to disseminate their idolatrous rites. This observation, which might be supported by numberless authorities, did the nature of the present inquiry permit, will, we think, go a great way towards obviating the objection.

Although, as has been observed, every particular deity had his own peculiar mysterious sacred rites, yet of all others those of Mithras, Bacchus (o), and Ceres, were deemed the most august, and were most universally and most religiously celebrated. To these, therefore, we shall in a good measure confine ourselves upon this occasion. If our readers shall become intimately acquainted with these, they may readily dispence with the knowledge of the rest, which are, indeed, no more than echoes and emanations from these fources. We shall then, in the first place, present to our readers a brief sketch of the mysteries of Mithras.

Mithras, or according to the Perian, Mib, was one of the great gods of the Afiatics. His worship was for many ages confined to Persia. Afterwards, however, it was propagated so far and wide that some have imagined they had discovered vestiges of it even in Gaul. Mib, according to Dr Hyde*, signifies vet. Per. love, and likewise the Sun. If we might presume to faram. differ from so respectable an authority, we should conjecture that it is a cognate of the Hebrew word Mibir, "excellence, preludion." That there was an analogy between the Hebrew and old Perian, is generally admitted by the learned. Be that as it may, Mithras was the sun (r) among the Perians; and in honour of

(x) Persons who had descended into Tropthonius's vault were said to have been so terrified with shocking sights, that they never laughed during the remainder of their lives.

(1) These were tripping poets like our minstrels; who frequented the houses of the great men of Greece, and entertained the company upon public occasions with finging and tales of other times.

(o) Bishop Warburton has, with much ingenuity, and a vast profusion of reading, endeavoured to prove that Virgil borrowed the whole scenery of the first Aeneid from the sources mentioned in the text.

(n) Isis was the moon, and the original Juno was the same planet.

(p) Moehm, in his notes on Cudworth's Intellectual System, page 330, has taken much pains to prove that Mithras was a deified mortal; but we cannot agree with that learned man in this point.
of that luminary this institution was established. Mithras, according to Plutarch (q), was the middle god between Oramaz and Ariman, the two supreme divinities of Persia. But the fact is, the solar planet was the visible emblem of Oramaz, the good genius of the Persian tribes, and the same with the Osiris of the Egyptians. From these people, some have imagined that Zoroaftres (r), or Zerdust, borrowed his mysteries of Mithras. To this opinion we cannot give our assent, because the probationary trials to be undergone by the candidates among the former were much more savage and fanglinary than among the latter. — Both, however, were instituted in honour of the same deity, and probably the scenes exhibited, and the information communicated in both were analogous; a circumstance which perhaps gave birth to the opinion abovementioned.

The grand festival of Mithras was celebrated six days, in the middle of the month Mihr (s). Upon those days, it was lawful for the kings of Persia to get drunk and dance. On this festival we imagine, the candidates for initiation, having duly proved their vocation, were solemnly admitted to the participation of the mysteries.

Zoroaftres (r) worshipped Mithras, or the Sun, in a certain natural cave, which he formed into a temple, and filled up in a manner exactly mathematical. There Mithras was represented as presiding over the lower world with all the pomp of royal magnificence. In it too were seen the symbols of Mithras and of the nature, worshipped. This deity was sometimes represented as mounted on a bull, which he is breaking, and which he kills with a sword. On some bas reliefs still existing, he appears as a young man with his tiara turned upward, after the manner of the Persian kings. He is clothed with a short tunic and breeches, after the Persian fashion. Sometimes he wears a small cloak. By his sides are seen other human figures, with tiaras of the same fashion on their heads, but without cloaks. One of these figures commonly holds in his one hand a torch lifted up; in the other one turned downward. Sometimes over the cave is seen the chariots of the Sun and moon, and divers constellations, such as cancer, scorpion, &c.

In one of these caves the ceremonies of initiation were performed; but before the candidate could be admitted, he was forced to undergo a course of probationary exercises, so numerous and so rigorous that very few had courage and fortitude enough to go through them. He was obliged to live a life of virtue and abstinence for a space of seven years previous to the period of his initiation. Some months before he it was obliged to submit to a long and austere fast, which continued fifty days. He was to retire several days to a deep and dark dungeon, where he was successively exposed to all the extremes of heat and cold. Meanwhile he frequently underwent the baptismo, which the priests applied without mercy. Some say this purification continued two whole days, and was repeated no less than 15 times. In the course of these probationary exercises, the candidate was generally reduced to a skeleton; and we are told, that there have been several inferences of persons who have perished in the attempt.

Upon the eve of the initiation, the aspirant was obliged to brace his armour, in order to encounter the fiercest giants and savage monsters. In those spacious subterranean mansions a mock hunting was exhibited. The priests and all the subordinate officers of the temple, transformed into lions, tigers, leopards, bears, serpents, and other savage creatures, attacked him with loud howlings, roaring, and yelling, and every instance of fierce fury. In those mock combats, the hero was often in danger of being really worried, and always came off with bruises and wounds. Lampridius informs us, that when the emperor Commodus was initiated, he actually carried the joke too far, and butchered one of the priests, who attacked him in the figure of a wild beast. The Persians worshipped Mithras or the Sun by a perpetual fire: hence the votary was obliged to undergo a trial; that is, to pass seven times through the sacred fire, and each time to plunge himself into cold water. Some have made these probationary penances amount to 80; others have thought that they were in all only 8. As we find no good authority for either of these numbers, we think ourselves at liberty to hazard the following conjecture: The number seven was deemed sacred over all the casts. The Mythriac penances we imagine were either seven, or if they exceeded it, were regulated by seven repetitions of that number. The candidate having undergone all these torturing trials with becoming patience and fortitude, was declared a proper initiate. But before his admission he was obliged to bind himself by the most solemn oath, with horrible imprecations annexed, never to divulge any single article of all that he had learnt, nor should be communicated to him in the course of his initiation.

What inaudible or ineffable secrets were imparted to reveal the initiated, it is impossible at this distance of time to discover with any tolerable degree of certainty. We mysteries may, however, rest assured that the most authentic tradition concerning the origin of the universe; the nature, attributes, perfections, and operations, of Ormazd: the haftful influences of Ariman; and the "

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(q) Isis and Osiris, page 369. l. 20. from the bottom. This philosopher makes Zoroaftres, according to some, 5000 years prior to the Trojan war. This date is certainly extravagant. We cannot, however, agree with some moderns, who make him contemporary with Darius Hyllapés, the immediate succour of Cambyses, because it contradicts all antiquity.

(r) M. Silowette, Differ. V. page 17. affirms that Zoroaftres was initiated among the Egyptians.

(s) The month Mihr began September 30, and ended October 30.

(t) See Dr. Hyde de Rét vet. Perc. page 16, 17. Mr Bryant's Anal. vol. i. page 232. Porphyry, de autro Nymph. page 254. This philosopher often mentions the cave of Mithras, and always attributes the institution of his rites to Zoroaftres.
nigh effects of the government of Mithras, were unfolded and incalculable. The secret phenomena of nature, as far as they had been discovered by the magi, were likewise exhibited; and the application of their effects, to astonish and delude the vulgar, were taught both in theory and practice. The exercise of public and private virtues was warmly recommended; and vice represented in the most odious and frightful colours. Both these injunctions were, we may suppose, enforced by a display of the pleasures of Elysium and the pains of Tartarus, as has been observed above in describing the mysteries of the Egyptians.

Those initiations are mentioned by Lampridius in the life of Commodus, and likewise by Justin, and Tertullian, who both flourished in the second century. The last of these two speaks of a kind of baptism, which washed from the souls of the initiated all the stains which they had contracted during the course of their lives prior to their initiation. He at the same time mentions a particular mark, which was impressed upon them (v), of an offering of bread, and an emblem of the resurrection: which particulars, however, he does not describe in detail. In that offering, which was accompanied with a certain form of prayer, a vessel of water was offered up with the bread. The same father elsewhere informs us, that there was sent to the initiated a crown suspended on the point of a sword; but that they were taught to say, Mithras is my crown. By this answer was intimated, that they looked upon the service of that deity as their chief honour and ornament.

After that the Telete (x) were finished, the pupil was brought out of the cave or temple, and with great solemnity proclaimed a lion of Mithras (y); a title which imported strength and intrepidity courage in the service of the deity. They were now consecrated to the god, and were supposed to be under his immediate protection; an idea which of course animated them to the most daring and dangerous enterprises.

The worship of Mithras was introduced into the Roman empire towards the end of the republic, where it made very rapid progress. When Christianity began to make a figure in the empire, the champions for paganism thought of proposing to men the worship of this power of benevolence, in order to counterbalance or annihilate that worship which the Christians paid to Jesus Christ the true Sun of righteousness. But this mode was soon abolished, together with the other rites of paganism. The Perian grandees often affected names compounded with Mithras; hence Mithridates, Mithrobazane, &c.: Hence too, the precious stone called Mithridat *, which by the reflection of the sun sparkled with a variety of colours. There is likewise a certain pearl of many different colours, which they call Mithras. It is found among the mountains near the Red Sea; and when exposed to the sun, it sparkles with a variety of dyes. We find likewise a king of Egypt of that name who reigned at Heliopolis; who being commanded in a dream to erect an obelisk to the solar deity, reared a most prodigious one in the neighbourhood of that city.

The votaries of Mithras pretended that he was sprung from a rock, and that therefore the place where the mysteries were communicated to the initiated was always a cave. Many different reasons have been assigned for the origin of this rock-born deity, most of which appear to be unsatisfactory. If our readers will not belive the probability of this conjecture, we should beg leave to remit them to the learned Mr Brant's Anal. sa of Mythology, where they will find this point discussed with deep research and wonderful ingenuity. Whatever may have been the origin of this opinion with relation to the birth of Mithras, it is certain that some reverence to rocks and caves was kept up a long time even after the establishment of Christianity. Hence the prohibition given to some of the proleynes to that religion that they should no more presume to offer up their prayers ad petras at the rocks (a).

We shall conclude our account of the mysteries of Mithras with a passage from Mr Anquetil, to whom are so much indebted for what knowledge we have of the Ptolemaic theology, and in which the functions of that deity are briefly and comprehensively delineated. "The peculiar functions of Mithras are to fight continually against Ahriman and the impure army of evil genii, whose constant employment is to scatter terror and desolation over the universe: to protect the frame of nature from the demons and their productions. For this purpose he is furnished with a thousand ears and a thousand eyes, and traverses the space between heaven and earth,

(v) In allusion to this practise of imprinting a sacred mark, probably on the forehead of the initiated, we find the injunction to the angel, Ezek. chap. ix. ver. 4, and the Revelation 14:1.

(x) The mysteries were called Telete, which imports, "the rites which confer perfection."

(y) Tertull. adv. mar. p. 55. The priests of Mithras were called the lions of Mithras, and his priests foci liones: some say hyenas. The other inferior ministers were called eagles, hawks, ravens, &c., and on their festivals they wore masks corresponding to their titles, after the Egyptian manner, where the priests appeared at the ceremonies with masks resembling the heads of lions, apes, dogs, &c., a circumstance which furnishes a presumption that the mysteries of Mithras were of Egyptian original.

(z) Our Saviour probably alludes to this emblem, when he talks of building his church on a rock, and adds, that the gates of hell should not prevail against it.

(a) The Caledonian druids seem to have regarded certain stones with a superstitious veneration, in which the Catholics initiated them. There are in several places of Scotland large stones, which the vulgar call leopard stones, i.e. we imagine, leper.
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earth his hands armed with a club or mace. Mithras gives to the earth light and fun; he traces a course for the waters; he gives to men corn, pastures, and children; to the world virtuous kings and warriors; maintains harmony, upon earth, watches over the law, &c." As the history of Mithras, and the nature of his mysteries, are not generally known, we imagined it would be agreeable to many of our readers to have the most important articles relating to that subject laid before them as it were in detail.

We now proceed to the orgia, or mysteries of Bacchus, which we shall introduce with a brief history of that deity. The original Dionysus or Bacchus was the Osiris of the Egyptians, which last was the Sun (a). Whether there was an Egyptian monarch of that name, as Diodorus Siculus affirms $, has no manner of connection with the present disquisition. The Greek name of that deity, plainly oriental, being compounded of Οσίρις, "right," and νάφας or νάφα, in the Aeolic dialect νάφα, "a prince." This name was imported from the east by Orpheus, Cadmus, or by whoever else communicated the worship of Osiris to the Greeks. That the Dionysus of the Greeks was the same with the Osiris of the Egyptians, is universally allowed. Herodotus tells us expressly $, that Osiris is Dionysus in the Greek language; Martianus Capellus, quoted above, expresses the very same idea $. The original Osiris was the fun; but the Dionysus or Bacchus of the Greeks was the same with the Osiris of the Egyptians; therefore the Bacchus or Dionysus of the Greeks was likewise the Osiris of the same name.

The name Osiris has much embarrassed critics and etymologists. The learned Jablonski $, instead of delineating the character, attributes, operations, adventures, exploits, and peculiar department assigned this deity by his votaries, has spent much of his pains on trying to investigate the etymology of his name. If it is granted, which is highly probable, that the Hebrew and Egyptian tongues are cognate dialects, we should imagine that it is actually the Chaldean Osiris of the former language, which imports, "to make rich, to become rich." Indeed the words Osiris and Isis were not the vulgar names of the sun and moon among the Egyptians, but only epithets importing their qualities. The name of the fun among that people was Phric or Phry, and that of the moon Isis, whence the Greek Is. The term Osiris was applied both to the sun and to the river Nile; both which by their influence contributed respectively to enrich and fertilize the land of Egypt.

It was a general custom among the orientals to denominate their princes and great men from their gods, deities, heroes, &c. When the former were advanced to divine honours, they were in process of time confounded with their archetypes. The original divinities were forgotten, and their upstart deities usurped their place and prerogatives. In the earliest pe-


(c) Men and women dressed in the habits of those rural deities.

(d) Many have thought this expedition fabulous; but the numberless monuments of Egyptian architecture, sculpture, statuary, lately discovered in the eft, confirm it.
The mysteries of Isis and Osiris established in commemoration of those adventures.

Ofiris was rescued from the banks of the Nile by her husband, who, of course, carried her back to Egypt; but the mischiefous Typhon, ever on watch, found her on the banks of the Nile; and having robbed her of her charge, cut the body into 14 parts, and flattered them up and down. Now, once more, according to the fable, Isis set out in quest of those parts, all of which, only one excepted, she found and inferred in the place where she found them: and hence the many tombs of Osiris in that country. These tombs were denominated tepelines by the natives. Many other fabulous adventures were ascribed to those two personages, which is not our province to enumerate at present. If our readers should wish to be more minutely informed on this subject, they may have recourse to the authors mentioned in the last quoted author, or to the learned Mr Bryant’s Analysis of Ancient Mythology, and M. Cour de Gebelin, where they will find matter enough to gratify their curiosity.

To commemorate those adventures, the mysteries of Isis and Osiris were establised; and from them both those of Bacchus and Ceres, among the Greeks were derived. Of the Egyptian solemnity, we have an exact epitome of the mysteries of Isis and Osiris. They observe annually, with deep lamentations and shaved heads, the catastrophe of Osiris over a buried statue of that monarch. They beat their breasts, mangle their arms; tear open the scars of their former wounds; that by annual lamentations the catastrophe of his miserable and fatal death may be revived in their minds. When they have practised these things a certain number of days, then they pretend that they have found the remains of his mangled body; and having found them, their forrows are lulled asleep, and they break out into immediate joy.” What Maxims of morality, secrets of physiognomy, or phenomena of astronony, were couched under this allegorical process, is not our business to investigate in this place. We shall only observe, that, in all probability, Isis and Osiris were sovereigns of Egypt at a very early period: that they had conferred many signal benefits on their subjects, who, influenced by a sense of gratitude, paid them divine honours after their decease; that in process of time they were confounded with the sun and the moon; and that their adventures were at length magnified beyond all credibility, interlarded with fables, and allegories, and employed in the mysteries as channels to convey a variety of instructions to the initiated.

Be that as it may, it is certain that the very same mode of worship was established at Byblus, and in after ages transferred to Tyre. The Mizraim and Cannaanim were nearly connected by blood, and their religious ceremonies were derived from the very same source. By what medium the worship of Osiris at Abydus and Tyre was connected, we shall leave others to explain; we shall only observe, that among the Phoenicians this deity obtained the names Adonis and Bacchus. The former is rather an epithet than a name; the latter is evidently an allusion to the weeping and lamentation (e) with which the rites were performed. We find another name of that divinity mentioned in Scripture (r), but that term is plainly of Egyptian original; we shall now proceed to the mysteries of Osiris as they were celebrated among the Greeks and Thracians, under the name of the Original of Dionysus or Bacchus.

Orpheus the celebrated Thracian philosopher had travelled into Egypt in quest of knowledge: and from that country, according to the most authentic accounts, he imported the bacchanalian rites and institutions. Some have affirmed that this same Orpheus being intimately acquainted with the family of Cadmus, communicated these rites to them, and endeavoured to transfer them to the grandion of that hero, which grandion became afterwards the Greecian Bacchus. It is, however, we think, much more probable, that those rites were imported from Egypt or Phoenicia, by (c) Cadmus himself, who was a native of the former country, and is told to have spent some time in the latter, before he emigrated in quest of a settlement in Bacotia. It is said that Semele, the daughter of Cadmus, and the mother of the Grecian Bacchus, was struck with lightning at the very instant of his birth. The child, was in all probability named Bacchus, from the sorrow and lamentation this melancholy accident had occasioned in the family. Cadmus, in order to conceal the dishonour of his daughter, might, we imagine, convey away his infant grandion to some of his relations in Phoenicia or

(c) For the conquests and adventures of Osiris and Isis, we must fend our learned readers to Diod. Sic. Bib, i. i, and Plut. Isis and Osiris, p. 256 et seq. which we have been obliged to abridge, in consequence of the limits prescribed us.

(f) Adonis is evidently the Hebrew Adoni, “my lord,” and imports the sovereignty of the deity.

(g) Bacchus is derived from the Phoenician word bophab, “to weep.” This was the name embraced by the Romans.

(h) Exek chap. 8. ver. 14. lammas is the name of one of the months of the Egyptian year.

(i) Cadmus and Melampus, who were both Egyptians, introduced the Bacchanalia into Greece. The Egyptian or oriental name of Bacchus was Dinys, that is “the prince of light.” Cadmus had learned the name Bacchus from the Phoenicians.

(k) We have omitted the immense farrago of fable relating to the connexion between Jupiter and Semele, as of little importance to our readers.
or Egypt. There he was educated and instructed in all the mysteries of Isis and Osiris, and at the same time initiated in all the magical or juggling tricks of the Egyptian priests and Hierophants. This accomplished, when he arrived at manhood he returned to Thebes with the traditional retinue of the original deity of the same name; and claimed divine honours accordingly. This claim, however, was not admitted without much opposition; Pentheus, another grandson of Cadmus, was torn to pieces by the frantic women. Some fan of Cadmus, was privy to the whole plan, when he arrived out of this combination was formed a species of adventures disgraceful to human nature, absurd, and inconsistent. Indeed the younger or Théban Bacchus seems to have been a monster of debauchery; whereas the Egyptian is represented as a person of an opposite character. Of course the mysteries of the former were attended with the most shocking abominations.

The mysteries, as has been observed above, were first celebrated at Thebes the capital of Boeotia, under the auspices of the family of Cadmus. From this country they gradually found their way into Greece, and all the neighbouring parts of Europe. They were celebrated once every three years (1), because at the end of three years Osiris returned from his Indian expedition. As the Greeks had impudently transferred the actions of the Egyptian hero to their upstart divinity, the same period of time was observed for the celebration of those rites in Greece that had been ordained for the same purpose in Egypt.

When the day appointed for the celebration of the orgia (a) approached, the priests issued a proclamation, enjoining all the initiated to equip themselves according to the ritual, and attend the procession on that day appointed. The votaries were to dress themselves in coats of deer-skins, to loose the fillets of their hair, to cover their legs with the same stuff with their coats, and to arm themselves with thyrsi, which were a kind of spears wholly of wood entwined with leaves and twigs of the vine or ivy. It is said that the Bacchanalians, especially the Thracians, used often to quarrel and commit murder in their drunken revels: and that in order to prevent those unlucky accidents, a law was enacted, that the votaries instead of real spears should arm themselves with those sham weapons which were comparatively inoffensive. The figure of the deity, which was always covered with vine or ivy leaves, was now taken down from its pedestal, and elevated on the shoulders of the priest. The cavalcade then proceeded nearly in the following manner:

First of all, hymns were chanted in honour of Bacchus, who was called the \textit{Power of dance, saltis, and jells}; while at the same time he was deemed equally qualified for the exploits of war and heroism. Horace, in some of his dithyrambic odes, has concisely pointed out the subjects of these Bacchalian songs. In the collection of hymns fabulously attributed to Orpheus, we find several addressed to this deity (p).

\begin{itemize}
  \item \textit{Nannus}, an Egyptian of Pentapolis, has collected all the fabulous adventures of Bacchus, and exhibited them in a beautiful but incorrect poem: To this we must refer our learned reader. Of the Dionysiacs we have a most judicious sketch, \textit{Greeks. Calend. p. 553. et al.}
  \item \textit{Mysteries of Bacchus}. (a) The orgia belonged to all the Myrones, but to those of Bacchus in a peculiar manner.
  \item \textit{Telexerion}. (b) According to Clem. Alexander. Cohort. p. 12. Pott. the word \textit{orgia} is derived from \textit{argos}, which signifies "anger," and originated from the resentment of Ceres against Jupiter, in consequence of a most outrageous insult he had offered her with force. We should rather imagine it derived from the Hebrew word \textit{argos}, signifying a "cheet or coffer," alluding to the casket which contained the sacred ymb is of the god.
  \item The Egyptians or Phenicians might write and pronounce, \textit{argos, argos}, or in some manner nearly resembling \textit{orgia}.
  \item \textit{Pentheus}, another grandson of Cadmus, was privy to the whole plan.
\end{itemize}
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As it may, we learn from Porphyry*, that in the island of Chios they used to sacrifice a man to Bacchus, and that they used to mangle and tear him limb from limb.

This was no doubt practised in commemoration of the catastrophe mentioned above.

The orgia of this Pagan god were originally simple enough; but this unfacilitated mode was of no long continuance, for riches soon introduced luxury, which quickly infected even the ceremonies of religion. On the day set apart for this solemnity, men and women crowned with ivy, their hair dishevelled, and their bodies almost naked, ran about the streets, roaring aloud. Books (v) of Bacchus. In this rout were to be seen people intoxicated at once with wine and enthusiasm, dressed like Satyrs, Fauns, and Silenus, in such scandalous postures and attitudes, with so little regard to modesty and even common decency, that we are persuaded our readers will readily enough forgive our omitting to describe them. Next followed a company mounted upon asse, attended by Fauns, Bacchanauls, Thyades, Mimallonides, Naiads, Tityri, &c. who made the adjacent places echo to their frantic shrieks and howlings. After this tumultuous herd were carried the statues of victory and altars in form of vine-sheds crowned with ivy, smoking with incense and other aromatics. Then appeared several chariots loaded with thyrsi, arms, garlands, cauls, pitchers, and other vases, tripods, and vases. The chariots were followed by young virgins of quality, who carried the baskets and little boxes, which in general contained the mysterious articles above enumerated. These, from their office, were called ephiphone. The phallophori (x) followed them, with a chorus of Itholphophori habited like Fauns, counterfeiting drunk persons, singing in honour of Bacchus songs and dances suited to the occasion. The procession was closed by a troop of Bacchanalians crowned with ivy, interwoven with branches of yew and with serpents*. Upon some occasions, at those scandalous festivals, naked women whipped themselves, and tore their skin in a most barbarous manner. The procession terminated on mount Citheron, where it fell out from the Thébes; and in other places, in some distant unfrequented desert, where the votaries practised every species of debauchery with fever.
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cercy and impunity. Orpheus saw the degeneracy of those ceremonies; and in endeavouring to reform them he probably lost his life. Pentheus suffered in the like attempt, being torn in pieces by the Bacchantines on the mount Citheron, among whom were his own mother and his aunts. The Greeks, who were an airy jovial people, seem to have paid little regard to the plaintive part of the orgia; or rather, we believe, they acted with howling and frantic exclamations, often enhanced by a combination of drunkenness, ecstacy, and enthusiastic fury.

What secrets, religious, moral, political, or physical were communicated to the votaries, it is impossible to determine with any degree of certainty.—One thing we may admit, namely, that the doctrines discovered and inculcated in the orgia, were originally the very same which the apostles of the sect had insinuated in Egypt and Phoenicia; and of which we have given a brief account near the beginning of this article. It is however probable that the famous or Theban Bacchus had superadded a great deal of his own invention, which, we may believe, was not altogether fo found and fabulous as the original doctrine. However that may be, the initiates were made to believe that they were to derive wonderful advantages from the participation of these rites, both in this life and that which is to come. Of this, however, we shall talk more at length by and by in our account of the Eleusinian mysteries.

To detail the etymology of the names of this Pagan deity, the fables relating to his birth, his education, his transformations, his wars, peregrinations, adventures, the various and multiform rites with which he was worshipped, would swell this article to a most immoderate size. If any of our readers should wish to be more minutely and more accurately acquainted with this subject, we must beg leave to remit them to Diod. Sic. Apollod. Bibl. Euripid. Aristophane Ran. Nonn Dionys. and among the moderns, to Bau. Mythol. Voss. de. orig. Idol. Mont. Fourmount, Reflexions sur l'origine anciens peuples, Mr Bryant's Analyzy: and especially to Mons Cour de Gbelin, Calendries ou Almanach. That prince of etymologists, in his account of the festival of Bacchus, has given a most acute and ingenious explication of the names and epithets of that deity. For our part, we have endeavoured to collate and exhibit such as we judged most important, most entertaining, and most instructive, to the less enlightened classes of our readers.

We now proceed to the Eleusinian mysteries, which, among the ancient Greeks and Romans, were treated with a superior degree of awe and veneration. These were instituted in honour of Ceres, the goddess of corn; who, according to the most authentic accounts, was the Isis of the Egyptians. The mysteries of Olymivs and Isis have been hinted at in the preceding part of this article. They were originally instituted in honour of the sun and moon, and afterwards conferred on an Egyptian prince and princess, who, in consequence of their merits, had been deified by that people. We know of no more exact and brilliant description of the ceremonies of that goddess, in the most polished ages of the Egyptian superstition, than what we meet with in the witty and florid Apuleius*, to which we must take the liberty to refer our more curious readers. Our business at present shall be to try to investigate by what means, and upon what occasion those mysteries were introduced into Attica, and established at Eleusis. A passage from Diodorus Siculus §, which we shall here translate, will, we think, throw no inconsiderable light on that abstruse part of the subject.

"In like manner with him (Cecrops), says that judicious historian, they tell us, that Eretheus, a prince of Egyptian extraction, once reigned at Athens. Of this fact they produce the following evidence:—A searing drought, during the reign of this prince, On what prevaild over almost all the habitable world, except occasion introduced into Attica."

We now proceed to the Eleusinian mysteries, which, among the ancient Greeks and Romans, were treated with a superior degree of awe and veneration. These were instituted in honour of Ceres, the goddess of corn; who, according to the most authentic accounts, was the Isis of the Egyptians. The mysteries of Olymivs and Isis have been hinted at in the preceding part of this article. They were originally instituted in honour of the sun and moon, and afterwards conferred on an Egyptian prince and princess, who, in consequence of their merits, had been deified by that people. We know of no more exact and brilliant description of the ceremonies of that goddess, in the most polished ages of the Egyptian superstition, than what we meet with in the witty and florid Apuleius*, to which we must take the liberty to refer our more curious readers. Our business at present shall be to try to investigate by what means, and upon what occasion those mysteries were introduced into Attica, and established at Eleusis. A passage from Diodorus Siculus §, which we shall here translate, will, we think, throw no inconsiderable light on that abstruse part of the subject.

Here then we have the whole mystery of the arrival of Ceres in Attica, and the institution of her mystery at Eleusis unveiled. The whole is evidently an oriental allegory. The fruits of the earth had been destroyed by a long course of drought; Egypt, by its peculiar situation, had been preferred from that dreadful calamity. Eretheus, in consequence of his relation to the Egyptians, imported from their country a quantity of grain, not only sufficient for the consumption of his own subjects, but also a great overplus to export to other parts of Greece, Sicily, Italy, Spain, &c. Triptolemus, another Egyptian, was appointed by Eretheus to export this superfluous store. That hero, according to Pherecydes, was the son of Oceanus and Tellus, that is, of the sea and the earth; he caused his parents were not known, and because he came to Eleusis by sea. The ship in which he sailed, after he had distributed his corn to the western parts of the world, was decorated with the figure of a winged dragon: therefore, in the allegorical style of his country he was said to be wafted through the air in a chariot drawn by dragons. Those creatures, every body knows, were held sacred by the Egyptians.

Wherever Triptolemus disposed of his corn thither were extended the wanderings of Ceres. In order to elucidate
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At this point, we must observe that along with the grain imported from Egypt, Erebuthus, or Triptolemus, or both transported into Attica a cargo of priests and priestesses from the temples of Bubiris, a city which lay in the 5th centre of the Delta, where the goddess Isis had a number of chapels erected for her worship. The presidents of these ceremonies, like all other bigots, gladly laid hold on this opportunity of propagating their religious rites, and disseminating the worship of the deities of their country. The Egyptian priests were zealous in propagating the dogmas of their superstition, abundantly evident from the extensive spreading of their rites and ceremonies over almost all Asia and a considerable part of Europe. The Greek and Roman deity is known to have originated from them; and numberless monuments of their impious worship are still extant in Persia, India, Japan, Tartary, &c. Our inference then is, that the worship of Isis was introduced into every country where Triptolemus sold or disposed of his commodities. Hence the wanderings of Ceres in search of her daughter Proserpine, who is generally called Core. The famine occasioned by the drought destroying the fruits of the ground, imports the loss of Proserpine. The restoration of the corn in various parts of the earth, by fresh supplies from Egypt, from time to time, imports the wanderings of Ceres in quest of Proserpine. The whole process is an oriental allegory. The dis-appearing of the fruits of the earth, of which Proserpine, or Persephone (y), or Paryphone (v), is the emblem, is the allegorical rape of that goddess. She was seized and carried off by Pluto, sovereign of the infernal regions. The seed committed to the earth in that dry season appeared no more, and was, consequently, laid to dwell under ground with Pluto. It was then that Ceres, that is, corn imported from Egypt, set out in quest of her daughter. Again, when the earth recovered its prime fertility, the Core, or maid, was found by her mother Ceres, that is, the earth; for Isis, among the Egyptians, frequently signified the earth. The wanderings of Isis in search of Olyris furnished the model for the pereginations of Ceres.

Ceres, the Roman name of the goddess of corn, was unknown to the modern Greeks, They always denominated her Damater (z), which is rather an epithet than a proper name. The Greeks, who always affected to use only names of originals, we think suppressed the Egyptian name on purpose, to conceal the country of that deity. As a proof of the probability of this conjecture it may be observed, that they metamorphosed the wanderings of Isis in search of Olyris into the pereginations of Ceres in quest of Proserpine. The Romans, who were less ambitious of the character of originality, retained one of her oriental names (a). Ceres, says Diodorus, appeared thrice in Attica during the reign of Erebuthus; which seems to import, that fleets loaded with corn had thrice arrived in that country from Egypt during that period.

Cecrops the first king of Attica had established the worship of the Saitic Athena or Minerva in that region and consecrated his capital to that deity. Erebuthus, in his turn introduced the worship of Isis or Damater who in all appearance was the tutelar deity of Bubiris his native city. The subjets of Cecrops were a colony of Saites, and readily embraced the worship of Minerva; but the aborigines of that district being accustomed to a maritime, perhaps to a piratical course of life, were more inclined to consecrate their city to Neptune the god of the sea, and to constitute him their guardian and protector. Cecrops by a stratagem secured the preference to Minerva his favourite divinity. Erebuthus, in order to give equal importance to his patrons, had the address to institute the Eleusinian mysteries; and to accomplish his design laid hold on the opportunity abovementioned. This appears to us the most probable account of the origin and institution of the Eleusinian mysteries; for which the Sicilian historian has indeed furnished the clue. We shall now proceed to detail some other circumstances which attended the original institution of these far-famed ceremonies.

The archpriests who perforated the newly imported deity was entertained by one Celeus (4), who was either viceroy of that petty district of which Eleusis was the capital, or some considerable personage in that city or its neighbourhood. Upon her immediate arrival, according to the fabulous relations of the Greeks, a farce was acted not altogether suitable to the character of a goddess whose mysteries were one day to be deemed so sacred and awful. These coarse receptions, and other indecencies attending the first appearance of the goddess, that is the Egyptian dame who assumed her character, were copied from the like unhallowed modes of behaviour practised on occasion of the solemn proceedings of her native country. These solemnities, or coarse jokes, had an allegorical signification in Egypt; and among the most ancient Greeks the very same spirit was universally diffused by the oriental colonists who from time to time arrived and settled among them. In process of time they abandoned the figurative and allegorical style, in consequence of their acquaintance with philosophy and abstract reasoning.

(y) This word seems to be formed of two Hebrew terms, pler "fruit," and tzaphon or naphon, "abundance, recondite, reconditius, recondite, recondite;"

(a) Damater is compounded of the Chaldæan particle de "the," and mäter "mother." As Isis often signified the earth, the Greeks naturally adopted that title; because, according to them, that element is the mother of all living. In the very same manner they disdained the word Juna, an original title of the moon; and substituted Hera, which intimates "mistress or lady."

(A) According to some of the Latin etymologists, Ceres, or rather Ceres, is derived from gena "to bear, to carry," because the earth bears all things; or because that element is the general fruit-bearer. But as this term came to Italy immediately from the east, and not by the medium of Greece, we would rather incline to adopt an oriental etymology. The Hebrew word cheres signifies arare "to plow:" a name naturally applicable to the goddess of husbandry.
reasoning. In the ceremonies of religion, however, the same allegorical and typical representations which had been imported from the east were retained; but the Greek hierophants in a short time lost every idea of their latent import, and religious, moral, or physical interpretation. Accordingly, this unlearned re-encounter between Ceres and Banbo (a), or Jambhe, was retained in the mysteries, though we think it was copied from Egypt, as was said above, where even that obscene action was probably an allegorical representation of something very different, from what appeared to the Greeks.

At the same time that Ceres arrived in Attica, Bacchus likewise made his appearance in that country. He was entertained by one Ierous; whom, as a reward for his hospitality, he instructed in the art of cultivating the vine, and the method of manufacturing wine. Thus it appears that both agriculture and the art of managing the vintage were introduced into Athens much about the same time. Ceres was no other than a priestess of Isis; Bacchus was no doubt a priest of Osiris. The arrival of these two personages from Egypt, with a number of inferior priests in their train, produced a memorable revolution in Athens, both with respect to life, manners, and religion. The sacred rites of Isis, afterwards so famous under the name of the Eleusinian mysteries, date their institution from this period.

When this company of propagandists arrived at Eleusis, they were entertained by some of the most respectable persons who then inhabited that district. Their names, according to Clem. Alexand., were Banbo, Dyfalus, Tripotlemus, Eumolpus, and Eubulus. From Eumolpus were descended a race of priests called Eumolpides, who figured at Athens many ages after. Tripotlemus was an ox-herd, Eumolpus a shepherd, and Eubulus a wine-herd. These were the first apostles of the Eleusinian mysteries. They were instructed by the Egyptian missionaries; and they, in their turn, instructed their successors. Ereuteus, or, as some say, Pandion, continued the sanctuary, and built a small temple for its accommodation in Eleusis, a city of Attica, a few miles west of Athens, and originally one of the twelve districts into which that territory was divided. Here then we have arrived at the scene of those renowned mysteries, which for the space of near 2000 years were the pride of Athens and the wonder of the world.

The mysteries were divided into the greater and lesser. The latter were celebrated at Agrae, a small town on the river Ilyius; the former were celebrated in the month which the Athenians called Boedromion (c); the latter in the month Anthesterion (d). The lesser mysteries, according to the fabulous legends of the Greeks, were instituted in favour of the celebrated Hercules. That hero being commanded by Eurytheus to bring up Cerberus from the infernal regions, was defirous of being initiated in the Eleusinian mysteries before he engaged in that perilous undertaking. He addressed himself to Ennomus the hierophant for that purpose. There was a law among the Eleusinians prohibiting the initiation of foreigners. The priest not daring to refuse the benefit to Hercules, who was both a friend and benefactor to the Athenians, advised the hero to get himself adopted by a native of the place, and so elude the force of the law. He was accordingly adopted by one Pyollus, and so was initiated in the lesser mysteries which were instituted for the first time upon that occasion. This account has all the air of a fable. The lesser mysteries were initiated by way of preparation for the greater.

The person who was to be initiated in the lesser mysteries, as well as in the greater, was obliged to undergo a previous to initiation. Besides, he was to bind himself by the most solemn vows not to divulge any part of the mysteries. At the same time, however, according to the original institution, to be a person of unblemished moral character. These were preliminaries indispensably necessary in order to admission. A bull was sacrificed to Jupiter, and the hide of that animal called by a peculiar name (dic kebolos), was carefully preserved and carried to Eleusis, where it was spread under the feet of the initiated. The candidate was then purified by bathing in the river Ilyius, by associations with salt water or salt, with laurel barley, and passing through the fire: all which rites were attended with incantations and other usages equally insignificant and ridiculous. Last of all, a young sow was sacrificed to Ceres; and this animal, according to the ritual, belonged to be with pigs; and before it was killed it was to be walked in Cantharus, one of the three harbours which formed the Piraeus.

All these ceremonies duly performed, the candidate was carried into the hall appointed for the purpose of initiation. There he was taught the first elements of those arcana which were afterwards to be more fully and more clearly revealed in the more august mysteries of Eleusis. The pupils at Agrae were called Mylai, which may intimate probationers; whereas those of Eleusis were denominated Edfcles, importing that they saw as they were seen.

The lesser mysteries were divided into several stages. There were several names of stages, with long inter
tervals between them.

With


(b) The third month of the Athenian year, answering to our September.

(d) The eighth month, answering to our February; but Meursius makes it November.
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With respect to the greater mysteries, it is probable that originally none but the natures of Attica were admitted to partake of them. In process of time, however, the pale was extended so far and wide as to comprehend all who spoke the Greek language. All foreigners were debarred from those sacred rites. They tell us, however, that Hercules, Bacchus, Catoftor and Polax, Aesculapius and Hippocrates, were initiated in an extraordinary manner, from a regard to their high character and heroic exploits. All barbarians, too, were excluded: yet Anacharsis the Sceythian was indulged that privilege, in consequence of his reputation for science and philosophy. All persons guilty of manslaughter, though even accidentally or involuntarily, all magicians, enchanters; in a word, all impious and profane persons, were expressly prohibited the benefit of this pagan sacrament. At last, however, the gate became wider, and crowds of people, of all nations, kinds, and languages, provided their character was fair and irreproachable, rushed in by it. In process of time the Athenians initiated even their infants; but this, we imagine, must have been a kind of purification from which it was supposed that they derived a kind of moral ablation from vice, and were thought to be under the peculiar protection of the gods.

The celebration of the mysteries began on the 15th day of the month Boedromion; and, according to the most ancient authors, lasted nine days. Meurinus has enumerated the transactions of each day, which are too numerous to fall within the compass of this article; we must therefore refer our curious reader to the author just mentioned. Some days before the commencement of the festival, the precones, or public criers, invited all the initiated, and all the pretenders to that honour, to attend the festival, with clean hands and a pure heart, and the knowledge of the Greek language.

On the evening of the 15th day of the month called Boedromion the initiations commenced. Our readers will observe, that all the most sacred and solemn rites of the pagan superstition were performed during the night: They were indeed generally works of darkness. On this day there was a solemn cavalcade of Athenian matrons from Athens to Eleusis in carriages drawn by oxen. In this procession the ladies used to rally one another in pretty loose terms, in imitation of the prophecies of the Egyptians (says he, quoting from Porphyry) they are of the following complexion. The Prep. Demiurgus, whom the Egyptians call Cneph, is figured as a man of an azure colour, shaded with black, holding in his right hand a sceptre and in his left a girdle, and having on his head a royal wing or feather wreathed round. Such, we imagine, was the equipment of the Eleusinian hierophant. This person was likewise styled Prophet. He was to be of the family of the Eumolpidae; was obliged to make a vow of perpetual chastity, and even his voice, hair, and attitude, were adjusted to the ritual.

The next minister was the Daduchus, or torch-bearer; who, according to the father above quoted, was attired like the sun. This minister resembled the sun, because that luminarv was deemed the visible type of the supreme Demiurgus, and his vicegerent in governing and arranging the affairs of this lower world.

The third was the person who officiated at the altar. He was habited like the moon. His office was to implore the favour of the gods for all the initiates. We should rather imagine, that the person at the altar, as he resembled the moon, was intended to represent the goddess herself: for the Egyptian Isis, who was the archetype of Ceres was sometimes the moon and sometimes the earth.

The sacred herald was another principal actor in this solemn exhibition. His province was to recite every thing that, according to the ritual, was to be communicated to the novices; and he probably represented Thyoth or Thoth, that is Hermes or Mercury, the interpreter of the gods.

Besides...
The ceremony.

Besides these, there were five epimeletes or curators, of whom the king was one, who jointly directed the whole ceremonial. Lastly there were ten priests to offer the sacrifices. There were no doubt many officers of inferior note employed upon these occasions, but these were only insignificant appendages, whose departments have not been transmitted to posterity.

After this detail of the ministers of this solemn service, we return to the mystæ, or candidates for initiation. Some of the fathers of the church mention a hymn composed by the celebrated Orpheus, which was sung by the mystagogus or king upon that occasion. This hymn appears to us one of those epigrammatic compositions which abounded in the first ages of Christianity, and which the pious apologists often adopted without sufficient examination. That some sacred hymn was chanted upon that occasion, we think highly probable; but that the one in question was either composed by Orpheus, or used at the opening of these ceremonies, to us appears somewhat problematical.

Before the ceremony opened, a book was produced, which contained every thing relating to the temple. This was read over in the ears of the mystæ, who were ordered to write out a copy of it for themselves. This book was kept as Eleusis in a sacred repository, formed by two stones exactly fitted to each other, and of a very large size. This repository was called petæona. At the annual celebration of the greater mysteries, these stones were taken aunder, and the book taken out; which, after being read to the mystæ, was replaced in the same cæment.

The initiations began with a representation of the wanderings of Ceres, and her bitter and loud lamentations for the loss of her beloved daughter. Upon this occasion, no doubt, a figure of that deity was displayed to the mystæ, while loud lamentations echoed from every corner of the sanctuary. One of the company having kindled a firebrand at the altar, and thus kindled a flame in the middle of the temple, waving the torch with the utmost fury, a second imitated it from him, rearing and waving it in the same frantic manner: then a third, fourth, &c. in the most rapid succession. This was done to imitate Ceres, who was said to have perambulated the globe of the earth with a flaming pine in her hand, which had lighted at mount Ætna.

When the pageant of the goddess was supposed to arrive at Eleusis, a solemn paean ensued, and a few trilling questions were put to the mystæ: What these questions were, is evident from the answers, "I have failed; I have drunk the liquor: I have taken the contents out of the cofier, and having performed the ceremony, have put them into the hamper: I have taken them out of the hamper, and put them again in the cofier." The meaning of these answers, we conjecture, was this: "I have failed as Ceres failed while in search of her daughter: I have drunk the worst of the drink when given her by Banho; I have performed what Ceres taught her first disciples to perform, when the committed to them the sacred hamper and cofier." After these interrogatories and the suitable responses, the mundus Cereris was displayed before the eyes of the mystæ, and the my/æos or hierophant; or perhaps the sacred herald by his command, read a lecture on the allegorical import of those sacred symbols. This was heard with the most profound attention; and a solemn silence prevailed throughout the scene. Such was the first act of this religious farce, which perhaps consisted originally of nothing more.

After the exposition of the mundus Cereris, and the import of her wanderings, many traditions were communicated to the mystæ concerning the origin of the universe and the nature of things. The doctrines delivered in the greater mysteries, says Clem. Alex., "relate to the nature of the universe. Here all instruction ends. Things are seen as they are; and nature and the things of nature, are given to be comprehended."

To the same purpose Cicero: "Which points being explained and reduced to the standard of reason, the nature of things, rather than that of the gods, discovered." The father of the universe, or the supreme demiurgus, was represented as forming the chaotic mass into the four elements, and producing animals, vegetables, and all kinds of organized beings, out of those materials. They say that they were informed of the secrets of the anomalies of the moon; and of eclipses of the sun and moon; and, according to Virgil,

Unde bonimentum genus, et pœcudes, unde imber et ignes.

What system of cosmogony these hierophants adopted, is evident from the passage above quoted from Eusebius: and, from the account immediately preceding, it was that of the most ancient Egyptians, and of the orientals in general. This cosmogony is beautifully and energetically exhibited in Plato's Timæus, and in the genuine spirit of poetry by Ovid in the beginning of his Metamorphoses.

The next scene exhibited upon the stage, on this Exploits of solemn occasion, consist of the exploits and adventures of the gods, the deities of the gods, demigods, and heroes, who had, and from time to time, been advanced to divine honours. These were displayed as passing before the mystæ in pageants fabricated for that important purpose. This was the original mode among the Egyptians, and was no doubt followed by their Eleusinian pupils. Those adventures were probably demonstrated to have been allegorical, symbolic, hiero-glyphical, &c. at least they were exhibited in such a favourable point of view as to elicit those absurdities and incongruities with which they were foopplicated by the poets and the vulgar.

With respect to the origin of those fictitious deities, it was discovered that they had been originally rigid, men who had been exalted to the rank of divinity, in consequence of their heroic exploits, their useful inventions, their beneficent actions, &c. This is so clear from the two passages quoted from Cicero, by bishop Warburton, that the fact cannot be controversy. But that prelate has not informed us so precisely, whether the mystagogues represented them as nothing more than dead men, in their present state, or as beings who were actually existing in a defined state, and executing the functions assigned them in the bosom of paganism. Another query naturally occurs, that is, to what purpose did the mystagogues apply this communication? That the hierophants di
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actually represent those deified mortals in the latter prædication, is obvious from another passage quoted from Cicero by the same prelate, which we shall trancribe as translated by him: "What think you of those who assert that valiant, or famous, or powerful men, have obtained diverse honours after death: and that these are the very gods now become the objects of our worship, our prayers, and adoration? Euhemerus tells us, when these gods died, and where they lie buried. I forbear to speak of the sacred and unguilt rites of Eleusis. I pass by Samothrace and the mysteries of Lemnos, whose hidden rites are celebrated in darkness, and amidst the thick shades of groves and forests." If, then those deified mortals were become the objects of worship and prayers, there can be no doubt of the belief of their deified existence. The allusion to the Eleusinian and other pagan mysteries towards the close of the quotation, places the question beyond the reach of controversy. But though, according to this account, "there were gods many and lords many;" yet it is evident from the passage quoted from Euhemerus in the preceding part of this article, that the unity of the Supreme Being was maintained, exhibited, and incultated. This was the original doctrine of the Hierophants of Egypt: It was maintained by Thales and all the retainers of the Ionian school. It was the doctrine of Pythagoras, who, probably gleaned it up in the country just mentioned, in connexion with many other dogmas which he had the assurance to claim as his own.

But however the unity, and perhaps some of the most obvious attributes of the Supreme Author of nature, might be illustrated and incultated, the tribute of homage and veneration due to the subordiinate divinities was by no means neglected. The initiates were taught to look to the dìi majorum gentium with a superior degree of awe and veneration, as beings endowed with an ineffable measure of power, wisdom, purity, goodness, &c. There were, if we may use the expression, the prime favourites of the Monarch of the universe, who were admitted into his immediate presence, and who received his benefits from his own mouth, and communicated them to his subordinate officers, prefects, lieutenants, &c. These they were exhorted to adore; to them they were to offer sacrifices, prayers, and every other act of devotion, both on account of the excellency of the nature and the high rank they bore at the court of heaven. They were instructed to look up to hero-gods and demi-gods, as beings exalted to the high rank of governors of different parts of nature, as the immediate guardians and protectors of the human race; in short, as gods near at hand, as prompters to a virtuous course, and all who observed it; as ready upon all occasions to confer blessings upon the virtuous and deserving. Such were the doctrines taught in the teleæ with respect to the nature of the Pagan divinities, and the worship and devotion enjoined to be offered them by the mysteries.

As the two principal ends proposed by these initiations were the exercise of heroic virtues in mortal life, and the practice of sincere and uniform piety by the candidates for immortal happiness, the hierophants had adopted a plan of operations exceptionally accommodated to both these purposes. The virtuous conduct and heroic exploits of the great men and demi-gods of early antiquity, were magnified by the most pompous eloquiums, enforced with suitable exhortations to animate the votaries to imitate so noble and alluring an example. But this was not all; the heroes and demigods themselves were displayed in pagants, or vehicles of celestial light. Their honours, offices, habitations, attendants, and other appendages, in the capacity of demons, were exhibited with all the pomp and splendor that the sacerdotal college were able to devise. The sudden glare of mimetick light, the melting music stealing upon the ear, the artificial thunders reverberated from the roof and walls of the temple, the appearance of fire and ethereal radiance the vehicles of flame, the effigies of heroes and demons adorned with crowns of laurel emitting rays from every spar, the fragrant odours and aromatic gales, which breathed from every quarter, all dexterously counterfeited by sacerdotal mechanism, must have filled the imagination of the afohnified votaries with pictures at once tremendous and transporting; Add to this, that every thing was transfigured in the dead of night amidst a dismal gloom: whence the most bright effulgence instantaneously burst upon the sight. By this arrangement the aspirants to initiation were wonderfully animated to the practice of virtue while they lived, and inspired with the hope of a blest immortality when they died. At the same time, their awe and veneration for the gods of their country was wonderfully enhanced by reflecting on the appearances above described. Accordingly Strabo very judiciously observes, "that the mythical secrecy of the sacred rites preserves the majesty of the Deity, imitating its nature, which escapes our apprehension. For these reasons, in celebrating the teleæ, the demons were introduced in their deified or glorified state.

But as all the candidates for initiation might not aspire to the rank of heroes and demigods, a more easy and a more attainable mode of conduct, in order to arrive at the palace of happiness, behoved to be opened. Private virtues were incultated, and these too were to meet a condign reward. But alas, this present life is too often a chequered scene, where virtue is depressed and trodden under foot, and vice lifts up its head and rides triumphant. It is a dictate of common sense, that virtue should sooner or later emerge, and vice sink into contempt and misery. Here then the conductors of the mysteries properly and naturally, adopted the doctrine of a future state of rewards and punishments. The dogma of the immortality of the human soul was elucidated, and carefully and pathetically incultated. This doctrine was likewise imported from Egypt; for Herodotus informs us, "that the Egyptians were the first people who maintained the immortality of the human soul." The Egyptian immortality, however, according to him, was only the metempsychosis or transmigration of souls. This was not the system of the ancient Egyptians, nor indeed of the teleæ. In theo, a metempsychosis was admitted; but that was carried forward to a very distant period, to wit, to the grand Egyptian period of 36,000 years.

As the Mystagogues well knew that the human mind is more powerfully affected by objects presented to the eyes than by the most engaging instructions conveyed by
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by the ear, they made the emblems of Elyium and Tartarus pass in review before the eyes of their novices. There the Elyrian scenes, so nobly described by the Roman poet, appeared in mimic splendor; and on the other hand, the gloom of Tartarus, Charon's boat, the dog of hell, the fires with tresses of snakes, the tribunal of Minos and Rhadamantus, &c. were displayed in all their terrific state. Tantalus, Ixion, Siyphus, the daughters of Danaus, &c. were represented in pageants before their eyes. These exhibitions were accompanied with most horrible cries and howlings, thunders, lightning, and other objects of terror, which we shall mention in their proper place.

No contrivance could be better accommodated to animate the pupils to the practice of virtue on the one hand, or to deter them from indulging vicious passions on the other. It resembled opening heaven and hell to a hardened sinner. The practices inculcated in celebrating the mysteries are too numerous to be detailed in this imperfect sketch. The worship of the gods was strictly enjoined, as has been shown above. The three laws imported from Eleusinia were warmly recommended in the oracles of predestination, and were actually observed. 1. To honour their parents; 2. To treat the gods with the utmost respect; 3. Not to treat brute animals with cruelty. These laws were imported from Egypt, and were communicated to the Eleusinians by the original missionaries. Cicero makes the civilization of mankind one of the most beneficial effects of the Eleusinian institutions: "Nolum mihi, cum multa eximia divinaque videntur Athenaeque peperifeti; tum nihil melius illius mysteriis, quibus ex agrelli immanque vita, exculsi ad humanitatem, et mitigati fumus; inatiaque, ut appellantur, ita revera principia vitae cognovimus; neque solum cum feptificium vi-vendi rationem acceppimus, fed etiam cum sfe meliore moriendo." Hence it is evident, that the precepts of humanity and morality were warmly recommended in these institutions. The virtue of humanity was extended, one may say, even to the brute creation; as appears from the law of Triptolemus's laws above quoted. Some articles were enjoined in the teletas which may appear to us of least importance, which, however, in the symbolic style of the Egyptians, were abundantly significant. The initiated were "commanded to abstain from the flesh of certain birds and fishes; from beans, from pomegranates and apples, which were deemed equally polluting. It was taught, that to touch the plant of asparagus was as dangerous as the most deadly poison. Now, says Porphyry, who ever is versed in the history of the e phés, knows for what reason they were commanded to abstain from the flesh of birds."

The initiated bound themselves by dreadful oaths to observe most conscientiously and to practice every precept tendered to them in the course of the teletas; and at the same time never to divulge one article of all that had been heard or seen by them upon that occasion. In this they were exceedingly jealous, that Elecyblius the tragedian was in danger of capital punishment for having only alluded to one of the Eleusinian scenes in a tragedy of his; and one of the articles of indiction again Diogoras the Molian was, his having spoken disrespectfully of the mysteries, and diffused people from partaking of them. It must then be allowed, that the institution of the mysteries was of infinite advantage to the pagan world. They were indeed a kind of sacraments, by which the initiated bound themselves by a solemn vow to practice piety towards the gods, justice and humanity towards their fellow-men, and gentleness and tenderness towards the inoffensive part of the brute creation. The pagans themselves were so thoroughly convinced of this fact, that in their disputes with the apologists for Christianity, they often appealed to the teletas, and contrasted their maxims with the most sublime doctrines of that heavenly institution.

In order to impress these maxims the more deeply upon the minds of the novices, and to fix their attention more fastidiously upon the lectures which were delivered to them by the mystagogue or the sacred herald, a mechanical operation was played off at proper intervals during the course of the celebration. "Towards the end of the celebration (says Sibbeus), the whole scene is terrible; all is trembling, shuddering, sweat, and astonishment. Many horrible spectres are seen, and strange cries and howlings uttered. Light succeeds darkness; and again the blackest darkness the most glaring light. Now appear open plains, flowery meads, and waving groves; where are seen dances and choruses; and various holy phantasmagoria chant the chant. Melodious notes are heard from far, with all the sublime simphonies of the sacred hymns. The pupil now is completely perfected, is initiated, becomes free, released, and walks about with a crown on his head, and is admitted to bear a part in the sacred rites. A-fritides de Myt. Eleus. calls Elyium "a kind of temple of the whole earth, and of all that man beholds done in the most dreadful and the most exhilarating manner. In what other place have the records of so many things so marvelously? or in what region upon earth have the objects presented to the eye bore a more exact resemblance to the sounds which strike the ear? What object of sight have the numberless generations of men and women beheld comparable to those exhibited in the ineffable mysteries?" To the same purpose, Pheus, in the oracles of Zoroastro, informs us, "that frightful and shadowy apparitions, in a variety of forms, used to be displayed to the eye in the course of their initiation. And a little after, he adds, "that thunder and lightning and fire, and every thing terrible which might be held symbolical of the divine presence, was introduced." Claudian, in his poem De Raptu Proserpina, gives an elegant though brief description of this phenomenon, which throws some light on the passages above quoted.

"... Jam mibi ceramum trespides delubra movent... Sedibus et claram dis pergore culmina lucem... Adventum tegeta Deo, jam magnus ab imis... Auditor forum terris, templaque remusit... Cerespium..."

The sight of those appearances was called the Antipfas, or "the real presence;" hence those rites were sometimes called Epoonitis. The Egyptians were actually initiated, and were admitted into the Sacrum Scelorum, and bore a part in the ceremonial; whereas the Mysteries, who had only been initiated in the lesser Mysteries at Agræ, were obliged to take their station in the porch of...
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Let us to flow't meads repair,
With deathless roses blooming,
Whose balmy sweets impregn the air,
Both hills and dales perfuming.

Since fate benign our choir has joint'd,
We'll trip in mystic measure:
In sweetest harmony combin'd
We'll quaff full draughts of pleasure.

For us alone the pow'r of day
A milder light dispenses;
And sheds a benight a mellow'd ray
To cheer our ravi'ld senses:
For we behold the mystic flow,
And brav'd Eleusin' dangers.
We do and know the deeds we owe
To neighbours, friends, and strangers.

Euripides, in his Bacchae (e), introduces the chorus extolling the happiness of those who had been acquainted with God by participating in the holy mysteries, and whose minds had been enlightened by the mythical rites. They boast, "that they had led a holy and unblemished life, from the time that they had been initiated in the sacred rites of Jupiter Idæus, and from the time that they had relinquished celebrating the nocturnal rites of Bacchos, and the banquets of raw flesh torn off living animals." To this fainthood of life they had no doubt engaged themselves, when they were initiated in the mysteries of that god. The Eleusinian Eaptes derived the same advantages from their sacramental engagements. Fourthly, the initiated were imagined to be the peculiar wards of the Eleusinian goddesses. These deities were supposed to watch over them, and often to avert impending danger, and to rescue them when beset with troubles.

Our readers will not imagine that the initiated reaped much benefit from the protection of his Eleusinian tutelary deities; but it was sufficient that they believed the fact, and actually depended upon their intercession. Fifthly, the happy influences of the telete, were supposed to administer consolation to the Eaptes in the hour of dissolution; for, says Iphocrates "Ceres bestowed upon the Athenians two gifts of the greatest importance; the fruits of the earth, which were the cause of our no longer leading a savage course of life; and the telete, for they who partake of these entertain more pleasant hopes both at the end of life, and eternity afterwards." Another author tells us, "At the time of the Mysteries the importance of the Mysteries was heightened by the fact that the initiated were not only often rescued from death and danger, but were also given the boon of a happy condition." Sixthly, After death, in the Elysian fields, they were to enjoy superior degrees of felicity, and to be bathed in eternal sunshine, to quaff nectar, and feast upon ambrosia, &c.

The priests were not altogether dishonored in this salutary process. They made their disciples believe, that the souls of the initiated, when they arrived in the infernal regions, should roll in mire and dirt, and with very great difficulty arrive at their destined mansion.

(a) Act I near the beginning, and in many other places.
When the Athenians advised Diogenes to get himself initiated, and enforced their arguments with the above considerations, "It will be pretty enough (replied the philosopher) to see Ageiathus and Epaminondas wallowing in the mire, while the most contemptible rascals who have been initiated are strutting in the islands of bliss."

When Antithenes was to be initiated in the Orphic mysteries, and the priest was bestowing of the many altroning benefits which the initiated should enjoy in a future state (says Antithenes), "Why, forsooth, (says Antithenes), 'tis wonder your reverence don't e'en hang yourself in order to come at them the sooner."

When such benefits were expected to be derived from the mysteries, no wonder if all the world crowded to the Eleusinian standard. After the Macedonian conquests, the Hierarchans abated much of their original strictness. By the age of Cicero, Eleusis was a temple whether all nations referred to partake of the benefits of that institution. We find that almost all the great men of Rome were initiated. The Hierophants, however, would not admit Nero on account of the profaneness of his character. Few others were refused that honour; even the children of the Athenians were admitted. But this, we think, was rather a lufturation or consecration, than an initiation. Perhaps it paved the way for the more august ceremony, as the Christian baptism does among us for the other sacrament.

That this institution gradually degenerated, can hardly be questioned; but how much, and in what points, we have not been able to investigate. The fathers of the church, from whom that charge is chiefly to be collected, are not always to be trusted, especially when they set themselves to arraign the institutions of Paganism. There were indeed several ancient authors, such as Melanthus, Minander, Socrates, &c. who wrote purposely on the subject in question, but their works are long since irrecoverably lost. For this reason, modern writers, who have professedly handled it, have not always been successful in their researches. The two who havelaboured most indefatigably, and perhaps most successfully, in this field, are Murchius and Warburton. The former, in his Liber Singularis, has collected everything that can be gleaned from antiquity relating to the ceremonial of these institutions, without, however, pointing out theiroriginal, or elucidating the end and import of their establishment. The latter has drawn them into

the vortex of a system which has in many instances led him to ascribe to them a higher degree of merit than we think they deserve. These instances we would willingly have noticed in our progress, had the limits prescribed us admitted such a diffusion.

If we may believe Diodorus the Sicilian, these mysteries, which were celebrated with such wonderful secrecy at Eleusis, were communicated to all mankind among the Cretans. This, however, we think, is rather problematical. We imagine that excellent historian has confounded the mysteries of Cybele with those of the Eleusinian Ceres. These two deities were undoubtedly one and the same, that is, the moon or the earth. Hence it is probable, that there was a striking resemblance between the sacred mysteries of the Cretans and Eleusinians.

This institution continued in high reputation to the age of St Jerome, as appears from the following passage; "Hierophantes quoque Atheniensium legantique hodie ciceretur fortes attiro." The emperor Valentinianus intended to have suppressed them; but Zosimus informs us, that he was diverted from this design by the proconsul of Greece. At length Theodosius the elder, by an imperial edict prohibited the celebration of these as well as all the other mysteries, introduced in the reign of Eusebius, maintained their ground to the period just mentioned, that is, near 2000 years; during which space, the celebration of them never had been interrupted but once. When Alexander the Great massacred the Thebans and razed their city, the Athenians were so much affected with this melancholy event, that they neglected the celebration of that festival.

There were almost numberless other mysterious institutions among the ancient Pagans, of which these sketched above were the most celebrated. The Samothracian mysteries, instituted in honour of the Cabiri, were like-wise of considerable celebrity, and were supposed to confer much the same blessing with the Eleusinian, but were not of equal celebrity. The Cabiri were Phaenician and like-wise Egyptian deities. The learned Bochart has explained their origin, number, names and some part of their worship. The Orphic mysteries were like-wise famous among the Thracians. Orpheus learned them in Egypt, and they were nearly the same with the sacra Bacchanaalia of the Greeks. There were likewise the mysteries of Jupiter Idaeus in great request among the Cretans, those of the Magna Mater or Cybele, celebrated in Phrygia. To enumerate and detail all these would require a complete volume. We hope our readers will be fully satisfied with the specimen exhibited above. We are convinced many things have been omitted which might have been inserted, but we have collected the most curious and the most important.

Every one of the politians might have been authenticated by quotations from authors of the most unquestionable credibility, but that process would have swelled the whole article beyond all proportion.
Mystics, something mysterious or allegorical.

Some of the commentators on the facred writings, besides a literal find also a mythical meaning. The sense of scripture, nay they, is either that immediately signified by the words and expressions in the common use of language; or it is mediate, sublime, typical, and mystical. The literal sense they again divide into proper literal, which is contained in the words taken simply and properly; and metaphorical literal, where the words are to be taken in a figurative and metaphorical sense. The mystical sense of scripture they divide into three kinds: the first corresponding to faith, and called allegorical; the second to hope, called anagogical; and the third to charity, called the tropological sense. And sometimes they take the same word in scripture in all the four senses; thus the word Jerusalem, literally signifies the capital of Judea: allegorically, the church militant: tropologically, a believer; and anagogically, heaven.

The mystics, to excite their fanatic ecstases and amorous extravagancies, allege that passage of St. Paul, The Spirit pray in us by sighs and groans that are unutterable. Now if the Spirit, say they, pray in us, we must resign ourselves to its motions, and be swayed and guided by its impulse, by remaining in a state of mere inaction.

Pulvis contemplation is that state of perfection to which the mystics all aspire.

The authors of this mystical science, which sprang up towards the close of the third century, are not known; but the principles from which it was formed are manifest. Its first promoters proceeded from the known doctrine of the Platonic school, which was also adopted by Origen and his disciples, that the divine nature was diffused through all human souls, or that the faculty of reason, from which proceeded the health and vigour of the mind, was an emanation from God into the human soul, and comprehended in it the principles and elements of all truth, human and divine. They denied that men could by labour or study excite this celestial flame in the breast; and therefore they disapproved highly of the attempts of those, who by definitions, abstract theorems, and profound speculations, endeavoured to form distinct notions of truth, and to discover its hidden nature. On the contrary, they maintained that silence, tranquillity, repose, and solitude, accompanied with such acts as might tend to extirpate and exhaust the body, were the means by which the hidden and internal word was excited to produce its latent virtues, and to instruct men in the knowledge of divine things. For thus they reasoned; those who behold with a noble contempt all human affairs, who turn away their eyes from terrestrial vanities, and shut all the avenues of the outward senses against the contagious influences of material world, muti necessarily return to God, when the spirit is thus disengaged from the impediments that prevented that happy union. And in this blessed frame they not only enjoy inexpressible raptures from their communion with the Supreme Being, but also are invested with the ineffable privilege of contemplating truth undisguised and uncorrupted in its native purity, while others behold it in a vitiated and delusive form.

The number of the mystics increased in the fourteenth century, under the influence of the Grecian fanatic, who gave himself out for Dionysius the Areopagite, disciple of St. Paul, and probably lived about this period: and by pretending to higher degrees of perfection than other Christians, and professing greater austerity, their cause gained ground, especially in the eastern provinces, in the fifth century. A copy of the pretended works of Dionysius was sent by Balbus to Lewis the Meek in the year 824, which kindled the holy flame of mysticism in the western provinces, and filled the Latins with the most enthusiastic admiration of this new religion.

In the twelfth century, these mystics took the lead in their method of expanding scripture; and by searching for mysteries and hidden meanings in the plainest expressions, forced the word of God into a conformity with their visionary doctrines, their enthusiastic feelings, and the system of discipline which they had drawn from the excursions of their irregular fancies. In the thirteenth century, they were the most formidable antagonists of the schoolmen, and towards the close of the fourteenth, many of them refided and propagated their tenets almost in every part of Europe. They had, in the fifteenth century, many persons of distinguished merit in their number; and in the sixteenth century, previous to the reformation, if any sparks of real piety subsisted under the despotic empire of superstition, they were only to be found among the mystics.

The principles of this sect were adopted by those called Quakers in the seventeenth century, and, under different modifications, by the Quakers and Methodists.

MYSTRUM, a liquid measure among the ancients, containing the fourth part of the Cyathus, and weighing two drams and an half of oil, or two drams two scruples of water or wine. It nearly answers to our spoonful.

MYTELENE See MYTELONE.

MYTENS (Daniel), of the Hague, was an admired painter in the reigns of king James and king Charles. He had certainly (Mr. Walpole says) studied the works of Rubens before his coming over. His landscape in the back grounds of his portraits is evidently in the style of that school; and some of his works have been taken for Vandyck's. The date of his arrival is not certain. At Hampton-court are several whole lengths of princes and princesesses of the house of Brunswick-Lunenburgh, and the portrait of Charles Howard earl of Nottingham; at Kensington is Mytens's own head. At Knowsle, Lionel Cranfield earl of Middlesex, lord treasurer, with his white staff, whole length. At Lady Elizabeth Germaine, niece to Drayton is a very fine whole length of Henry, rich earl of Holland, in a striped habit, with a walking stick. At St James's is Jeffery Hudson the dwarf, holding a dog by a string, in a landscape, coloured warmly and freely like Snyder or Rubens. Mytens drew the same figure in a very large picture of Charles I. and his Queen,
MYTHOLOGY.

Definition. A term compounded of two Greek words, and in its original import it signifies any kind of fabulous doctrine: in its more appropriated sense, it means those fabulous details concerning the objects of worshipping which were invented and propagated by men who lived in the early ages of the world, and by them transmitted to succeeding generations, either by written records or by oral tradition.

As the theology and mythology of the ancients are almost inseparably connected, it will be impossible for us to develope the latter, without often introducing some observations relating to the former. We must therefore intreat the indulgence of our readers, if upon many occasions we should hazard a few frictions on the names, characters, adventures, and functions of such pagan divinities as may have furnished materials for those fabulous narrations which the nature of the subject may lead us to discuss.

Origin of fable. With respect to fable, it may be observed in general, that it is a creation of the human imagination, and derives its birth from that love of the marvellous which is in a manner congenial to the soul of man.—The appearances of nature which every day occur, objects, actions, and events, which succeed each other, by a kind of rotine, are too familiar, too obvious, and uninteresting, either to gratify curiosity or to excite admiration. On the other hand, when the most common phenomena in nature or life are new modelled by the plastic power of a warm imagination: when they are diversified, compounded, embellished, or even arranged and moulded into forms which seldom or perhaps never occur in the ordinary course of things—novelty generates admiration, a passion always attended with delightful sensations. Here then we imagine we have discovered the very source of fiction and fable.—They originated from that powerful propensity in our nature towards the new and surprising, animated by the delight with which the contemplation of them is generally attended.

Many circumstances contributed to extend and establish the empire of fable. The legislator laid hold on this bias of human nature, and of course employed fable and fiction as the most effectual means to civilize a rude, unpolished world. The philosopher, the theologian, the poet, the musician, each in his turn, made use of this vehicle to convey his maxims and instructions to the savage tribes. They knew that truth, simple and unadorned, is not poissied of charms powerful enough to captivate the heart of man in his present corrupt and degenerate state. This consideration, which did indeed result from the character of their audience, naturally led them to employ fiction and allegory from this was derived the allegorical taste of the ancients, and especially of the primary ages of the east.

Though almost every nation on the face of the globe, however remote from the centre of population, however savage and averse from cultivation, has fabricated and
and adopted its own system of mythology; the Orientals, however, have distinguished themselves in a peculiar manner, by the boldness, the inconsistency, and the extravagance of their mythology. The genial warmth of those happy climes, the fertility of the soil, which afforded every necessity, every convenience, and often every luxury of life, without depressing their spirits by laborious exertions; the face of nature perpetually blooming around them, the skies smiling with uninterrupted serenity; all contributed to inspire the Orientals with a glow of fancy and a vigour of imagination rarely to be met with in less happy regions. Hence every object was swelled beyond its natural dimensions. Nothing was great or little in moderation, but every sentiment was heightened with incredible hyperbole. The magnificent the sublime, the vast, the enormous, the marvellous, therosse, the magnificent the sublime, the vast, the enormous, the marvellous, the roose, the were the veil which hid the hidden springs of the world. The Oriental mythology was the groundwork of that impenetrable covering.

As the allegorical tales of the eastern nations had sprung from their propensities to fable, and as that propensity had in its turn originated from the love of the marvellous; so did allegory in process of time contribute its influence towards multiplying fables and fiction almost in infinitum. The latent import of the allegorical scenes being in a few ages lost and obliterated, what was originally a moral or theological system, assumed the air and habit of a personal adventure.

The propensities towards personification, almost universal among the orientals, was another fruitful source of fable and allegory. That the people of the east were strongly inclined to personify inanimate objects and abstract ideas, we imagine will be readily granted, when it is considered, that in the formation of language they have generally annexed the affection of sex to those objects. Hence the distinction of grammatical genders, which is known to have originated in the eastern parts of the world. The practice of personifying virtues, vices, religious and moral affections, was necessary to support that allegorical style which universally prevailed in those countries. This mode of writing was in high reputation even in Europe some centuries ago; and to it we are indebted for some of the most noble poetical compositions now extant in our own language. Those productions, however, are but faint imitations of the original mode of writing still current among the eastern nations. The Egyptians derived this species of composition from the Moorish inhabitants of Spain, who imported it from Arabia, their original country.

The general use of hieroglyphics in the east, must have contributed largely towards extending the empire of mythology. As the import of the figures employed in this method of delineating the signs of ideas was in a great measure arbitrary, mistakes must have been frequently committed in ascertaining the notions which they were at the first intended to represent. When the development of these arbitrary signs happened to be attended with uncommon difficulty, the expounders were obliged to have recourse to conjecture. Those conjectural explications were for the most part tinctured with some bias towards the marvellous which universally prevailed among the primitive men. This we find is the case even at this day, when moderns attempt to develop the purport of emblematical figures, preferred on ancient medals, engravings, &c.

The wise men of the east delighted in obscure enigmatical sentences. They seem to have derived every sentiment, obvious to vulgar apprehension, from the word of the wise, and their dark sayings, often occur in the most ancient records both sacred and profane. The fages of antiquity used to vie with each other for the prize of superior widom, by propounding riddles, and dark and mysterious questions, as subjects of investigation. The contest between Solomon and Hi- sered, and that between Amaša king of Egypt and Polycrates tyrant of Samos, are universally known,—As the import of those enigmatical propositions was often absolutely lost, in ages when the art of writing was little known, and still less practised, nothing remained but fancy and conjecture, which always verged towards the regions of fable. This then, we think, was another source of mythology.

The Pagan priests, especially in Egypt, were probably the first who reduced mythology to a kind of system. The facerdotial tribe, among that people, a kind of whose fages of religion were the veil which covered the mystic depositories of learning as well as of virtue, and mythology. That order of men monopolized all the arts and sciences. They seem to have formed a conspiracy among themselves to preclude the laity from all the avenues of intellectual improvement. This plan was adopted with a view to keep the laity in subjection, and to enhance their own importance. To accomplish this end, they contrived to perform all the ministrations of their religion in an unknown tongue, and to conceal them with a thick veil of fable and allegory. The language of Ethiopia became their sacred dialect, and hieroglyphics their sacred character.—Egypt, of course, became a kind of fairyland, where all was jugglery, magic, and enchantment. The initiated alone were admitted to the knowledge of the occult mystical exhibitions, which, in their hands, constituted the essence of their religion. From thence the vulgar and profane were prohibited by the most rigorous penalties (See Mysteries). The Egyptians, and indeed all the ancients without exception, deemed the mysteries of religion too sacred and solemn to be communicated to the herd of mankind, naked and unrefined; a mode by which they imagined those sacred and sublime oracles would have been defiled and degraded. "Procul, o procul or procul, Odi profundum vulgus et arceo." Egypt was the land of graven images; allegory and mythology were the veil which concealed religion from the eyes of the vulgar; fable was the groundwork of that impenetrable covering.

In the earliest and most unpolluted age of society we cannot suppose fable to have existed among men. Fables are always tales of other times, but at this period other times did not reach far enough backward to afford those fruits of the imagination sufficient time to arrive at maturity. Fable requires a considerable space of time to acquire credibility, and to rise into reputation. Accordingly, we find that both the Chinese...
and Egyptians, the two most ancient nations whose annals have reached our times, were altogether unacquainted with fabulous details in the most early and least improved periods of their respective monarchies. It has been shown almost to a demonstration, by a variety of learned men, that both the one and the other people, during some centuries after the general deluge, retained and practiced the primitive Noachic religion, in which fable and fancy could find no place; all was genuine unpolluted truth.

As soon as the authentic tradition concerning the origin of the universe was either in a great measure lost, or at least adulterated by the inventions of men, fable and fiction began to prevail. The Egyptian Tneb or T thief, or Mercury Trismegistus, and Mochus the Phanician, undertook to account for the formation and arrangement of the universe, upon principles purely mechanical. Here fable began to usurp the place of genuine historical truth. Accordingly, we find that all the historians of antiquity, who have undertaken to give a general detail of the affairs of the world, have adhered in their narration with a fabulous cosmogony. Here imagination ranged unconfined over the boundless extent of the primary chaos. To be looked into Sanchoniathon’s Cosmogony, Euseb- Thoth mythology, or fabulous traditions, we must, without the historians, who pretend to have seen the most considerable periods of the primary creation. This emperor, according to the Chincfe history, was a circumst ance which rivetted the esteem of all that posterity.

The Chinefe, if any credit be due to their own univerfe was either in a great 

The Chinefe, if any credit be due to their own univerfe was either in a great 

The Chinefe mythology, or fabulous traditions, we shall proceed to lay before our readers a brief detail of the mythology of the most respectable nations of antiquity, following the natural order of their situation.

The Chinefe, if any credit be due to their own annals, or to the mithological church of Rome, who pretend to have copied from them, were the first of the nations. Their fabulous records reach upwards many myriads of years before the Mosaic era of the creation. The events during that period of time, if any had been recorded, must have been fabulous as the period itself. These, however, are buried in eternal oblivion. The mithological religions, who are the sole sources of our information with relation to the earliest periods of the Chinefe history, represent those people as having retained the religion of Noah many centuries after the foundation of their empire. Upon this supposition, their cosmogony must have been found and genuine, without the least tincture of those fabulous ingredients which have both disguised and disgraced the cosmogonies of most other nations.

According to the most authentic accounts, Foh or Fohi laid the foundation of that empire about 4000 years ago. This emperor, according to the Chinefe, was conceived in a miraculous manner. His mother, say they, one day as she was walking in a deserted place, was surrounded by a rainbow; and, being impregnated by this meteor, was in due time delivered of that celebrated legislator. This personage, like the Athenian Cecrops, was half a man and half a serpent. His intellectual powers were truly hyperbolical. In one day he discovered 50 different species of poisonous herbs. He taught his countrymen the whole art of agriculture in the space of a very few years. He instructed them how to sow five different sorts of grain, his invention boats and arts for building the art of fabricating porcelain, the management of silk-worms, the manufacturing of silk, &c. In a word that wonderful personage was inspired by Heaven with knowledge, which qualified him for composing that incomparable body of laws which are even at this day the wonder of the world. Our readers will admit, that this whole detail is fabulous and chimerical. The most learned part of them will readily observe, that the Chinefe, in ascribing the invention of all the useful arts to their Fohi, are perfectly agreed with almost all the other nations of antiquity. The Indians ascribe every invention to Budha, or Vishnu, or Foh; the Persians to Zoroas ter; the Chaldeans to their man of the sea, whom they call Osiris; the Egyptians to Tho thor of Thoth; the Phocnicians to Meliboeus; the Greeks to the family of the Titan; and the Scandinavians to Odin, &c.

About 55 years before the Christian era, appeared the famous Chinefe philosopher Confucius, or Confu- cius. Concerning the birth of this prince of philosophers, the Chinefe have propagated the following legendary tale. His mother walking in a solitary place was impregnated by the vivifying influence of the heavens. The babe, thus produced, spake and reasoned as soon as it was born. Confucius, however, wrought no miracles, performed no romantic exploits, but lived an austere ascetic life, taught and inculcated the doctrines of pure morality, and died, remarkable only for superior wisdom, religious, moral, and political.

About the year of Christ 601, flourished the Searfury Lao-kizm. His mother carried him 30 years in her womb, and he was delivered of him under a plum tree. This philosopher was the Epicurus of the Chinefe. His disciples, who were denominated Faohs, i.e. heavenly doctors, were the first who corrupted the religion of the Chinefe. They were addicted to magic, and introduced the worship of good and bad demons. Their doctrine was embraced by a long succession of emperors. One of these princes, called Toudi, had been deprived by death of a favourite mistress, whom he loved with the most extravagant passion. The emperor, by the magical skill of one of these doctors, obtained an interview with his deceased mistress, a circumstance which rivetted the whole order in the affection and esteem of the deluded prince. Here our reader will observe the exact counterpart of the fable of Eurydice, so famous in the mythology of the Greeks and Romans. That such a system of religious principles must have abounded with mythical adventures is highly probable; but as the mithological religions, to whom we are chiefly indebted for our information relating to the religion of the Chinefe, have not taken the pains to record them, we find it impossible to gratify the curiosity of our readers on that head.

The worship of the idol Foh, or Foh, was transplanted from India into China about the 5th year of the Christian era, upon the following occasion. One of the doctors of the Foh-fo had promised a prince of the family of the Tchou, and brother of the emperor, that he would make him consult into communion with the spirits. At his solicitation a ambassador was dispatched into India, in order to inquire where the true religion...
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A gnol was to be found. There had been a tradition, say the missionaries, ever since the age of Confucius, that the true religion was to be found in the west.—The ambassador from India: and finding that the god Foe was in high reputation in that country, he collected several images of that deity painted on chintz, and with it 42 chapters of the canonical books of the Hindoos, which, together with the images, he laid on a white elephant, and transported into his native country. At the same time he imported from the same quarter the doctrine of the transmigration of souls, which is firmly believed in China to this day. The doctrine and worship of Foe, thus introduced, made a most rapid progress all over China, Japan, Siam, &c. The priests of Foe are called among the Siamese, Talopins; by the Tartars, Lama; by the Chineese, Ho-chang; and by the people of Japan, Bonzes. By this last appellation they are generally known in Europe.

An infinitude of fable was invented and propagated by the disciples of Foe, concerning the life and adventures of their master. If the earlier ages of the Chineese history are barren of mythological incidents, the later periods, after the introduction of the worship of Foe, furnished an inexhaustible store of miracles, monsters, fables, intrigues, exploits, and adventures, of the most villainous complexion. Indeed, most of them are so absurd, so ridiculous, and at the same time so interesting as to absorb the attention of the hearer, even from a wish to investigate the truth of the narration. Such as may find themselves disposed to rake into this abominable pulpit, we must refer to the reverend fathers du Halde, Couplet, Amiot, Kircher, and other members of the propaganda, in whose writings they will find where, withal to satisfy, and even to forfeit, their appetites.

The Hindoos, like the other nations of the east, for a long time retained the worship of the true God. At length, however, idolatry broke in, and, like an impetuous torrent, overwhelmed the country. First of all, the ancient history of the origin of the universe was either utterly lost, or disguised under a variety of fictions and allegories. We are told that Brimba, the supreme deity of the Hindoos, after several previous efforts, at last succeeded in creating four perfons, whom he appointed to rule over all the inferior creatures. Afterwards Brimba joined his efficient power with Bifhol and Rudler; and by their united exertions they produced ten men, whose general appellation is Muni, that is, the inspired. The same being, according to another mythology, produced four other persons, as imaginary as the former; one from his breath, one from his back, one from his lip, and one from his heart. These children were denominated Bungis; the import of which word we cannot pretend to determine. According to another tradition, Brimba produced the Bramins from his mouth, to pray, to read, to instruct; the Chiltren from his arms, to draw the bow, to fight, to govern; the Bice from his belly or thighs, to nourish, to provide the necessaries of life by agriculture and commerce; the Soder from his feet, for subjection to servile, to labour, to travel. 

The reader will see at once, in these allegorical persons, the four calls or septs into which the Hindoo nation has, time immemorial, been divided. These are, some of their most celebrated mythological traditions with relation to the origin of the universe.

The Hindoos have likewise some mythological opinions which seem to relate to the general deluge. They tell us, that during the preservation of herds of four-legged animals, of genii and of virtuous men, of vedas of deluge, &c. the law, and of precious things, the Lord of the universe assumes many bodily shapes; but though he pervades, like the air, a variety of beings, yet he is himself unvaried, since he has no quality in him subject to change. At the close of the last calpa, there was a general destruction, occasioned by the sleep of Brahme, whence his creatures in different worlds were drowned in a vast ocean. Brahme being inclined to slumber after a lapse of so many ages, the strong demon Hayagriva came near him, and stole the vedas which had flowed from his lips. When Heri, the preserver of the universe, discovered this deed of the prince of Dahnavas, he took the shape of a minute wind called Sap-hari. After various transformations, and an enormous increase of size in each of them, the Lord of the universe loving the righteous man (a); who had still adhered to him under all these various shapes, and intending to preserve him from the sea of destruction caused by the depravity of the age, thus told him how he was to act: “In seven days from the present time, O thou Saker of enemies! the three worlds will be plunged in an ocean of death; but in the midst of the deitroying waves a large veiled tent by me for thy use shall stand before thee.” The remaining part of the mythology so nearly resembles the Mosaic history of Noah and the general deluge, that the former may be a strong confirmation of the truth of the latter. To dry up the waters of the deluge, the power of the Deity descends in the form of a boar, the emblem of strength, to draw up and support on his tusks the whole earth, which had been sunk beneath the ocean. Again, the same power is represented as a tortoise sustaining the globe, which had been convulsed by the violent assaults of demons, while the gods charmed the sea with the mountain Mandar, and forced it to divide the sacred things and animals, together with the water of life which it had swallowed. All these stories, we think relate to the same event, shadowed by a moral, a metaphorical, and an astronomical allegory; and all three seem connected with the hieroglyphical sculptures of the old Egyptians.

The Hindoos divide the duration of the world into four ages or Jugis, or Jetus, or Jegues, each consisting of a prodigious number of years. In each of these periods, the age and stature of the human race have been gradually diminished; and in each of them mankind has gradually declined in virtue and piety, as well in age and stature. The present period they call the Colle, i.e. the corrupt Jogue, which they say is to last 400,000

(a) He was Sovereign of the world. His name was Mana, or Stattagrava; his patronymic name was Vajatra, son or child of the Sun.
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400,000 years, of which near 5000 years are already past. In the last part of the preceding Jogue, which they call the Dwa paar, the age of man was contracted into 1000 years, as in the present it is confined to 100. From this proportional diminution of the length of the human life, our readers will probably infer, that the two last Jogues bear a pretty near resemblance to the Mosaic history of the age of the antediluvian and postdiluvian patriarchs; and that the two first are imaginary periods prior to the creation of the world, like those of the Chinefe, Chaldeans, and Egyptians.

The world subject to various dilutions and refutations.

According to the mythology of the Hindoos, the system of the world is subject to various dilutions and refutations. At the conclusion of the Collae Jogue, say they, a grand revolution will take place, when the solar system will be confumed by fire, and all the elements reduced to their original constituent atoms. Upon the back of these revolutions, Brahma, the supreme deity of the Hindoos, is sometimes represented as a new born infant, with his toe in his mouth, floating on a camala or water flower, sometimes only on a leaf, of that plant, on the surface of the vault of abyss. At other times he is figured as coming forth of a winding shell; and again as blowing up the mundane foam with a pipe at his mouth. Some of these emblematical figures and attitudes, our learned readers will probably observe, nearly resembhe those of the ancient Egyptians.

But the vulgar religion of the ancient Hindoos was of a very different complexion; and opens a large field of mythological adventures. We have observed above, that the Fœ or Foe of the Chinefe was imported from India; and now we shall give a brief detail of the mythological origin of that divinity. We have no certain account of the birth-place of this imaginary deity.—His followers relate, that he was born in one of the kingdoms of India near the line, and that his father was one of that country. His mother brought him into the world by the left side, and expired soon after her delivery. At the time of her conception, she dreamed that she had swallowed a white elephant; a circumstance which is supposed to have given birth to the veneration which the kings of India have always shown for a white animal of that species. As soonas he was born, he had strength enough to fland erect without assistance. He walked abroad at seven, and pointing with one hand to the heavens, and with the other to the earth, he cried out. "In the heavens, and on the earth there is no one but me who deserves to be honoured." At the age of 30, he felt himself all on a sudden filled with the divinity; and now he was metamorphosed into Fœ or Pagod, according to the explication of the Hindoos. He had no sooner declared himself a divinity, than he thought of propagating his doctrine, and proving his divine mission by miracles. The number of his disciples was immense; and they soon spread their dogmas over all India, and even to the higher extremities of Asia.

One of the principle doctrines which Fœ and his disciples propagated, was the metempsychosis or transmigration of souls. This doctrine, some imagine, has given rise to the multitude of idols reverenced in every country where the worship of Fœ is established. Quadrupeds, birds, reptiles, and the vilest animals, had temples erected for them because, say they, the soul of the god, in his numerous transmigrations, may have at one time or other inhabited their bodies.

Both the doctrine of transmigration and of the worship of animals seems, however, to have been imported from Egypt into India. If the intercourse between these two countries was begun at so early a period as some very late writers have endeavoured to prove, such a supposition is by no means improbable. The doctrine of the transmigration of souls was early established among the Egyptians. It was, indeed, the only idea they formed of the soul's immortality. The worship of animals among them seems to have been still more ancient. If such an intercourse did actually exist, we may naturally suppose that colonies of Egyptian priests found their way into India, as they did afterwards into Afia Minor, Italy and Greece. That colonies of Egyptians did actually penetrate into their country, and settle there, many centuries before the nativity, is a fact that cannot be called in question, for reasons which the bounds prescribed us on this article will not allow us to enumerate. We shall only observe, that from the hieroglyphical representations of the Egyptian deities seem to have originated those monstrous idols which from time immemorial have been worshipped in India, China, Japan, Siam, and even in the remotest parts of Asiatic Tartary.

Fœ is often called Budha, Buddha, and sometimes Visnou; perhaps, indeed, he may be distinguished by nations of many other names, according to the variety of dialects of the different nations among which his worship was established. An innumerable of fables was propagated by his disciples concerning him after his death. They pretended that their master was still alive; that he had been already born 8000 times; and that he had successively appeared under the figure of an ape, a lion, a dragon, an elephant, a boar, &c. These were called the incarnations of Visnou. At length he was confounded with the Supreme God; and all the titles, attributes, operations, perfections, and ensigns of the Most High were ascribed to him. Sometimes he is called Amida, and represented with the head of a dog, and worshipped as the guardian of mankind. He sometimes appears as a princely perfage, issuing from the mouth of a fish. At other times, he wears a lunette on his head, in which are seen cities, mountains, towers, trees, in short, all that the world contains. These transformations are evidently the children of allegorical or hieroglyphical emblems, and form an exact counterpart to the symbolical worship of the Egyptians.

The enormous mafs of the mythological traditions which have in a manner deluged the west continent of India, would fill many volumes: We have selected the preceding articles as a specimen only, by which our readers may be qualified to judge of the rest. If they find themselves disposed to indulge their curiosity at greater length, we must refer them to Thevenot's and Hamilton's Travels, to Mont. Aqueulis in his Zond. Aveila Halide's Introduction to his translation of the Code of Gentoo Laws, Col. Dow's History of Hindoostan, Grofsés Voyage to the East Indies, Asiatic Researches, vol. 1. and 2.
The mythology of the Persians is, if possible, still more extravagant than that of the Hindoos. It supposes the world to have been repeatedly destroyed, and repeopled by creatures of different formation, who were successively annihilated or banished for their disobedience to the Supreme Being. The monstrous griffin *Sinergb* tells the hero *Caherman* that he had already lived to see the earth seven times filled with creatures and seven times a perfect void; that, before the creation of Adam, this globe was inhabited by a race of beings called *Peri and Dives* whose character formed a perfect contrast. The *Peri* are described as beautiful and benevolent: the *Dives* are deformed, malevolent, and mischievous, differing from infernal demons only in this, that they are not as yet confined to the pit of hell. They are for ever ranging over the world, to scatter discord and misery among the sons of men. The *Peri* nearly resemble the fairies of Europe; and perhaps the *Dives* gave birth to the giants and magicians of the middle ages. The sons of men. The myth of the world was formed, malevolent, and evil-omnipotent; the *Dives* are the sons of men. The myth of the world was formed, malevolent, and evil-omnipotent; the *Dives* are distributed, malevolent, and mischievous, differing from the infernal demons only in this, that they are not as yet confined to the pit of hell.

When the *Peri* are in danger of being overpowered by their foes, they solicit the alliance of some mortal hero; which produces a series of mythological adventures, highly ornamental to the strain of the *Persian* bards, and which, at the same time, furnishes an inexhaustible fund of the most diversified machinery.

One of the most celebrated adventurers in the mythology of Persia is *Tabunara*, one of their most ancient monarchs. This prince performs a variety of exploits, while he endeavours to recover the fairy *Merjan*. He attacks the *Dive Demruft* in his own cave; where, having vanquished the giant or demon, he finds vast piles of hoarded wealth: these he carries off with the fairest captive. The battles, labours, and adventures of *Roftan*, another Persian worthy, who lived many ages after the former, are celebrated by the Persian bards with the fame extravagance of hyperbole with which the labours of *Hercules* have been sung by the poets of Greece and Rome.

The adventures of the Persian heroes breathe all the wildness of achievement recorded of the knights of Gothic romance. The doctrine of enchantments, transformations, &c. exhibited in both, is a characteristic symptom of one common original. Persia is the genuine classic ground of eastern mythology, and the source of the ideas of chivalry and romance: from which they were propagated to the regions of Scandinavia, and indeed to the remotest corners of Europe towards the west.

Perhaps our readers may be of our opinion, when we offer it as a conjecture, that the tales of the war of the *Peri and Dives* originated from a vague tradition concerning good and bad angels: nor is it, in our opinion, improbable that the fable of the wars between the gods and giants, so famous in the mythology of Greece and Italy, was imported into the former of these countries from the same quarter. For a more particular account of the Persian mythology, our readers may consult Dr Hyde de Relig. vet. Peri. Med. &c. D. Herbelet's *Bibl. Orient*, and Mr Richard-
laws and religious ceremonies, and explained to them the principles of mathematics, geometry and astronomy. In a word, he communicated to them every thing necessary, useful and ornamental: and so universal were his instructions, that not one single article had ever been added to them since the time they were first communicated. Helladius is of opinion that this strange performance, whoever he was, came to be represented under the figure of a fish, not because he was actually believed to be such, but because he was clothed with the skin of a seal. By this account our readers will see that the Babylonian Cunaxa is the exact counterpart of the Osiris of the Chaldees, and the Typhon or Mercury Trismegistus of the Egyptians. It is likewise apparent, that the idea of the monitor compounded of the man and the fish has originated from some hieroglyphic of that form grafted upon the appearance of man. Some modern mythologists have been of opinion that Cunaxa was actually Noah the great preacher of righteousness: who as some think, settled under the figure of a fish, not because he was regarded as a prophet from that people, we must be convinced that they also, as well as the other nations of the east, abounded in fabulous relations and romantic compositions. The natives of that country have always been enthusiastically addicted to poetry, of which fable is the essence. Wherever the muses have erected their throne, fables and miracles have always appeared in their train. In the Koran we meet with frequent allusions to well-known traditional fables. These had been transmitted from generation to generation by the bards and rhapsodists for the entertainment of the vulgar. In Arabia, from the earliest ages, it has always been one of the favourite entertainments of the common people, to assemble in the serene evenings around their tents, or on the platforms with which their houses are generally covered, or in large halls erected for the purpose, in order to amuse themselves with traditional narrations of the most distinguished actions of their most remote ancestors. Oriental imagery always embellished their romantic details. The glow of fancy, the love of the marvellous, the propensity towards the hyperbolic, and the vaft, which constitute the essence of oriental description, must ever have drawn the relation aside into the devious regions of fiction and fairy-land. The religion of Mahomet beat down the original fabric of idolatry and mythology together. The Arabians fables current in modern times, are borrowed or imitated from Persian compositions; Persia being full the grand nursery of romance in the east.

In Egypt we find idolatry, theology, and mythology, almost inseparably blended together. The inhabitants of this region, too, as well as of others in the vicinity of the centre of population, adored for several centuries to the worship of the true God. At last, however, conscious of their own ignorance, impurity, imperfection, and total unfitness to approach an infinitely perfect Being, distant, as they imagined, and invisible, they began to cast about for some beings more exalted and more perfect than themselves, by whose mediation they might prefer their prayers to the supreme Majesty of heaven. The luminaries of heaven, which they imagined were animated beings, naturally presented themselves. These were splendid and glorious beings. They were thought to partake of the divine nature: they were revered as the saviors,
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prefects, and representatives of the supreme Lord of the
universe. They were visible, they were benefi-
cient; they dwelt nearer to the gods, they were near
at hand, and always accessible. These were, of course,
employed as mediators and intercessors between the
supreme Divinity and his humble subjects of this lower
world. Thus employed, they might claim a subordinate
share of worship, which was accordingly assigned to
them. In course of time, however, that worship, which
was originally addressed to the Supreme Deity
by the mediation of the heavenly bodies, was in a
great measure forgotten, and the adoration of man-
kind ultimately terminated on those illustrious crea-
tures. To this circumstance, we think, we may ascribe
the origin of that species of idolatry called Zabifs, or
the worship of the host of heaven, which overspread
the world early and almost universally. In Egypt
this mode of worship was adopted in all its most ab-
surd and most enthusiastic forms: and at the same
time the most heterogeneous mythology appeared in,
its train. The mythology of the ancient Egyptians
was so various and multiform, so complicated and so
mysterious, that it would require many volumes even
to give a superficial account of its origin and progress,
not only in its mother country, but even in many oth-
ner parts of the eastern and western world. Besides,
the idolatry and mythology of that wonderful country
are so closely connected and so inseparably blended to-
gether, that it is impossible to describe the latter with-
out at the same time developing the former. We hope,
therefore, our readers will not be disappointed if, in
a work of this nature, we touched only upon some of
the leading or most interesting articles of this compli-
cated subject.

The Egyptians confounded the revolutions of the
heavenly bodies with the reigns of their most early
monarchs. Hence the incredible number of years in-
cluded in the reign of their eight superior gods, who,
according to them, filled the Egyptian throne succe-
sively in the most early periods of time. To these,
according to their system, succeeded twelve demigods,
who likewise reigned an amazing number of years.
These imaginary reigns were no other than the perio-
dical revolutions of the heavenly bodies preferred in
their almanacks, which might be carried back, and actu-
ally were carried back, at pleasure. Hence the fab-
ulous antiquity of that kingdom. The imaginary
exploits and adventures of these gods and demigods
furnished an inexhaustible fund of mythological ro-
mances. To the demigods succeeded the kings of the
cyclic cycle, perfomages equally chimerical with the
former. The import of this ephebet has greatly per-
plexed critics and etymologists. We apprehend it
is an oriental word importing royal dignity, elevation of
rank. This appellation intimated, that the mon-
archs of that cycle, admitting that they actually ex-
isted, were more powerful and more highly revered
than their successors. After the princes of the cyclic
cycle comes another race, denominated Nebthes, a title
likewise implying royal, splendid, glorious. These
cycles figure high in the mythological annals of the
Egyptians, and have furnished materials for a variety
of learned and ingenious disquisitions. The wars and
adventures of Osiris, Orus, Typhon, and other alle-
gorical personages who figure in the Egyptian rubric;
the wanderings of Isis, the sifter and wife of Osiris;
the transformation of the gods into diverse kinds of
animals; their birth, education, peregrinations, and
exploits; compose a body of mythological fictions
so various, so complicated, so ridiculous, and often so
apparently absurd, that all attempts to develop and
explain them have hitherto proved unsuccessfuL All,
the greatest part of those extravagant fables, are the
offspring of hieroglyphical emblematic symbols de-
vised by the priests and sages of that nation, with
a view to conceal the mysteries of their religion from
that class of men whom they stigmatized with the name
of the unintituated rabbles.

The worship of brute animals and of certain vege-
tables universal among the Egyptians, was another ex-
ample of the same source of mythological adventures. The E-
imals, &c, Egyptians, many of whom were likewise profound
philosophers, observed or pretended to observe, a kind
of analogy between the qualities of certain animals and
vegetables, and those of some of their subordinate di-
vinities. Such animals and vegetables they adopted,
and consecrated to the deities to whom they were sus-
pensed to bear this analogical resemblance: and in pro-
cess of time they considered them as the visible emblems
of those deities to which they were consecrated. By
these the vulgar addressed their archetypes: in the same
manner, as in other countries, pictures and statues were
employed for the very same purpose. The mob, in
process of time, forgetting the emblematical character
of those brutes and vegetables, addressed their devotion
immediately to them; and of course these became the
ultimate objects of vulgar adoration.

Aft after these objects, animate or inanimate, were
consecrated as the visible symbols of the deities, it soon
became fashionable to make use of their figures to re-
prent those deities to which they were consecrated.
This practice was the natural consequence of the hier-
oglyphical style which universally prevailed among
the ancient Egyptians. Hence Jupiter Ammon was
represented under the figure of a ram, Apis under that of
a cow, Osiris of a bull, Pan of a goat, Thoth or
Mercury of an ibis, Bubastis or Diana of a cat, &c.
It was likewise a common practice among those de-
clined to people to dignify these objects, by giving them
the names of those deities which they represented.
By
this mode of dignifying these sacred emblems, the
veneration of the rabble was considerably enhanced,
and the ardour of their devotion inflamed in propor-
tion. From these two sources, we think, are derived
the fabulous transformations of the gods, so generally
celebrated in the Egyptian mythology, and from it
imported into Greece and Italy. In consequence of
this practice, their mythological system was rendered
at once enormous and unintelligible.

Their Thoth, or Mercury Trismegistus, was, in our
opinion, the inventor of this unhappv system. This
Trismegist-
us was the origi-
nal author of letters, geometry, astrononuy, music, ar-
culture in a word, of all the elegant and useful
arts, and of all the branches of science and philosophy.
He it was who first discovered the analogy between
the divine affections, influences, appearances, opera-
tions, and the corresponding properties, qualities, and
indincts
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infinite of certain animals, and the propriety of dedicating particular kinds of vegetables to the service of particular deities.

The priests, whose province it was to expound the mysteries of that allegorical hieroglyphical religion (see Mysterie), gradually lost all knowledge of the primary import of the emblematical characters. To supply this defect, and at the same time to veil their own ignorance, the fardelous instructors had recourse to fable and fiction. They heaped fable upon fable, till their religion became an accumulated chaos of mythological absurdities.

Two of the most learned and most acute of the ancient philosophers have attempted a rational explication of the latent import of the Egyptian mythology; but both have failed in the attempt; nor have the moderns, who have laboured in the same field, performed their part with much better success. Instead, therefore, of prosecuting this inexplicable subject, which we shall dwell this article beyond all proportion, we must beg leave to refer those who are desirous of further information to the following authors, where they will find enough to gratify their curiosity, if not to inform their judgment: Herodotus, lib. ii. Diodorus Siculus, lib. ii. Plut. Isis and Osiris; Jamblicitus de Myth. Egypt. Horapollo Hieroglypis. Egypt. Macrobi. Sat. cap. 23. among the ancients; and among the moderns, Kircher’s Oedip. Voifi. de orig. et prog. Idol. Mr. Bryant’s Annals of Anc. Mythol. Mont. Gebelin Monde prin. and above all, to the learned Jahnblot’s Panh. Egyptiurn.

The elements of Phoenician mythology have been preserved by Enoebin, Prep. Evang. sub. init. In the large excerpt which that learned father hath copied from Philo Bibilius’s translation of Sanchoniathos’s History of Phoenicia, we are furnished with several articles of mythology. Some of these throw considerable light on several passages of the sacred history; and all of them are distinctly connected with the mythology of the Greeks and Romans. There we have preferred a brief but entertaining detail of the fabulous adventures of Uranus, Cronus, Dagon, Thoth or Mercury, probably the same with the Egyptian hero of that name. Here we find Muth or Pluto, Aephectus or Vulcan, Ekelapius, Nereus, Poseidon or Neptune &c. Atlaire, or Venus Urania, makes a conspicuous figure in the catalogue of Phoenician worthies: Pallas or Minerva is planted on the territory of Attica; in a word, all the branches of the family of the Titans, who in after ages figured in the rubric of the Greeks, are brought upon the stage, and their exploits and adventures briefly detailed.

By comparing this fragment with the mythology of the Atlanteans and that of the Cretans preferred by Diodorus the Sicilian, lib. vi. we think there is good reason to conclude, that the family of the Titans, the several branches of which seem to have been both the authors and objects of a great part of the Grecian idolatry, originally emigrated from Phoenicia. This conjecture would receive additional strength, when it is considered, that almost all their names recorded in the fabulous records of Greece, may be easily traced up to a Phoenician original. We agree with Herodotus, that a considerable part of the idolatry of Greece may have been borrowed from the Egyptians; at the same time, we imagine it highly probable, that the idolatry of the Egyptians and Phoenicians were, in their original constitution, nearly the same. Both systems were Sabian, or the worship of the host of heaven. The Pelagi according to Herodotus, learned the names of the gods from the Egyptians; but in this conjecture it is certain was warped by his partiality for that people. Had those names been imported from Egypt, they would no doubt have bewrayed their Egyptian original; whereas, every etymologist will be convinced that every one is of Phoenician extraction.

The adventures of Jupiter, Juno Mercury, Apollo, Diana, Mars, Minerva, or Pallas, Venus, Bacchus, Ceres, Proserpine, Pluto, Neptune, and the other descendants and coadjuvants of the ambitious family of the Titans, furnih by far the greatest part of the mythology of Greece. They left Phoenicia, we think, about the age of Moses; they settled in Crete, a large and fertile island; from this region they made their way into Greece, which, according to the most authentic accounts, was at that time inhabited by a race of savages. The arts and inventions which they communicated to the natives; the mystic arts of which the ancients were so inculcated; the laws, customs, polity, and good order, which they established; in short, the blessings of humanity and civilisation, which they everywhere disseminated in proofs of time, inspired the unpolished inhabitants with a kind of divine admiration. Those ambitious mortals improved this admiration into divine homage and adoration. The greater part of the worship, which had been formerly addressed to the luminaries of heaven, was now transferred to those illustrious personages. They claimed and obtained divine honours from the deluded rabble of enthusiastic Greeks. Hence sprang an inexhaustible fund of the most inconsistent and irreconcilable fictions.

The fables and frailties of the deified mortals were hence transmitted to posterity, incorporated as the pompous attributes of supreme divinity. Hence the heterogeneous mixture of the mighty and the mean which cheques the characters of the heroes of the Iliad and Odyssey. The Greeks adopted the oriental fables; the import of which they did not understand. These they accommodated to heroes and illustrious personages, who had figured in their own country in the earliest periods. The labours of Hercules originated in Egypt, and evidently relate to the annual progress of the sun in the zodiac, though the vain glorius Greeks accommodated them to a hero of their own, the reputed son of Jupiter and Alcmena. The expedition of Osiris they borrowed from the Egyptians, and transferred to their Bacchus, the son of Jupiter and Semle the daughter of Cadmus. The transformation and wanderings of Io are evidently transcribed from the Egyptian romance of the travels of Isis in quest of the body of Osiris, or of the Phoenician Atlaire, drawn from Sanchoniathos. Io or Is is in reality the Egyptian name of the moon; and Atlaire was the name of the same planet among the Phoenicians. Both these fables are allegorical representations of the anomalies of the lunar planet, or perhaps of the progress of the worship of that planet in different parts of the world. The fable of the configuration occasioned by Phaeton is clearly of oriental extraction, and alludes to an excessive drought which in the early periods.
periods of time scorched Ethiopia and the adjacent countries. The fabulous adventures of Perseus are said to have happened in the same regions, and are allegorical representations of the influence of the solar luminary; for the original Perseus was the sun. The rape of Proserpine and the wanderings of Ceres: the Eleusinian mysteries; the oria or sacred rites of Bacchus; the rites and worship of the Cabiri—were imported from Egypt and Phenicia; but strangely garbled and disfigured by the Hierophants of Greece. The gigantic, or war between the gods and the giants, and all the fabulous events, and varieties of that war, form an exact counterpart to the battles of the Peri and Dives, celebrated in the romantic annals of Persia.

The Greeks A considerable part of the mythology of the Greeks sprang from their ignorance of the oriental languages. They disdained to apply themselves to the study of languages spoken by people whom, in the pride of their heart, they stigmatized with the epithet barbarians. This aversion to every foreign dialect was highly detrimental to their progress in the sciences. The same neglect or aversion has, we imagine, proved an irreparable injury to the republic of letters in all succeeding ages. The aoids or strolling bards laid hold on those oriental legends, which they sophificated with their own additions and improvements, in order to accommodate them to the popular taste. These wonderful tales figured in their rhapsodical compositions, and were greedily swallowed down by the credulous vulgar. These fictions, as they rolled down, were constantly augmented with fresh materials, till in process of time their original import was either forgotten or buried in impenetrable darkness. A multitude of these Hefiod has collected in his Theogonia, or generation of the gods, which unhappily became the religious creed of the illiterate part of the Greeks. Indeed, fable was fo closely interwoven with the religion of that airy volatile people, that it seems to have contaminated not only their religious and moral, but even their political tenets.

The celebrated oracle of Dodona was copied from that of Ammon of Thebes in Egypt: The oracle of Apollo at Delphos was an emanation from the same source: The celebrated Apollo Pythius of the Greeks was no other than Od or Aub of the Egyptians, who denounced the baflfick or royal snake Oui Cai, because it was held sacred to the sun. Od or Aub is still retained in the Coptic dialect, and is one of the many names or epithets of that luminary. In short, the groundwork of the Greek mythology is to be traced in the eel. Only a small part of it was fabricated in the country; and what was imported pure and genuine was miserably sophificated by the hands through which it passed, in order to give it a Grecian air, and to accommodate its style to the Grecian taste. To enlarge upon this topic would be altogether superfluous, as our learned readers must be well acquainted with it already, and the unlearned may without much trouble or expense furnish themselves with books upon that subject.

The Roman mythology was borrowed from the Greeks. That people had addicted themselves for many centuries to the arts of war and civil polity, science and philosophy were either neglected or unacknowledged. At last they conquered Greece, the native land of science, and then "Greece capta ferum, victor empi arte at intulit agrifeti Latii." This being the case, their mythology was, upon the whole, a transcript from that of Greece. They had indeed gleaned a few fables from the Pelagi and Hetruicans, which, however, are of so little consequence, that they are scarcely worth the trouble of transcribing.

The mythology of the Celtic nations is in a good measure lost. There may possibly still remain some vestiges of the Druidical superstitious in the remotest parts of the Highlands and islands of Scotland; and perhaps in the uncivilized places of Ireland. These we presume, would afford our readers little entertainment, and still less instruction. Instead therefore of giving a detail of those uninteresting articles, we shall beg leave to refer our readers to Ollan's Poems, and Col. Valency's Collections of Irish Antiquities, for satisfaction on that subject.

The mythology of the northern nations, i.e. of the Norwegians, Danes, Swedes, Icelanders, &c. are uncommonly curious and entertaining. The Edda and Volupa contain a complete collection of fables which have not the smallest affinity with those of the Greeks and Romans. They are wholly of an oriental complexion, and seem almost congenial with the tales of the Perisans above described. The Edda was compiled in Iceland in the 13th century. It is a kind of Sylen of the Scandinavian mythology: and has been reckoned, and we believe justly, a commentary on the Volupa, which was the Bible of the northern nations. Odin or Othin, or Woden or Waden, was the supreme divinity of those people. His exploits and adventures furnish the far greatest part of their mythological creed. That hero is supposed to have emigrated from the east; but from what country or at what period is not certainly known. His achievements are magnified beyond all credibility. He is represented as the god of battles, and as slaying thousands at a blow. His palace is called Valhal: it is situated in the city of Midgard, where, according to the fable, the souls of heroes who had bravely fallen in battle enjoy supreme felicity. They spend the day in mimic hunting-matches, or imaginary combats. At night they assemble in the palace of Valhalla, where they feast on the most delicious viands, dressed and served up by the Valkyries, virgins adorned with celestial charms, and flushed with the bloom of everlasting youth. They obliterate themselves with drinking mead out of the ikulls of enemies whom they killed in their days of nature. Meat, it seems, was the nectar of the Scandinavian heroes.

Sleeping, the horse of Odin, is celebrated along with his matter. Heia, the Hell of the Scandinavians, affords a variety of fables equally shocking and heterogeneous. Loke, the evil genius or devil of the northern people, nearly resembles the Typhon of the Egyptians. Sigma or Sina is the comfort of Loke; from this name the English word fa is derived. The giants Weymur, Ferbanter, Belopher, and Helhunda, perform a variety of exploits, and are exhibited in the most frightful attitudes. One would be tempted to imagine, that they perform the exact counterpart of the giants of the Greek and Roman mythologies. Instead of glancing at these ridiculous and uninteresting fables,
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In America, the only countries must be Mexico and Peru. The other parts of that large continent were originally inhabited by savages, most of them as remote from religion as from civilization. The two vast empires of Mexico and Peru had existed about 400 years only before the Spanish invasion. In neither of them was the use of letters understood; and of course the ancient opinions of the natives relating to the origin of the universe, the changes which succeeded, and every other monument of antiquity, was obliterated and lost. Clavigero has indeed enumerated a vast number of singular gods worshipped by the Mexicans; but produces nothing either entertaining or interesting with respect to their mythology. The information to be derived from any other quarter is little to be depended upon. It passes through the hands of bigoted missionaries or other ecclesiastics, who were so deeply infatuated with fanaticism, that they viewed every action, every sentiment, every custom, every religious opinion and ceremony of those half civilized people, through a false medium. They often imagined they discovered resemblances and analogies between the rites of those savages and the dogmas of Christianity, which too weakly excite but in their own heated imagination.

The only remarkable piece of mythology in the annals of the Peruvians, is the pretended existence of Manco Capac the first Inca of Peru, and of Rama Oculla his consort. These two illustrious personages appeared first on the banks of the lake Titicaca. They were persons of a majestic stature, and clothed in decent garments. They declared themselves to be the children of the Sun, sent by their beneficent parent, who beheld with pity the miseries of the human race, to instruct and to reclaim them. Thus we find these two legislators availed themselves of a pretence which had often been employed in more civilized regions to the very same purposes. The idolatry of Peru was gentle and beneficent, that of Mexico gloomy and singular. Hence we may see, that every mode of superstition, where a divine revelation is not concerned, borrows its complexion from the characters of its professors.

In the course of this article, our readers will observe that we have not much enlarged upon the mythology of the Greeks and Romans; that subject, we imagine to be so universally known by the learned and so little valued by the vulgar, that a minute discussion of it would be altogether superfluous. Besides, we hope it will be remembered that the narrowness of the limits precluded us would fear not admit of a more copious detail. We would flatter ourselves, that in the course of our disquisitions we have thrown out a few reflections and observations, which may perhaps prove more acceptable to both descriptions of readers.

44 Mytilus, the Mussel, in ichthyology: a genus of animals, belonging to the order of vermes teffacea. The animal is an affida: the shell bivalve often affixed to some substance by a beard; the hinge without a tooth, marked by a longitudinal hollow line. Of these animals there are a great many species, some of them inhabiting the seas, others the rivers and ponds. Several of them are remarkable for the beauty of their internal shell, and for the pearls which are sometimes found in them.

1. The edulis, or edible mussel, has a strong shell, slightly incurved on one side, and angulated on the other.
The modiolus, or great mussel, with a strong shell, blunted at the upper end; one side angulated near the middle; from thence dilating towards the end, which is rounded. It dwells in the Mediterranean, Indian, European, and American seas: and its shell, which is a deep orange colour, is eatable. It is the greatest of the mussels known in Britain; being from six to seven inches in length; it lies at great depths; often seizes the baits of ground-lines, and is taken up with the hooks.

The cygnus, or swan mussel, with a thin brittle shell, very broad and convex, marked with concentric furrows; attenuated towards one end, dilated towards the other; decorticated about the hinge; the colour a dull green; the length six inches, breadth three and a half. It is an inhabitant of the European rivers, frequented chiefly their mouths.

The anatina, or duck mussel, has a shell more oblong and less convex than the last; is very brittle and semitransparent; the space round the hinges like the last; the length about five inches, breadth two. It is found in Europe in fresh waters. Both it and the cygnus are devoured by swans and ducks; whence their names; crows also feed on these mussels, as well as on different other shell fishes: and it is diverting to observe, that when the shell is too hard for their bills they fly with it to a great height, drop the shell on a rock, and pick out the meat when the shell is fractured by the fall.

The cryttagalli, or cock's-comb mussel, has the shell folded or plaited as it were, spinous, and both lips rugged. It makes its abode the coral beds of the Indian ocean.

The margaritiferus, or pearl bearing mussel, has the shell compressed and flat, nearly orbicular, the base transversely, and imbricated with dentated coats. It dwells in the ocean of either India. This is the murrea-pearlum of Rumphius, or mother-of-pearl shell. On the inside it is exquisitely polished, and of the whitenss and water of pearl itself. It has also the same lustre on the outside after the external epidermis have been taken off by aquafortis and the lapidary's mill. Mother-of-pearl is used in inlaid works, and in several toys, as nutcrackers, &c.

The lithophagus, or stone-eating mussel, has the shell cyllindric, the extremities both ways being rounded. It inhabits the Indian, European, and Mediterranean seas, penetrating and eating away marbles, &c. The Indian shell is softer and nearly tough like leather, but the European is more brittle.

The violaceus, or violet mussel, has the shell longitudinally furrowed, the rim very obtuse, somewhat formed like the mytilus edulis, but considerably larger and more flattened, of a beautiful violet colour. It inhabits the southern ocean. There are about 50 other species.

Mussels not only open and shut their shells at pleasure, but they have also a progressive motion; they can fasten themselves where they please; they respire water like fishes; and some even flutter about on its surface so as to inhale air. If they lie in shallow places, a small circular motion is seen above the heel of the shell: and a few moments after, they cast out the water by one single stroke at the other end of the shell. The mouth is situated near the sharp angle of the animal, and is furnished with four floating fringes in the shape of multiochios which may perhaps answer the purpose of lips. The bars which surround the edge of almost half the mussel, are a wonderful web of hollow fibres which serve as fins or organs of respiration, as vessels for the circulation of the fluids, and probably, as some philosophers suppose, as wedges for opening their shells; for we observe two large muscles or tendons for the purpose of swelling them; but we in vain look for their antagonists, or those which are defined to open them. When the mussel wishes to open itself, it relaxes the two muscles or tendons, and swells the fringes, which act as wedges and separate the shells. The animal fits up itself by the contraction of two thick fibrous muscles which are fixed internally to each end of the shells; and these shells are lined all around with a membrane or epidermis, which unites them so closely together when they are soaked in water, that not the smallest drop can escape from the mussel. When mussels choose to walk (a), they often contrive to raise themselves on the sharp edge of their shells, and put forth a feathery substance susceptible of extension, which serves them as a leg to drag themselves along, in a kind of groove or furrow which they form in the sand or mud, and which supports the shell on both sides. In ponds, these furrows are very observable. From the same member or leg hanging the threads...
The experiment proved the power of fastening themselves either to stones, or to another’s shells, in a very strong and firm manner; but the method of doing this was not well understood till the observations of Mr. Reaumur explained it. Every one who opens and examines a common mussel, will find, that in the middle of the fish there is placed a little blackish or brownish body resembling a tongue. This is large mussels is near half an inch long, and a little more than the sixth of an inch in breadth, and is narrower at the origin than at the extremity: from the root of this tongue, or that part of it which is fastened to the body of the fish, there are produced a great number of threads, which, when fixed to any solid substance, hold the mussel firmly in its place; these threads are usually from an inch to two inches in length, and in thicknesses from that of a hair to that of a hog’s bristle. They issue out of the shell in that part which is naturally open, and fix themselves to any thing that lies in their way, to stones, to fragments of shells, or which is the most common case, to the shells of other mussels: whence it happens that there are usually such large quantities of mussels found together. These threads are expanded on every side, and are usually very numerous, 150 having been found sitting from one shell: they serve the office of so many cables; and, each pulling in a proper direction, they keep the mussel fixed against any force that can be offered from whatever part it come. The filaments are well known to all who eat mussels, who ever carefully separate them under the name of the beard; and Mr. Reaumur has found that while the animal is living in the sea, if they are all torn away by any accident, the creature has a power of substituting others in their room; he found that if a quantity of mussels were detached from one another and put into a vessel of any kind, and in that plunged into the sea, they in a little time fastened themselves both to the sides of the vessel and to one another’s shells; the extremity of each thread seemed in this case to serve in the manner of a hand to seize upon any thing that it would fix to, and the other part, which was slender and smaller, to do the office of an arm in conducting it.

To know the manner of the mussels performing this operation, this diligent observer put some mussels into a vessel in his chamber, and covered them with sea water; he there saw that they soon began to open their shells, and each put forth that little body, before described by its resemblance to a tongue, and at the root of which these threads grow; they extended and shortened this part several times, and thrust it out every way, often giving it not less than two inches in length, and trying before, behind, and on every side with it, what were the proper places to fix threads at: at the end of these trials, they let it remain fixed for some time on the spot which they chose for that purpose, and then drawing it back into the shell with great quickness, was easy to see that they were then fastened by one of these threads to the spot where they had before touched and remained fixed for a few minutes; and in repeating this workmanship the threads are increased in number one at every time, and being fixed in different places they sustain the fish at rest against any common force.

The several threads were found to be very different from one another; the new formed ones being ever whiter, more glossy, and more transparent than the others: and it appeared on a close examination, that it was not, as might have been most naturally supposed, the office of the tongue to convey the old threads one by one to the new places where they now were to be fixed, but that these in reality were now become useless; and that every thread we see now formed, is a new one made at this time; and in fine, that nature has given to some sea-urchins, as well as to many land-insects, a power of spinning those threads for their necessary use, and that mussels and the like fish are under water, what caterpillars and spiders are at land.

To be well assured of this, however, Mr. Reaumur cut off the beard or old threads of a mussel as close as he could, without injuring the part; and the proof of the opinion of their spinning new ones at pleasure was now brought to this easy trial, whether these mussels, so deprived of their old ones, could fix themselves as soon as others which were poisified of theirs, and cold throw out their threads to as considerable distances.

The experiment proved the truth of the conjecture; for those whose beards or old threads were cut off, fixed.
fixed to the shell of another. The fringed edge of the mussel, which Lewenhoeck calls the beard, has in every minute part of it such variety of motions as is inconceivable; for being composed of long fibres, each fibre has on both sides a vast many moving particles.

The mussel is infected by several enemies in its own element; according to Reaumur it is in particular the prey of a small shell-fish of the trochus kind. This animal attaches itself to the shell of the mussel, pierces it with a round hole, and introduces a fort of tube five or fix lines long, which it turns in a spiral direction, and with which it sucks the substance of the mussel. Muscles are also subject to certain diseases, which have been supposed to be the cause of those bad effects which sometimes happen from the eating of them. These are directed by Dr Meckring, in the 7th vol. of the German Ephemerides, to be the mops and the scab. The roots of the mops being introduced into the shell the water penetrates through the openings, and gradually dissolves the mussel. The scab is formed by a fort of tubercles which are produced by the dissolution of the shell. Certain small crabs, which are sometimes found in muscles, likewise tend to make them unwholesome.

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fixed themselves as soon as those in which they were left, and spread their threads to as great a distance every way.

When the mechanism of this manufacture was thus far understood, it became a natural desire to inquire into the nature of the part by which it was performed. This has hitherto been mentioned under the name of the tongue, from its shape; but it is truly the arm of the fifth; and whenever it happens to be loosened from its company, or fixed in a wrong place, it serves the animal to drag its whole body shell and all along, and to perform its several motions. It fixes itself to some solid body; and then strongly contracting its length, the whole fifth must necessarily follow it, and be pulled towards the place where it is fixed. This is an arm, however, that this part is so rarely put to, that it is not properly to be esteemed a leg or an arm for this; but, according to its more frequent employment, may much better be denominated the organ by which the threads are spun. Though this body is flat in the manner of a tongue for the greater part of its length, it is however rounded or cylindrical about the base or insertion, and it is much smaller there than in any other part: there are several muscular ligaments fastened to it about the root or base, which hold it firmly against the middle of the back of the shell; of these ligaments there are four which are particularly observable, and which serve to move the body in any direction. There runs all along this body a slit or crack, which pierces very deeply into its substance, and divides it as it were into two longitudinal sections; this is properly a canal, and along this is thrown the liquor which serves to form the threads; and it is in this canal or slit that these threads are moulded into their form. Externally, this appears only a small crack or slit, because the two flabby fleshes of the parts almost meet and cover it; but it is rounded and deep within, and is surrounded with circular fibres. This canal is carried regularly on from the tip of the tongue, as it is called, to its base, where it becomes cylindrical; the cylinder in this part being no other than a close tube or pipe, in which this open canal terminates. The cylindrical tube contains a round oblong body, of the nature of the threads, except that it is much larger; and from the extremity of this all the threads are produced, this serving as a great cable to which all the other little cordages derivered towards different parts are fixed. The tube or pipe in which this large thread is lodged, seems the reservoir of the liquor of which the other threads are formed; all its internal surface being furnished with glands for its secretion.

The mussel, like many other sea-fishes, abounds in this liquor; and if at any time one touch with a finger the base of this spinning organ, one draws away with it a viscous liquor in form of several threads, like those of the caterpillar, spider, and the other spinning land-animals. The threads fix themselves with equal ease to the most smooth and glossy, as to rougher bodies; if the muscles are kept in glass-jars of sea-water, they as firmly fasten themselves to the glass as to any other body. Muscles, be they ever so young, have this property of spinning; and by this means they fasten themselves in vast numbers to any thing which they find in the sea. Mr Reaumur has seen them, when as small as millet-seeds, spin plentifully, though their threads, proportioned to their own weight, are much finer and smaller than those of larger muscles.
The eating of mussels has sometimes produced erysipelas, eruptions, and itching all over the body, great restlessness and agitation; and though these complaints are easily removed by oil, milk, and emetics, and have seldom or never proved mortal, yet they have an alarming aspect, and make the patient suffer grievously. These noxious effects have been supposed to be owing to the mussels or part of them having been diseased. Some authors however have pretended that these effects never take place but between the vernal and autumnal equinox: and M. Bennie, physician at Antwerp, in a memoir on this subject, seems inclined to adopt this opinion; for he recommends abstinence from mussels during the months of May, June, July, and August. The cause of these noxious effects in the mussel is, according to this author, altogether accidental. They are occasioned, he says, by a kind of flelta marina, a little sea insect pretty common about the mouth of the Scheldt, which sometimes lodges itself in the mussel in quest of food; and whose spawn is so caustic and inflammatory, that, even when applied outwardly to the skin, it produces itching and swellings that are painful in a high degree. The itching occasioned by touching the spawn of the flelta marina is removed by vinegar; and this known fact induced Dr. Bennie to prescribe the internal use of vinegar, after bleeding, evacuations, and emetics. His method consists in recommending a large quantity of refreshing beverage, and, every hour, three ounces of vinegar diluted in water. The remedy, however, seems rather to confirm the opinion of those who impute the disorder in question to an unperceived commencement of putrefaction in the mussel; as vinegar is known to be a powerful antiseptic, and there is no sort of putrefaction more noxious and offensive than that of fish.—Upon the whole, the edulis, or eatable mussel, though a rich food, is difficult of digestion. In its best state it is even noxious to some constitutions; and when affected by disease is in some degree poisonous. Mussels are apt to do most harm when eaten raw. They ought always to be boiled with onions, well washed with vinegar, and seasoned with pepper; and even thus qualified, they should not be eaten too often or too frequently.

MYT


The n is a nasal consonant; its sound is that of a, paffed through the nose; so that when the nose is stopped by a cold, or the like, it is usual to pronounce d for n. M. l'Abbe de Dangeau observes, that in the French, the n is frequently a mere nasal vowel, without any thing of the consonant in it. He calls it the Slavonic vowel. The Hebrews call their n nun, which signifies child, as being supposed the offspring of m; partly on account of the resemblance of sound, and partly on that of the figure. Thus from the n, by omitting the last column, is formed m; and thus from the capital N, by omitting the first column, is formed the Greek minucex. Hence for biennem, &c. the Latins frequently use limus; &c. and the same people convert the Greek λ, at the end of a word, into an m, as γαμυτος, pharmacum, &c. See M.

N before p, b, and m, the Latins change into m, and frequently into f and r: as in italia, illids, inrigs.
NAB [614] NAB

NABARD, NABARD, NABARD, or N Nabard, (anc. geog.), a town situated on the confines of Syria and Mesopotamia, and Babylonians; populous, and with a rich and extensive territory, not easily to be attacked by an enemy, being surrounded on all sides by the Euphrates and strong walls (Josephus). In the lower age the Jews had a celebrated school there.

NAAS, a borough and port town of Ireland, in the county of Kildare, and province of Leinster. It is the chief town of that county, and alternately with Athy the affixes town. It is distant above 15 miles south west of Dublin, in N. Lat. 53° 10′ W. Long. 6° 50′. It sends two members to parliament; and gives title of viscount to the family of Burke. It has five fairs in the year.—This place was anciently the residence of the kings of Leinster; the name signifies "the place of elders." For here the states of that province assembled during the 6th, 7th, and 8th centuries, after the Nafleighan of Carmen had been mathematicalized by the Christian clergy. On the arrival of the English it was fortified; many castles were reared, the ruins of which are still visible; and parliaments were held there. At the foot of the mount or rath are the ruins of a house founded in 1484, for emerites of the order of St. Augutin. In the 17th century the lord of Naas founded a priory dedicated to St John the baptist, for Augutinian regular canons. In the centre of this town the family of Eiflace erected a monastery for Dominican friars, dedicated to St. Euflacbus; and it appears that their possessions in Naas were granted them in the year 1355. This place was a strong hold during the civil wars.

NABATENE, or REGIO NABATRORUM, according to Jerome, comprised all the country lying between the Euphrates and the Red Sea, and thus contained Arabia Deserta, with a part of the Petrae; so called from Nabaitoth, the first born of Ismael. According to Dio­dorus, it was situated between Syria and Egypt. The people Nabati (i.e. Maccabees, Diodorus Siculus); inhabiting a desert and barren country; they lived by plundering their neighbours according to Diodorus. Nabathens the aciphet.

NABIS, tyrant of Sparta, reigned about 204 B.C.; and is reported to have exceeded all other tyrants so far, that upon comparison, he left the epithets of grateful and merciful to Dionysius and Phalaris. He is said to have contrived an instrument of torture in the form of a flame of a beautiful woman whose rich dress concealed a number of iron spikes in her bosom and arms. When any one therefore opposed his demands, he would say "If I have not talents enough to prevail with you, perhaps my woman Apega may peruse you." The statue then appeared; which Nabas taking by the hand, led up to the person, who being embraced by it, was thus tortured into compliance. To render his tyranny less unpopular, Nabas made an alliance with Flaminius the Roman general, and purdied with the most inverte enmity the war which he had undertaken against the Acha­eans. He befeiged Tyre, and defeated Philopela­men in a naval battle. His triumph was short, the general of the Achaean soon repaired his looses, and Nabas was defeated in an engagement, and killed as, he attempted to save his life by flight, about 194 years before the Christian era.

NABLOUS, a province of Syria anciently celebrated under the name of the kingdom of Samaria. Its capital, likewise called Nablus, is situated near to Sichem on the ruins of the Neopolis of the Greeks, and is the residence of a shah, who is subordinate to the pacha of Damascus, from whom he farms the tribute to the province.

NABLUM, in Hebrew, Nebel, was an instrument of music among the Jews; it had strings like the harp, and was played upon by both hands. Its form was that of a Greek v. In the Septuagint and vulgate, it is called nablum, psalterium, lyra; and sometimes cicibara.

NABO, or Neb, in mythology, a deity of the Babylonians, who presided over the next rank to Bel. It is mentioned by Isai. chap. xlviii. Voglios apprehends that Nabas was the moon, and Bel the Sun; but Grodias supposes that Nabas was some celebrated prophet of the country; which opinion is confirmed by the etymology of the name, signifying, according to Jerome, "one that presides over prophecy."

NABOB, properly NAB, the plural of Nab, a deputy. As used in Bengal, it is the same as Nazim. It is a title also given to the wives and daughters of princes, as well as to the princes themselves.

NABONASSAR, first king of the Chaldeans or Babylonians; memorable for the Jewish era which bears his name, which is generally fixed in 3257, beginning on Wednesday February 26th in the 3967th of the Julian period, 747 years before Christ. The Babylonians revolting from the Medes, who had overthrown the Assyrian monarchy, did, under Nabonassar found a dominion, which was much increased under Nebuchadnezzar. It is probable, that this Nabonassar is that Balaad in the second of Kings xx. 12. father of Merodach, who sent ambassadors to Hezekiah. See 2 Chron. xxxii.

NABOPOLASSAR, king of Babylon: he joined with Astyages the Mede, to destroy the empire of Ass­yria; which having accomplished, they founded the two empires of the Medes under Astyages, and the Chaldeans under Nabopolassar, 627 B.C.

NABUCHADNEZzar, or Nabuchodonosor, II. king of Assyria, son of Nabopolassar, and styled the Great, was associated by his father in the empire, 607 B.C.; and the following year he took Jehoiakim king
It is 'buried near it under an altar, admiration. Tarquin fragments left of his works he at length died, fed Metellus on account of the satyrical ridicule of the Romans of his preternatural power, cut a verse, and a great number of comedies: which cut with great diligence. He They were generally directly over our heads. But as he was admiring his own magnificence, and when they are red, black, &c. Their shapes are various; some refembling strawberries, others grapes, &c. Hieffer advises their removal by means of a ligature, a cautery, or a knife, as circumstances best suit.

As to the tumor called a wen, its different species are distinguished by their contents. They are encysted tumors; the matter contained in the first three following is infipid lymph, and that in the fourth is only fat. Mont. Lître was the first who particularly described the fourth kind; and to the following purpose he speaks of them all. A wen is said to be of three sorts, according to the kind of matter it contains: that whose contents resemble boiled rice, or curds, or a bread-poultice, is called atheroma; if it resembles honey, it is named meliteris; and if it is like fat, it is denominated flatoma; but there is a fourth sort, which may be called lipome, because of its fat contents resembling grease. He says that he has seen one on the shoulders of a man, which was a thin bag, of a tender texture, full of a soft fat, and that it had all the qualities of common grease. And though the fat in the lipome resembles that in the flatoma, yet they cannot be the same: for the matter of the flatoma is not inflammable, nor does it melt; or if it does, it is with great difficulty and imperfectly; whereas it is the contrary with the lipome. When the man who had the above named lipome was fattigued, or had drank freely of strong liquors, his lipome was inflamed for some days after, and its contents rarefy increased the size of the tumor.

The lipome seems to be no other than an enlargement of one or more of the cells of the adipose membrane, which is filled only with its natural contents. Its softness and largeness distinguish it in general from the other species, though sometimes the fatty contents will be so hard as to deceive. As this kind of wen does not run between the muscles, nor is posseffed of any considerable blood-veins, it may always be cut off with ease and safety.

As to the other kind of wens, their extirpation may or may not be attempted, according as their situation is with respect to adjacent vessels, the wounding of which would endanger the patient's life.

NAGERA, or Nagara, a town of Spain, in Old Caltilis, and the territory of RIOJA, with the title of a dutchy and fortress; famous for a battle fought in its neighbourhood in 1569. It is situated in a fertile country, on a brook called Naferilla. W. Long. 2. 20. N. Lat. 42. 25.

NAGRACUT, a town of India, the capital of a kingdom of the same name in the dominions of the Great
Nahum

Great Mogul, with a rich temple to which the Indians go in pilgrimage. It is seated on the river Ravi. E. Long. 78° 10'. N. Lat. 33° 12'.

NAHUM, or the Prophecy of Nahum, a canonical book of the Old Testament.

Nahum, the seventh of the 12 lesser prophets, was a native of Elkohai, a little village of Galilee. The subject of his prophecy is the destruction of Nineveh, which he describes in the most lively and pathetic manner: his style is bold and figurative, and cannot be exceeded by the most perfect masters of oratory. This prophecy was verified at the siege of that city by Assyges, in the year of the world 3378, 622 years before Christ.

NAIADES (nab. hijt.), certain inferior deities who presided over rivers, springs, wells, and fountains. The Naiades generally inhabited the country, and resorted to the woods or meadows near the stream over which they presided. They are represented as young and beautiful virgins, often leaning upon an urn from which flows a stream of water. Agle was the fairest of the Naiades, according to Virgil. Their name seems to be derived from nauin, to flow. They were held in great veneration among the ancients; and often sacrifices of goats and lambs were offered to them, with libations of wine, honey, and oil. Sometimes they received only offerings of milk, fruit, and flowers.

NAIANT, in heraldry, a term used in blazoning fitches, when borne in an horizontal posture, as if swimming.

NAIAS, in botany: A genus of the monandria order, belonging to the dicciae class of plants; and in the natural method ranking with those of which the order is doubtful. The male calyx is cylindrical and biform; the corolla quadrifid; there is no filament; nor is there any female calyx or corolla; there is one pistil; and the capsule is ovate and unilocular.

NAID, the interior of the great desert of Arabia, inhabited by a few scattered tribes of feebile and wretched Arabs. See Arabia.

NAIL, ungus, in anatomy. See there, no 81.

NAILS, in building, &c. small spikes of iron, brass, &c. which being drove into wood, serve to bind several pieces together, or to fasten something upon them. Nails were made use of by the ancient Hebrews for cancelling bonds; and the ceremony was performed by striking them through the writing. This seems to be alluded to in scripture, where God is said by our crucified Saviour to have "blotted out the handwriting of ordinances that was against us, and to have taken it out of the way, nailing it to his cross." Col. ii. 14.

For the cause and ceremony of driving the annual nail, or clavus annalis, among the Romans, see ANNUIS CLAVIS.

NAI, is also a measure of length, containing the 16th part of a yard.

NAILING OF CANNON. When circumstances make it necessary to abandon cannon, or when the enemy's artillery are feized, and it is not however possible to take them away, it is proper to nail them up, in order to render them useless: which is done by driving a large nail or iron spike into the vent of a piece of artillery, to render it un serviceable. There are various contrivances to force the nail out, as also sundry machines invented for that purpose, but they have never been found of general use; so that the best method is to drill a new vent.

One Gaifer Vimerculus was the first who invented the nailing of cannon. He was a native of Bremen and made use of his invention first in nailing up the artillery of Sigismond Malatesta.

NAIN (Lewis Belwi), one of the most learned and judicious critics and historians France has produced, was the son of a master of the requests, and born at Paris in 1637. At ten years old he went to school at Port Royal, and became one of the best writers of that institution. Sacy, his intimate friend and counsellor, prevailed with him in 1676 to receive the priesthood; which, it seems, his great humility would not before suffer him to aspire to. This virtue he seems to have possessed in the extreme; so that Boisfet, seeing one of his letters to father Damis with whom he had some little dispute, befought him merely "not be always upon his knees before his adversary, but raise himself now and then up." He was solicited to publish himself in the church, and Buzaval, bishop of Beauvais, wished to have him for his successor; but Nain, regardless of dignities, wished for nothing but retirement. In this he did indeed most effectually bury himself; and, joining the mortifications of a religious life to an indefatigable pursuit of letters, he wore himself entirely out, so as to die in 1698, aged 61, though he was formed for a longer life. His principal works are, 1. Memoirs on the ecclesiastical history of the first six ages of the church, 16 vols 4to. 2. The history of the emperors, 6 vols 4to. These works are deduced from original sources, and composed with the utmost fidelity and exactness.

NAIN or NAIM, situated at the bottom of mount Hermon on the north side, was anciently a city of the tribe of Issachar, in the province of Galilee. It was near the gates of this city that our Saviour reflored to life the only son of a widow, and where he inspired Mary Magdalene to come and mourn for her sins at his feet. These circumstances alone make this place worthy of notice: for at present Nain is only a hamlet inhabited by Christians, Mahometans, and Hebrews, where there is not a single monument to attract the curiosity of the traveller.

NAIRES, NAHERS, or NAIERS, in modern history, a name which is given by the Malabarians to the military of their country, who form a very numerous class or tribe, out of which the sovereigns of Malabar choose their body-guard.

NAIRN, a county of Scotland, comprehending the west part of Murray. It is bounded on the north by Murray frith, on the west and south by Inverness, and on the east by Elgin. The length of it amounts to 20 miles, and the breadth to 14. The air is temperate and salubrious, and the winters are remarkably mild.

The face of the country is rough and mountainous; yet there are some fruitful firths, or valleys, which produce good crops of oats and barley: but in general the country is much better adapted for pasture. Here are also large woods of fir, and other trees, that afford shelter to the game, of which there is great plenty. A firth is a long, narrow valley, with a river running through the bottom. Of these, the most remarkable
remarkable in this county, are Strathmarn, on the river 
of that name, in the south-west part of the shire; and 
on the south-east side, Strathlom, on both sides of 
Findhorn river. Nairn is well watered with burns, 
rivulets, and lakes, abounding with fish. In the southern 
part there is a small lake, called Aly, surrounding an 
island, on which there is a castle belonging to the lord 
of Minto; but the greater part of the shire is peopled 
by the Frasers, a warlike Highland clan, whose 
chief, the Lord Lovat, but his life on a scaffold for 
having been concerned in the late rebellion. There 
are a great number of villages; but few towns of note 
except Nairn, supposed to be the Tweed of Pohorny, 
situated at the mouth of the river which bears the same 
name; a royal borough, which gave a title of lord to 
an ancient family, forfeited in the rebellion of 1715. 
The harbour, which opened in the Murray frith, is 
now choked up with sand; and the commerce of the 
town is too inconsiderable to deserve notice. The 
people in general subsist by feeding sheep and black 
cattle. About four miles from Nairn stands the 
castle of Calder, on the river of that name, belonging to 
a branch of the family of Cumbell. In this 
neighbourhood we find a quarry of free-stone, and many 
signs of copper. About six miles to the north west 
of Nairn, a new fort has been lately built by order 
of the government, at a place called Ardosier, a small 
ithmus upon the Murray frith, which it is intended 
to command.

NAISSANT, in heraldry, is applied to any animal 
issuing out of the midst of some ordinary, and 
showing only his head, shoulders, fore-feet, and legs, 
with the tip of his tail; the rest of his body being hid in 
the shield, or some charge upon it; in which it differs 
from issuant, which denotes a living creature arising out 
of the bottom of any ordinary or charge. 
NAISSUS (anc. geog.) a town of Dardania, 
a district of Macedonia, said to be the birth-place 
of Constantine the Great, which seems probable from 
his often residing at that place. Naissian, the people 
(Coin). Now called Nijia, a city of Servia. E. Long. 
23° N. Lat. 43°.

NAKED SEEDS, in botany, those that are not inclu 
ded in any pod or cafe.

NAKIB, in the oriental dignities, the name of an 
officer who is a deputy to the calendicifer, or, as he 
may be called, the lord high chancellor of Egypt, 
appointed by the grand signior. His office is to carry 
the standard of Mahomet.

NAKOUS, an Egyptian musical instrument, made 
like two plates of brass, and of all sizes, from two 
inches to a foot in diameter; they hold them by strings 
fasted to their middles, and strike them together so 
as to beat time. They are used in the Coptic churches 
and in the Mahometan proceedings.

NAMA, in botany: A genus of the digynia or 
order, belonging to the pentandria class of plants: and 
in the natural method, ranking under the 13th order, 
Succulenta. The calyx is pentaphyllous, the corolla 
quinkquerate, the capsule molleculare and bivalved.

NAME, denotes a word whereby men have agreed 
to express some idea; or which serves to denote or 
signify a thing or subject spoken of. See Word. 
This the grammarians usually call a noun, nomen, 
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though their noun is not of quite so much extent as 
our name. See Noun.

Seneca, Lib. II. de Beneficiis, observes that there are 
great number of things which have no name; and 
which, therefore, we are forced to call by other bor 
rrowed names. Ingenius (fays he) verum est, quae 
non nominant, quae cum praestis et appellatibus signant 
non passu, alius accommodatius at omnis: which may show 
why, in the course of this dictionary, we frequently 
give divers names to the same word.

Names are distinguished into proper and appellative.

Proper Names, are those which represent some 
individual thing or person, so as to distinguish it from all 
other things of the same species; as, Socrates, which 
represents a certain philosopher.

Appellative or General Names, are those which 
signify common ideas; or which are common to several 
individuals of the same species; as, botes, animal, man, 
oak, &c.

Proper names are either called Christian, as being 
given at baptism; or surnames: The first imposed for 
distinction of persons answering to the Roman pre 
nomen; the second, for the distinction of families, an 
twering to the nomen of the Romans, and the patrionymic 
ics of the Greeks.

Originally every person had but one name; as among 
the Jews, Adam, &c. among the Egyptians, Bcrfris; 
among the Chaldees, Nina; the Medes, Aflugae; 
the Greeks, Diomedes; the Romans, Romanus; the 
Gauls, Divinitus; the Germans, Ariovistus; the Bri 
ts, Cuffidones; the English, Hengist, &c. And thus 
of other nations, except those savages of Mount Atlas, 
whom Pliny and Marcellinus represent as amanis, 
"named ors.

The Jews gave the name at the circumcision; viz. 
eight days after the birth: the Romans, to females the 
first name, to males the ninth; at which time they 
held a feast, called nomis.

Since Christianity has obtained, most nations have fol 
lowed the Jews, baptizing and giving the name on the 
eighth day after the birth; except our English ances 
tors, who till of late, baptized and gave the name on the 
birth day.

The first imposition of names was founded on differ 
ent views, among different people; the most common 
was to mark the good wishes of the parents, or to ent 
itle the children to the good fortune a happy name 
seemed to promise. Hence, Victor, Caesar, Faustus, 
Statius, Probus, &c.

Accordingly, we find such names, by Cicero called 
bona nomen, and By Tacitus fauia nomen, were 
first enrolled and ranged in the Roman musters; first 
called to serve at the sacrifices, in the foundation of 
colonies, &c. And, on the contrary, Livy calls Atrius 
Umber, alominandi omnis nomen; and Plautus, on oc 
casion of a person named Lyco, i. e. " greedy wolf," 
says;

Vos sum nunc facete, quae dilectum est eum 
Quo-id fit dominus, cui Lyco nomen sit.

Hence, Plato recommends it to men to be careful in 
giving happy names; and the Pythagoreans taught 
expressly, that the minds, actions, and successes of men 
were according to their names, genius, and fate. Thus
Panormitan, ex bono nomine vivitur bona presumpitio; and the common proverb, Bonum nominis bonum omen: and hence the foundation of the onomomantia. See ONOMOMANTIA.

It is an observation deserving attention, says the Abbé Barthélemy, that the greater part of names found in Homer are marks of distinction. They were given in honour of the qualities most esteemed in the heroic ages. From the word pelema, which signifies war, have been formed Tlepolemus and Archepol, the names of two heroes mentioned in the Iliad. The former name signifies able to support, and the latter, able to direct, the labours of war. By adding to the word mache, or battle, certain prepositions and different parts of speech, which modify the sense in a manner always honourable, are composed the names Amphilochus, Animachus, Promachus, Telenachus. Proceeding in the same way with the word honor, "strength or intrepidity," they formed the names Agapenes, "he who exerts valour:" Agenor, "he who directs it." From these, "swift," are derived Alexeobis, Panteobis, Periboeis, &c.

From nom, "mind or intelligence," come Alfinos, Arfinoes, Atiines, &c. From medes, "counsel," Agamedes, Eumedes, Lycoinedes, Thalmyomedes; and from elis, "glory," Amphiloch, Agales, Iphileos, Patroclus, Cleobulus, with many others.

Hence Camden takes it for granted, that the names, in all nations and languages, are significative, and not simple sounds for mere distinction sake. This holds not only among the Jews, Greeks, Latins, &c. but even among the Turks; among whom, Abdalla signifies God's servant; Soliman, peaceable; Mahomet, glorified, &c. And the favages of Hispaniola, and throughout America, who, in their languages, name their children, Glittering Light, Sun Bright, Fine Gold, &c.; and they of Congo, by the names of precious stones, flow er, &c.

To supposes names given without any meaning, however by the alternation of languages their significative may be lost, that learned author thinks is to reproach our ancestors; and that contrary to the sense of all ancient writers. Porphyry notes, that the barbarous names, as he calls them, were very emphatical, and very concise; and accordingly it was esteemed a duty to be Griswells, or sui nominis homines; as Severus, Probus, and Aurelius, are called sui nominis imperatores.

It was the usual way of giving names, to which the children might discharge their names. Thus when Gunther king of France named Clotharius at the font, he said, Crescat puer, & bujas fit dominus executor.

The ancient Britons, Camden says generally took their names from colours, because they painted themselves; which names are now lost, or remain hid among the Welsh. When they were subdued by the Romans, they took Roman names, some of which full remain, corrupted: though the greatest part became extinct upon the admission of the English Saxons, who introduced the German names, as Orilla, Penda, Oxford, Edward, &c.-The Danes, too, brought with them their names; as Swane, Harold, Knute, &c. The Normans, at the Conquest, brought in other German names, as originally using the German tongue: such as Robert, William, Richard, Henry, Hugh, &c. after the same manner as the Greek names: Alfynus, Beor­thius, Symmachus, &c. were introduced into Italy upon the division of the empire. After the Conquest, our nation, which had ever been averse to foreign names, as deeming them unlucky, began to take Hebrew names; as Matthew, David, Sampson, &c. The various names anciently or at present obtaining among us, from what language or people forever borrowed, are explained by Camden in his Remains. As to the period when names began to be multiplied, and surnames introduced, &c. see SURNAME.

Of late years it has obtained among us to give surnames for Christian names; which some dislike, on account of the confusion it may introduce. Camden relates it as an opinion, that the practice first began in the reign of Edward VI. by such as would godfathers, when they were more than half fathers. Upon which some were persuaded to change their names at confirmation; which, it seems, is usual in other countries.—Thus, two sons of Henry II. of France, christened Alexander and Hercules, changed them at confirmation into Henry and Francis. In monasteries, the religious assume new names at their admittance, to shew they are about to lead a new life, and have renounced the world, their family, and even their name: e.g., after Mary of the incarnation, brother Henry of the Holy Sacrament, &c. The popes also changed their names at their exaltation to the pontificate; a custom first introduced by pope Sergius, whose name till then, as Platina informs us, was Swine­fat. But Onuphrius refers it to John XII. or XIII. and at the same time adds a different reason for it from that of Platina, viz. That it was done in imitation of St Peter and St Paul, who were first called Simon and Saul.

Among the ancients, those deified by the Heathen confecrations had new names given them; as Romulus was called Quirinus; Melicertes, Portus or Portum­nus, &c.

New names were also given in adoptions, and sometimes by baptism: thus L. Æmilinus, adopted by Scipio, took the name of Scipio Africanus; and thus Auguflus, who at first was called C. Ovidius Thurinus, being adopted by the baptism of Julius Caesar into his name and family, took the name of Caius Julius Caesar Octavianus.

Names were also changed at enfranchisements into new cities. Thus Lucumo, at his first being made free of Rome, took the name Lucius Tarchynius Priscus, &c.; and flavus, when made free, usually assumed their masters names. Thole called to the equestrian order, if they had base names, were always new named, nomine ingeniorum veterumque Romanorum. And among the primitive Christians, it was the practice to change the names of the catechumens: Thus the renegado Lucianus, till his baptism, was called Lucius.

Toward the middle of the 15th century, it was the fancy of the wits and learned men of the age, particularly in Italy, to change their baptismal names for classical ones. As Sanazarus, for instance, who altered his own plain name to Attius Synarius. Numbers did the same, and among the rest Platina the historian at Rome, who, not without a solemn ce­remomial,
NAMPTWICH, or NANTWICH, a town of Cheshire in England, situated on the Weever river, 14 miles S. E. from Chester and 162 miles from London. It lies in the Vale-Royal, and is one of the largest and best built towns in the county, the streets being very regular, and adorned with many gentlemen's houses. The inhabitants drive a trade, not only by its large market on Saturday for corn and cattle, and its great thoroughfare to Ireland, but by its cheeze and its fine white salt, which are made here to the greatest perfection; and by shoes made here and sent to London to the warehousers. It is governed by a confiable, &c. who are guardians of the free-fringes. It is divided by the Weever into two equal parts, which is not navigable any farther than Winsford bridge. The Chester canal, lately completed, terminates in a handsome broad bason near this place. In this town were several religious foundations, no more. The church is a handsome pile of building in the form of a crofs, with a circular tower in the middle. There are here three fairs.

NAMUR, a province of the Netherlands, lying between the rivers Sambre and Meafe; bounded on the north by Brabant, on the east and south by the bishoprie of Leigue, and on the west by Hainault. It is very pretty, has several forests, marble quarries, and mines of iron, lead, and pit-coal; and is about 30 miles long and 20 broad. Namur is the capital town.

Namur, a large, rich, and very strong town of the Netherlands, capital of the county of Namur, with a strong castle, several forts, and a bishop's see. The most considerable forts are, Fort-William, Fort-Maeve, Fort Coqueler, and Fort-Epinoir. The castle is built in the middle of the town, on a craggy rock. It was besieged by king William in 1695, who took it in the sight of an army of 100,000 French, though there were 60,000 men in garrison. Namur is now a barrier-town, and has a Dutch garrigon. It was ceded to the house of Austria in 1713, but taken by the French in 1746; and restored by the treaty of Aix-la-Chapelle. It is situated between two mountains, at the confluence of the rivers Meafe and Sambre, in E. Long. 4° 57' N. Lat. 50° 25'.

NAN-CHANG-FOU, the capital of Kiang-Si, a province of China. This city has no trade but that of porcelain, which is made in the neighbourhood of Jao-tcheou. It is the residence of a vicerey, and comprehends in its district eight cities; seven of which are of the third class, and only one of the second. So much of the country is cultivated, that the plateers left are scarcely sufficient for the rocks.

NANNI, a town of France, and capital of Lorraine, is situated on the river Meuse, in the centre of the province. It is divided into the Old and New Towns. The first, though irregularly built, is very populous, and contains the ducal palace; the streets of the New Town are as straight as a line, adorned with handsome buildings, and a very fine square. The principal church is a magnificent structure, and in that of the Cordeliers are the tombs of the ancient dukes. The two towns are separated by a canal; and the new town was very well fortified, but the king of France has demolished the fortifications. It has been taken and retaken several times; particularly by the French, to whom it was ceded in 1756, to enjoy it after the death of Stanislaus.

NANI (John-Baptist), was born in 1616. His father was procurator of St Mark, and ambassadoir from Venice to Rome. He was educated with attention, and made considerable improvement. Urban VIII. was a just valuer of merit, soon perceived that of young Nani. He was admitted into the college of cardinals in 1641, and was shortly after nominated ambassadoir in France, where he signified himself by his compliant manners. He procured considerable succours for the war of Candia against the Turks; and became, after his return to Venice, superintendent of the war office and of finances. He was afterward ambassadoir to the empire, where he rendered those services to his country which, as a zealous and intelligent citizen, he was well qualified to discharge. He was again sent into France in 1660 to solicit fresh succours for Candia; and on his return was appointed procurator of St Mark. He died November 5, 1671, at the age of 63, much regretted by his countrymen. The Senate had appointed him to write the History of the Republic; which he executed to the satisfaction of the Venetians, although the work was less admired by foreigners, who were not proper judges of the accuracy with which he related the facts, of the purity of his diction, nor of the simplicity of his style; although it must be acknowledged that his narrative is much interrupted by too frequent parenthesis. In writing his history of Venice he has given an universal history of his times, especially with respect to the affairs of the French in Italy. This History which is continued from 1613 to 1671, was printed at Venice in 2 vols 4to, in the years 1662 and 1679.

NAN-KING, a city of China, and capital of the province of King-nan, is said to have been formerly one of the most beautiful and flourishing cities in the world. When the Chinese speak of its extent they say, if two horsemen should go out by the same gate, and ride round it on full speed, taking different directions, they would not meet before night. This account is evidently exaggerated; but it is certain, that Nan-king surpasses in extent all the other cities of China. We are assured that its walls are five leagues and a half in circumference.

This city is situated at the distance of a league from the river Yang-tse-kiang; it is of an irregular figure; the mountains which are within its circumference by ving prevented its being built on a regular plan. It was formerly the imperial city; for this reason it was called Hon-King, which signifies, "the Southern Court."
NANTIES, an ancient, rich, and very considerable town of France, in Bretagne, with a bishop's see, an university, and a mint. It is one of the most considerable places in the kingdom; contains the richest merchants; and was formerly the residence of the dukes of Bretagne, where they built a very strong caftle on the side of the river, and which is strongly fortified. There are several parishes, and a great many religious houses, and the cathedral contains the tombs of the ancient dukes. There are several fine bridges over the river Loire, which is navigable. The suburbs are so large, on account of the number of people that come from all parts to settle here, that they exceed the city. The Spaniards trade here, with wine, fine wool, iron, silk, oil, oranges, and lemons: and they carry back cloth, fuffs, corn, and hard-ware. The Dutch send salt fish, and all sorts of spices: and in return have wine and brandy. The Swedes bring copper; and the English lead, tin, and pit-coal. It was in this place that Henry IV. promulged the famous edict in 1598, called the Edict of Nantes, and which was revoked in 1685. Nantes was anciently, like almost every considerable city, extremely very strongly fortified. Peter de Dreux, one of the dukes of Bretagne, surrounded it with walls, which have only been demolished within these few years. The bridge is an object of curiosity. It is near a mile and a half in length, being continued across all the little islands in the Loire, from north to south. The territory of Nantes lies on both sides the Loire, and feeds a great number of cattle. Large vessels can come no higher than Port Launai, which is 12 miles from Nantes.

NANTUEIL (Robert), the celebrated designer and engraver to the cabinet of Louis XIV. was born at Rheims in 1630. His father, though but a petty shopkeeper, gave his son a liberal education; who having a taste for drawing, cultivated it with such success, that he became the admiration of the whole town: but marrying young, and not being able to maintain his talents known by a stratagem.—Seeing several abbés at the door of an eating-house, he asked the mistresses for an ecclesiastic of Rheims, whose name he had forgotten, but that the might easily know him by a picture of him which he showed: the abbés crowding round, were so charmed with it, that he seized the opportunity of offering to draw any of their pictures for a small matter. Customers came so fast, that he soon raised his price, and brought his family to Paris, where his reputation was quickly established. He applied himself particularly to taking portraits in crayons, which he afterwards engraved for the use of academical theses; and in this way he did the portrait of the king, and afterwards engraved it as big as the life; a thing never before attempted. The king was so pleased with it, that he created the place of designer and engraver to the cabinet for him, with a pension of 1000 livres. He died in 1678: and an entire collection of his prints amounts to upwards of 240.

NANTWICH. See NAMPTWICH.

NAPAEA, in botany: A genius of the Polyandra order, belonging to the Polydeltphia class of plants: and in the natural method ranking under the 37th order, Clonanifera. The calyx is fingle and cylindric the
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Naphtha. the arilli coagulated and monoporous. There are two species, both of them with perennial roots, composed of many thick fleshy fibres, which strike deep into the ground, and are connected at the top into large heads; the flowers grow to seven or eight feet high, producing white flowers, tubulous at bottom, but spreading open at top, and dividing into five obetute segments. Both these plants are natives of Virginia and other parts of North America: from the bark of some of the Indian kinds a fort of fine hemp might be procured, capable of being woven into very strong cloth. They are easily propagated by seed, which will thrive in any situation.

Naphtha, an inflammable substance of the bituminous kind, of a light brown colour, and incapable of decomposition, though frequently adulterated with heterogeneous mixtures. By long keeping it hardens in the air into a mass which being the lightest oil, is capable of being woven into very strong cloth. It is said to be of an extremely fragrant and agreeable smell though very different in this respect from vegetable oils. It is also transparent, extremely inflammable, dissolves resins and balsams, but not gum-resins nor elastic gum. It dissolves in the essential oils of thyme and lavender, but is insoluble in spirit of wine and ether. It burns with a bluish flame, and is as inflammable as ether, like which it also dissolves and dissolves in aqua-regia.

Naphtha, according to Cronsted, is collected from the surface of some wells in Persia; but Mr Kirwan informs us, that it issuing out of white, yellow, or black clays, in Persia and Media. The finest is brought from a peninsula in the Caspian Sea, called by Kempfer, *elpea.* It issues out through the earth into cisterns and wells, purposely excavated for collecting it at Aku in Persia. Different kinds of this substance are also found in Italy, in the duchy of Modena, and in Mount Ciaro, 12 leagues from Plaisance.

The formation of naphtha and petroleum is by most naturalists and chemists ascribed to the decomposition of solid bitumens by the action of subterranean fires; naphtha being the lightest oil, which the fire deteriorates first; what follows gradually acquiring the colour and consistence of petrol. Lastly, the petroleum, united with some earthy substances, or altered by acids, attains the appearance of mineral pitch, papahlalum, &c. This opinion seems to be supported by the phenomena attending the distillation of amber; where the first liquor that rises is a true naphtha; then a petroleum of a more or less brown colour; and lastly, a black substance like jet, which being further urged by the fire leaves a dry fleshy matter, &c. It is further observed that nature frequently produces all the different kinds of petroleum near the same place; of which we have an instance at Mount Teffin in the duchy of Modena in Italy. Some, however, are of opinion, that these mineral oils or bitumens are formed from the vitriolic acid, and various oily and fat substances found in the bowels of the earth.

NAPHTHALI, or NAPHTHALI (Joel xii.), one of the tribes of Israel; having Zabulon on the south, Asher on the west, the Jordan on the east, and on the north Antilibanus.

NAPIER (John), baron of Merchiston, in Scotland, inventor of the logarithms, was the eldest son of Sir Archibald Naper of Merchiston, and born in the year 1550. Having given early discoveries of great natural parts, his father was careful to have them cultivated by a liberal education. After going through the ordinary courses of philosophy at the university of St Andrew's, he made the tour of France, Italy, and Germany. Upon his return to his native country, his literature and other fine accomplishments soon rendered him conspicuous, and might have raised him to the highest offices in the state; but declining all civil employments, and the bustle of the court, he retired from the world to pursue literary researches, in which he made an uncommon progress, so as to have rendered himself useful to mankind, and to have earned for himself a place in the annals of science. He applied himself chiefly to the study of mathematics; but at the same time he did not neglect that of the Holy Scriptures. In both these he hath discovered the greatest knowledge profound penetration. His essay upon the book of the Apocalypse, indicates the most acute investigation, and an uncommon strength of judgment; though time hath discovered, that his calculations concerning particular events had proceeded upon fallacious data. This work has been printed abroad in several languages; particularly in French at Rochelle in the year 1653, 8vo, announced in the title as revised by himself. Nothing, says lord Buchan, could be more agreeable to the Rochellers or to the Huguenots of France at this time, than the author's announcement of the pope as antichrist, which in this book he has endeavoured to set forth with much zeal and erudition. But what has principally rendered his name famous, was his great and fortunate discovery of logarithms in trigonometry, by which the ease and expedition in calculation have so wonderfully assisted the science of astronomy and the arts of practical geometry and navigation. That he had begun the year 1593 the train of enquiry which led him to that great achievement in arithmetic, appears from a letter to Crugerus from Kepler in the year 1624, wherein, mentioning the Canon Mirrorius, he writes thus: "Nihil autem supra Neperianam rationem effe puto; et quod quidem litteris ad Tycho nom, anno 1593, scripsit: sect. Canop. n. m. i. e. in the book "Canon Mirrorius," which allusion agrees with the idle story mentioned by Wood in his Athenae Oxonienses, and explains it in a way perfectly consonant to the rights of Napier as the inventor.

When Napier had communicated to Mr Henry Briggs, mathematical professor in Gresham college, his wonderful canon for the logarithms, that learned professor set himself to apply the rules in his Infracop Napi, and in a letter to archbishop Ushar, in the year 1615, he writes thus: "Napier, baron of Merchiston, hath set his head and hands at work with his new and admirable logarithms. I hope to see him this summer if it please God; for I never saw a book which pleased me better, and made me more wonder." The following passage from the life of Lilly the astrologer is quoted by lord Buchan as giving a philosophical
Napier was the inventor of the logarithms at Merchiston near Edinburgh. "I will acquaint you (says Lilly) with one memorable story related unto me by John Marr, an excellent mathematician and geometrician, whom I conceive you remember. He was servant to King James I. and Charles I. When Merchiston first published his logarithms, Mr. Briggs, then reader of the astronomy lectures at gresham college in London, was so much surprized with admiration of them, that he could have no quietness in himself until he had seen that noble person whose only invention they were: he acquaints John Marr therewith, who went into Scotland before Mr. Briggs, purposely to be there when these two so learned persons should meet. Mr. Briggs appoints a certain day when to meet at Edinburgh; but failing thereof, Merchiston was fearful he would not come. It happened one day as John Marr and the baron Napier were speaking of Mr. Briggs: 'Ah, John (said Merchiston), Mr. Briggs will not now come.' At the very instant one knocks at the gate; John Marr hauled down, and proved to be Mr. Briggs to his great contentment. He brings Mr. Briggs up to the Baron's chamber, where almost one quarter of an hour was spent, each beholding the other with admiration before one word was spoken. At last Mr. Briggs began: 'Sir, I have undertaken this long journey purposely to see your person, and to know by what engines of wit or ingenuity you came first to think of this most excellent help into astronomy, viz., the logarithms; but Sir, being by you found out, I wonder nobody else found it out before, when now being known it appears so easy.' He was nobly entertained by Mr. Briggs, and was expressly to Scotland to visit him."

There is a passage in the life of Tycho Brahe by Gaffendi which may mislead an attentive reader to suppose that Napier's method had been explored by Herwart at Hoenburg: It is in Gaffendi's Observations on a Letter from Tycho to Herwart of the last day of August 1599: " Dixit Herwartus nihil morari se solvendi caujiquam trianguli difficultatem: solere esse enim multiplicationem, ac divisionem vicin aditionum, subtrahenam, et additionem, ut etiam plerumque in logaritmonorum canone Neperus." But Herwart here alludes to his work after wards published in the year 1610, which solves triangles by prolaphareis, a mode totally different from that of the logarithms.

Kepler dedicated his Ephemerides to Napier, which were published in the year 1617; and it appears from many passages in his letter about this time that he held him to be the greatest man of his age in the particular department to which he applied his abilities. "And indeed (says our noble biographer), if we consider that Napier's discovery was not like those of Kepler or of Newton, connected with any analogies or coincidences which might have led him to it, but the fruit of unaided reason and science, we shall be vindicated in placing him in one of the highest niches in the temple of fame. Kepler had made many unsuccessful attempts to discover his canon for the periodic motions of the planets, and hit upon it at last as he himself candidly owns on the 13th of May 1618: and Newton applied the palpable tendency of heavy bodies to the earth to the system of the universe in general: but Napier fought out his admirable rules by a flow scientific progress arising from the gradual evolution of truth."

The last literary exertion of this eminent person was the publication of his Rhetologus and Promptuary in the year 1617, which he dedicated to the Chancellor Seton; and soon after died at Merchiston on the 3d of April O.S. of the same year, in the 68th year of his age and 23d of his happy invention. - The particular titles of his published works are: 1. A plain discovery of the Revelation of St. John. 2. Miscellanea canonum confrucrorum et logaritmonicorum ad naturae simorum numeros habituadis. 3. Apparatus ad aliqua quaedam logariahromorum specie constitutam, in qua collectae unitas logarithmorum eff. 4. Rhetologus. 5. Apparatus ad aliqua quaedam logarithmorum eff.

This eminent person was twice married. By his first wife, who was a daughter of Sir James Stirling of Keir, he had only one son named Archibald, who succeeded to the estate. By his second wife, a daughter of Sir James Chisholm of Cromlix, he had a numerous issue. - Archibald Napier, the only son of the first marriage, was a person of fine parts and learning. Having more a turn to public business than his father had, he was raised to be a privy councilor by James VI. under whose reign he also held the offices of treasurer-depute, justice-clerk, and senatus of the college of justice. By Charles I. he was raised to the peerage by the title of Lord Napier.

Napier's Rods, or Bones, an instrument invented by Baron Napier, whereby the multiplication and division of large numbers is much facilitated.

As to the Construction of Napier's Rods: Suppose the common table of multiplication to be made upon a plate of metal, ivory, or pailleboard, and then conceive the several columns (standing downwards from the digits on the head) to be cut off under and these are what we call Napier's Rod for Multiplication. But then there must be a good number of each; for as many times as any figure is in the multiplicand, so many rods of that species (i.e., with that figure on the top of it) must we have; though fix rods of each species will be sufficient for any example in common affairs; there must be also as many rods of 0's.

But before we explain the way of using these rods, there is another thing to be known, viz., that the figures on every rod are written in an order different from that in the table. Thus the little square space or division in which the several products of every column are written, is divided into two parts by a line across from the upper angle on the right to the lower on the left; and if the product is a digit, it is set in
Napier.

Naples.

the territories of

lefs to

...fie; see again into the rods for it, or the next

to the figures in the dividend, and finding it to be just 6 times

...divisor, let 6 in the quotient.

6123 | 2179758 (356)

...18369 from the figures above, and there will re-

...18328; to which add 8, the next figure of the

...dividend, and seek again on the rods for it, or the next

...rod, which is called the index-rod, and of this we need but one single rod. See

...the different rods, and the index, separate from one another, in Plate CCCXLIV.

Multiplication by Napier's Rods. First lay down the

...next to this again, let the rod whose top is the next figure of the multiplicand; and so on in order to

...be multiplied by all the digits, and figures on each for different purposes. as

...therefore set 5 in the quotient, and subtract 30615 from 34288, and there will remain 3673; to which add 8, the last

...this number, by adding it to the figures in the lower part, or units place.

...set 5 in the quotient, and

...is the figure in the upper part of this square of the

...of the rod, as as it comprehended

...the ancient countries of Samnium, Campania, Apulia, and Magna Graecia. It is bounded on all sides by the Me-

...and Adriatic, except on the north-east, where it terminates on the Ecclesiastical state. Its
greatest length from south-east to north-west is about

...English miles; and its breadth from north-east to

...the conquests of Charlemagne. When that monarch put an end to the

...the dukedoms of Friuli, Spoleto, and Benevento, to acknow-

...of that figure; and therefore you have no more to do but to transfer the products and sum them. But in taking out these products from the rods, the order in which the figures stand obliges you to a very easy and small addition: thus, begin to take out the figure in the lower part, or units place, of the figure of the first rod on the right; and the figure in the upper part of this rod to that in the lower part of the next, and so on; which may be done as fast as you can look on them. To make this practice as clear as possible, take the following example.

Example: To multiply 4768 by 385. Having set the rods together for the number 4768 (ibid. n° 2.) against 5 in the index, I find this number, by adding according to the rule,

...3844

...14304

Total product

- -

1835680

To make the use of the rods yet more regular and easy, they are kept in a flat square box, whose breadth is that of ten rods, and the length that of one rod, as thick as to hold fix (or as many as you please) the capacity of the box being divided into ten cells, for the different species of rods. When the rods are put up in the box (each species in its own cell distinguished by the first figure of the rod set before it on the face of the box near the top), as much of every rod stands without the box as shows the first figure of that rod: also upon one of the flat sides without and near the edge, upon the left hand, the index rod is fixed; and along the foot there is a small ledge; so that the rods when applied are laid upon this side, and supported by the ledge which makes the practice very easy; but in case the multiplicand should have more than nine places, that upper face of the box may be made broader.

Some make the roads with four different faces, and figures on each for different purposes.

Division by Napier's Rods. First tabulate your divi-

...wherefore set 3 in the quotient, and sub-

...tract 18369 from the figures above, and there will re-

...18328; to which add 8, the next figure of the

...dividend, and seek again on the rods for it, or the next

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...this number, by adding it to the figures in the lower part, or units place.

...set 5 in the quotient, and

...is the figure in the upper part of this square of the

...as as it comprehended almost all the present kingdom of

...that part of Farther Calabria beyond the

...the dukedoms of Gaeta, Naples, and Amalfi, which were very inconsiderable, and extended along the shore only about 100 miles, and were interrupted by the Gulf of Otranto or of Capua.

This flourishing and extensive dukedom was at this time governed by Arechis, who had married one of the daughters of the last king of the Lombards, and had submitted, and taken the oath of allegiance to the emperor Charles. However, a few years after, he renounced his allegiance to the Franks, declared himself an independent sovereign, and was acknowledged as such by all the inhabitants of his duchy. To strengthen himself against Pepin king of Italy, who resided at Ravenna, he enlarged and fortified the city of Benevento, and likewise built Salerno on the sea coast surrounding it with a very strong and high wall. He engaged in several wars with the Greeks, whom he sometimes obliged to give him hostages; but having invaded the territories of the pope, whom Pepin could not affright, Charlemagne was prevailed on to return to Italy. Arechis, unable to oppose such a formidable enemy, sent his eldest son, Romauld, to Rome, with an offer of submission: but, at the intimation of the pope, Charles refused the,
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offer, and detained his son prisoner; after which he ravaged the country, and made himself master of Capua. Other deputies, however, proved more successful; and in the year 787, a peace was concluded on these conditions. That Arechis and the Beneventans should renew their allegiance to the Franks, that he should pay a yearly tribute to Pepin; deliver up all his treasure; and give his son Grimoald and his daughter Adelgisa, with twelve others, as hostages for his fidelity: however after many intreaties, Adelgisa was restored to her father.

Charles had no sooner left Italy, than Arechis forgot all his engagements, and began to negotiate with Irene, empress of Constantinople, and her son Constantine, for expelling the Franks out of Italy. For himself, he defined the honour of patriciate, and the dukedom of Naples with all its dependencies; and, in return, promised to acknowledge the Greek emperor as his sovereign, and to live after the manner of the Greeks. He required, however, to be supported by a Greek army; and that his brother-in-law Adalgisius, son to Defiderius the last king of the Lombards, should be sent over into Italy, to raise a party among his countrymen. These conditions were readily accepted, on condition that prince Romuald should be sent as a hostage; ambassadors were sent to Naples with the envoys of the patrician order, namely the mantle of cloth of gold, the sword, the comb, and the sandals; but before the ceremony could be performed, prince Romuald died, and soon after him his father: whose death was supposed to have been haftened by that of his son.

After the death of Arechis, the Beneventans sent a most submissive embassy to Charlemagne, intimating to him to send Grimoald, the late king's son, and only lawful heir to his crown; threatening at the same time to revolt if their prince was denied them. Charles readily granted their request, and allowed Grimoald to depart, after he had agreed to the following conditions, viz: That he should oblige the Lombards to shew their breasts; that in writings, and on money, the name of the king should be put before that of the prince; and that he should cause the walls of Salerno, Acerno, and Conflia, to be entirely demolished:—The new king was received by his subjects with the utmost joy; and for some time continued faithful to his engagements, excepting only the lat article, which he either neglected or eluded. So far, however, was he from alienating the Greeks, that he gave notice of their machinations to Pepin king of Italy; raised an army to oppose his uncle Adalgisius; and being joined by Hildebrand duke of Spoleto, and Vinigile the general of Pepin, he attacked the Greeks in Calabria soon after they had landed, entirely defeated and took his uncle prisoner, and, as is said, put him to a cruel death. Yet in a short time Grimoald contracted an alliance with the Greek emperor by marrying his niece Wanisia; and in the fifth year of his reign a war broke out between him and Pepin, which continued for twelve years; at the end of which time a truce was concluded. Grimoald survived this pacification only three years, and was succeeded by his treasurer Grimoald II. who submitted to Charlemagne after the death of Pepin; and from this time the Beneventans were looked upon as tributaries of the western emperors.

As yet, however, the city of Naples did not own allegiance to the dukes of Benevento, but was held by the eastern emperors; and frequent wars took place between the Beneventans and Neapolitans. This happened to be the case when Grimoald II. ascended the throne. He concluded an alliance with the Greeks, which however was of no long continuance; for Theodore, governor of Naples, having granted pretentions to Dauserius a noble Beneventan, who had been concerned in a conspiracy against his prince, Grimoald marched against the city of Naples, and invested it by sea and land. Theodore still refused to deliver up the traitor, and a general engagement both by land and sea was the consequence; in which the Neapolitans were defeated with so great a slaughter, that the sea was stained with their blood for more than seven days. Theodore then contented to deliver up Dauserius, with 8000 crowns for the expenses of the war; and Grimoald not only pardoned Dauserius, but received him into favour; the traitor, however, reflecting on the misfortunes of his crime, was seized with remorse; and went a pilgrimage to the holy land, carrying a large stone in his mouth, by way of penance, which he never took out but at his meals.

In the year 821, Grimoald was murdered by Radchelis count of Conflia, and Sico gaufdal of Acervento, and succeeded by Sico. Radchelis being soon after seized with remorse, became a monk; while Sico associated his son Sicardo with him in the government; and both, being of an ambitious and refractory disposition, fought a pretence for attacking the Neapolitans. This was soon found, and the city was invested by sea and land. The walls were furiously battered; and part of them being blown down, Sico prepared for a general assault. Stephe, at that time duke of Naples, pretended to submit; but that he might prevent the city from being pillaged, intreated Sico to put off his entry till the morning, and in the mean time sent out his mother and his two children as hostages. Sico consented to his request; but next morning found the breach built up, and the Neapolitans prepared for their defence. Exasperated at their perfidy, he renewed his attacks with vigour, but without any success; the besieged defending themselves with the utmost obstinacy. At last, perceiving that they should not be able to hold out much longer, they consented to a peace on the following conditions, viz: That the Neapolitans should pay an annual tribute to the princes of Benevento, and consent to the transporting of the body of St Januarius from his church without the walls of Naples to Benevento. These conditions being ratified, Sico returned with great honour to Benevento; but soon after renewed the war, under pretence that the Neapolitans had neglected to pay the stipulated sum; and hostilities continued till his death, which happened in 833.

Sico was succeeded in the government of Benevento and by his son Sicardo, who had married the daughter of succeder for Dauserius; and being influenced by the evil counsels of Roffrid his wife's brother, oppressed his subjects to such a degree that they conspired against his life. He besieged Naples with a powerful army, and took possession of Acerra and Atella, both of which he fortified. But Bonus, the Neapolitan duke, defended himself
The Saracens called in by the duke of Naples had caned over from Africa to his city, and Constanza. The boundary between Benevento and Capua was fixed at St. Angelo and Cerros; Alii Pergrius was made the boundary between Benevento and Salerno, and Staffolo between Benevento and Consta. The monasteries of Monte Cassino and St. Vincent were declared to be immediately under the protection of the emperor; both princes stipulated that no hostilities should be committed by either against the subjects of each other; and promised to join their forces in order to drive out the Saracens. Soon after this pacification, however, both Radelchis and Siconolphus died; the former appointing his son Radelgarius, or Radelcar, to succeed him; and the latter leaving an infant son, Sico, to the care of his godfather, Peter.

The war with the Saracens proved very unsuccessful; neither the united efforts of the princes, nor the affiliation of the emperor Lewis himself, being able to expel the infidels; and, in 854, Adelgise the second son of Radelchis, who had now succeeded, on the death of his brother Radelcar, to the principality of Benevento, was obliged to pay them an annual subsidy. Two years after, Landolfo Count of Capua, revolted from the prince of Salerno, and St. Steffano. The Saracens, being entirely reduced, in the mean time, Sico, the lawful prince of Salerno, had been poisoned by Count Landolfo, and the principality usurped by Ademarius, the son of Peter above mentioned; but in 861, Ademarius himself was seized and imprisoned by Gauferius, the son of Daferius formerly mentioned. This was occasioned by his cruelty and rapacity, which entirely alienated the hearts of his subjects from him, and encouraged Gauferius to become the head of the conspirators. The Saracens in the mean time committed terrible ravages throughout the Beneventan territories; which at last obliged Adelgise to enter into an alliance with Gauferius, and both together sent a most humble embassy to the emperor Lewis, requiring him to take them under his protection. About the same time an embassy arrived from Constantinople, proposing a junction of the forces of the eastern and western empires against the infidels; upon which Lewis gave orders for assembling a formidable army. But in the mean time Adelgise fell off from his alliance, and made peace with the Saracens; nay, according to some he encouraged them in their inquisitions, and it was at his desire that they invaded the duchy of Capua, and afterwards that of Naples, which they ravaged in a most barbarous manner. The Neapolitans in conjunction with the duke of Spoleto and the Count of Mari, endeavoured to oppose them; but being defeated, the Saracens continued their ravages with redoubled fury, and retired to Bari, which was their capital city with an immense booty.

In 866, Lewis arrived at Sora, with his army; and having marched to Capua, was there joined by Landolfo, the bishop and count, with a body of Capuans; but Landolfo soon after persuading his countrymen to desert, Lewis marched against that city, which he took after a siege of three months, and almost totally destroyed. In the end of the year he was joined by Gauferius with his quota of troops, having ordered the eyes of Ademarius to be put out in his absence. Lewis confirmed him in the principality, and marched with his army to Benevento, where Adelgise received...
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Naples. They are at last expelled.

inconsiderable places belonging to the Saracens, Lewis
soon after invaded Bari; but as the Saracens received
continual supplies from their countrymen settled in Si-
cily, and besides were protected by the Neapolitans,
he could not reduce the place till the year 871, though
he had received considerable assistance from his brother
lotharius, and the Greek emperor had sent him a fleet
of 200 sail. The expulsion of the Saracens was com-
pleted the same year by the taking of Tarento; after
which the emperor returned with great glory to Bene-
vento, resolving next to carry his arms into Sicily, and
expel the infidels from thence also. But his future
schemes of conquest were frustrated by a quarrel be-
tween him and Adelgise. The latter, pretending to
have been insulted by the empress, and
the Greek governor of Bari and Otranto, took
different sides in the quarrel, as they thought most
proper: and to complete the confusion, the new bishop
was expelled, and his brother, though a layman,
chosen to that office, and even consecrated by the pope
who wrote to Gaufridus, forbidding him to attack Ca-
pua under pain of excommunication. But though Gau-
fridus was, in general, obedient to the pope's com-
mands, he proved refractory in this particular, and laid
siege to Capua, for two years successively.

Thus the Capuan territories were reduced to the
most miserable situation; being obliged to maintain at
the same time the armies of the prince of Beneven-
to and the duke of Spoleto. The Saracens, in the mean-
time, took the opportunity of strengthening themselves
in Italy: and Athanaisius, notwithstanding the great
commendations he had received from the pope for put-
ting out his brother's eyes, contented to enter into an
alliance with them, in conjunction with whom he rav-
ged the territories of the pope as well as those of
Benevento and Spoleto, plundering all the churches,
monasteries, towns, and villages, through which they
passed. At the same time the prince of Salerno was
obliged to grant them a settlement in the neighbour-
hood of his capital; the duke of Geeta invited them to
his assistance, being oppressed by the count of Capua
and even the pope himself was obliged to make peace
with them, and to grant them a settlement on the north
side of the Carigliano, where they fortified themselves,
and continued for more than 40 years.

To put a stop to the confusion which reigned in I-

taly, the pope now thought proper to restore the bi-

ishop of Capua, who had been expelled, but allowed
his brother to reside in the city, and govern one half of
the diocese; but notwithstanding this partition, the
civil dissensions continued with the utmost violence, the
neatest relations murdering or banishing each other
according as the fortune of the one or the other pre-
valied.—Athanaisius, notwithstanding all the pope's re-

demands, continued his alliance with the Saracens;
conjunction with whom he ravaged the territory of
Benevento, and fomented the divisions in Capua, in
hopes of being able to make a conquest of it. At last
his holiness thought proper to issue a sentence of ex-
communication against him, but this attached him to
the Saracens more than ever; insomuch that he sent
to Suchaim, king of the Saracens in Sicily, defi-
ing him to come over and command a great body of
his countrymen who had settled at the foot of Mount Ve-
fusius. Suchaim accepted the invitation, and im-
mEDIATELY turned his arms against Athanaisius; allow-
ing his troops to live at discretion in the territory of
Naples where they ravished the women and plunder-
ed the inhabitants. These calamities were, by the
superfluous Neapolitans, imagined to be a consequence
of the sentence of excommunication; and therefore
they used their utmost endeavours to persuade the pre-
late to conclude a league with some Christian prince
and renounce all connexion with the infidels. In this
they at last proved successful, and Athanaisius con-
cluded an alliance with Guaimarius prince of Saler-
in order to allure the valiant Normans to leave their own country. This kind invitation encouraged a Norman chief, named Omoine Drenoet, to settle in Italy about the year 1015; having killed another lord in a duel, which obliged him to leave his own country, in order to avoid the resentment of his sovereign, Robert duke of Normandy. In the mean time, the city of Bari had revolted from the Greeks, and chosen one Mello for their leader, whose wife and children happened soon after to fall into the hands of their enemies, and were sent prisoners to Constantinople. No sooner, therefore, did Mello hear of the arrival of these adventurers, than he engaged them to assist him; and having drawn together a considerable army, defeated the Greeks with great slaughter, and obliged them to abandon their camp. In this engagement, the Normans distinguished themselves by their bravery: and the news of their success soon brought from Normandy an innumerable multitude of their countrymen with their wives and children. By this reinforcement, Mello gained two other victories, took a great many towns; and obliged the Greeks to abandon a large territory; but, in 1019, they were utterly defeated, and every thing recovered by the Greeks. The Greek general, Bajanus, continued to go on with such surprising successes, that he almost entirely re-established the affairs of his countrymen in Italy, and made a distinct province of the western part of Puglia, which he called Caputnata, and which to this day retains the name of Capitanata. His great progress at last alarmed the emperors of Germany; and, in 1027, Pandulphus prince of Capua made himself master of Naples; but was obliged three years afterwards, to leave it, by the Normans, who built the city of Averia, which was now erected into a county. In consequence of this piece of good fortune, great numbers of Norman adventurers migrated into Italy among whom were William, Drogo, and Umbert, three of the sons of Tancred duke of Hautville, from whose posterity those princes were descended, who first conquered the island of Sicily from the Saracens, and formed the present kingdom of Naples.

In 1040, the Greek emperor Michael Paleologus, in order to secure the affection of his fickle subjects, undertook the conquest of Italy from the Saracens, and for that purpose sent a general named Michael Maniacus into Sicily. This commander, hearing of the great reputation of the Normans, sent to Guaimarius, prince of Salerno, intreating him to grant him some of those warriors. His request was most willingly heard to by the prince of Salerno, who, to encourage the Normans to engage in the expedition promised them some additional rewards besides the emperor's pay. William, Drogo, and Umbert, accordingly marched from Salerno with 300 of their countrymen; and passing over into Sicily, distinguished themselves most remarkably in the conquest of that island. Maniacus acknowledged, that the recovery of Messina was chiefly owing to their valor: and William with his Normans gained a complete victory over the Saracens before Syracuse, where he killed the governor of the city in single combat. Maniacus made himself master of Syracuse, and almost entirely reduced the whole island; but being accused of treason, was next year carried prisoner to Constantinople. His successor Doceanus, being
The Normans having now conquered the greatest part of Puglia, proceeded to make a division of their conquest, in which, after each commander had got his proper share, the city of Melhis was left common to all, and appropriated as a place for assembling to consult about the most important affairs of the nation. Argyrus alone was neglected in this division; but he, having gained the favour of the emperor by expelling the rebel Maniacus from Italy, was by him created duke of Bar, on purpose to check the power of the Normans, with the title of prince and duke of Puglia. The Normans, however, were too powerful to be much awed by Argyrus, and behaved with great insolence to the neighbouring princes; but as they could not be expelled by force, and were confirmed in their conquests by Henry II. emperor of Germany in 1047, the Greek emperor attempted to get rid of them, by sending Argyrus with large sums of money to bribe them to enter into his service against the Perrians. But they, perceiving the snare, replied, that they were resolved not to leave Italy unless they were expelled by force; upon which Argyrus made use of the same money in bribing the Puglians to assassinate these invaders. This brought on a massacre, in which greater numbers of Normans perished than had fallen in all the late wars. Argyrus attempted to take advantage of the confusion produced by this massacre, but was defeated; after which he had recourse to Pope Leo, beseeching him to deliver Italy from these cruel tyrants; but this proved still more unsuccessful than the others had been; for the pope himself was defeated and taken prisoner; and, in consequence of the respect showed him by the Normans, granted them, as a sign of the holy see, all the conquests they had made or should make in Calabria and Sicily.

Soon after this, the Norman power became extremely formidable; the famous Robert Guiscard attended the throne in 1056. He made great progress in the conquest of Calabria, and reduced most of the cities which held for the Greeks in these parts. About the same time the counts of Capua were expelled from their territory; and the abbot Defiderius mentions his having seen the children of Landolphus V. the last count, going about as vagabonds, and begging for their support. The pope, alarmed at these conquests, excommunicated the Normans in wholesale, pretending that they had seized some of the territories belonging to the church; but, by the pretended submission of Robert, he not only was persuaded to take off the sentence of excommunication, but it even sufficed to get him with the provinces of Apulia, Calabria, and Sicily. After this, he continued the war against the Greeks with great success. In 1071, in conjunction with his brother Roger, he conquered the island of Sicily, and gave the investiture of the whole island to him, with the title of count, referring to himself only the half of Palermo, Melitina, and the valley of Demons. The like success attended his arms against Salerno in 1074; but after this, having unwarily taken some places from the pope, he again fell under the sentence of excommunication; yet he was reconciled to him in 1080, and received
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Naples, received a second time the investiture of all his dominions. The next year he undertook an expedition against the Greeks; and though the emperor was affiicted by a Venetian fleet, Robert made himself master of the island of Corfu, reduced Durazzo, and, great part of the island of Lefkland, where he was created emperor in consequence of his arms, and his near approach to Constantinople, he struck a universal terror among the Greeks. But while Robert was thus extending his conquests, he was alarmed by the news of a formidable rebellion in Italy, and that the emperor Henry had taken the city of Rome, and closely shut up the pope in the castle of St. Angelo. Robert therefore, leaving the command of the army to his son Boemund, returned to Italy, where he immediately dispersed the rebels, and releasted the pope, while his son gained a considerable victory over the Greeks. After this Robert made great preparations for another expedition into Greece, in order to secon his son Boemund Alexius Camenius, who was about this time declared emperor by the Greek army, being affiicted by the Venetian fleet, endeavoured to opposte his passage, but was entirely defeated, with the loss of a great many galleys. But a final sloop was now put to his enterprises by his death, which happened in the island of Corfu in 1085.

Though the power of the Normans was thus thoroughly established in Italy and Sicily, and though the prince of Benevento was in 1130 invested by the the pope with the title of king of Sicily; yet by reason of the civil divisions which took place among themselves and the general confusion which reigned in Italy in those ages, they were obliged, notwithstanding standing all their valour, to submit to the emperor in 1195. By him the Sicilians were treated with so great cruelty, that the empress Constance was induced to conspire against him in 1197, took him prisoner, and releasted him only on condition of his leaving off his army immediately for the Holy Land. This was complied with; but the emperor did not long survive that resolution, being poisoned, as was supposed, by order of the empress.

In 1254 the pope claimed the kingdom as a fief by the death of pope Nicholas. The new pope, Nicholas IV. was entirely in the interest of Charles, on whom, in 1281, he conferred the senatoral dignity of Rome. As he well knew the enmity which subsisted between the pope and king Charles, he disdosed his design to his holiness; who readily entered into his measures, wrote to Peter to hasten his armament, promising him the investiture of the island as soon as he had taken possession of it; and by refusing the assistance he had promised to Charles, obliged him for the present to delay his expedition. In the beginning of the year 1280, Procida returned to Arragon, and by showing the letters from the pope and Sicilian barons, prevailed on Peter to embark in his design, by affurting him of the assistance of Paleologus. The king of Arragon accordingly prepared a formidable fleet under pretence of invading Africa, and is even said to have received 20,000 ducats from Charles, in order to assist him in his preparations.

But while John went on thus successfully with his scheme, all his measures were in danger of being broke by the death of pope Nicholas. The new pope, Martin IV. was entirely in the interest of Charles, on whom, in 1281, he conferred the senatoral dignity of Rome. As he well knew the enmity which subsisted between the pope and king Charles, he disdosed his design to his holiness; who readily entered into his measures, wrote to Peter to hasten his armament, promising him the investiture of the island as soon as he had taken possession of it; and by refusing the assistance he had promised to Charles, obliged him for the present to delay his expedition. In the beginning of the year 1280, Procida returned to Arragon, and by showing the letters from the pope and Sicilian barons, prevailed on Peter to embark in his design, by assuring him of the assistance of Paleologus. The king of Arragon accordingly prepared a formidable fleet under pretence of invading Africa, and is even said to have received 20,000 ducats from Charles, in order to assist him in his preparations.

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his preparations with great diligence, intending to put to sea the following summer. Procida had returned to Palermo, to wait for a favourable opportunity of putting his design in execution, which was soon afforded him by the French. On Easter Monday, March 30th, 1282, the chief conspirators had assembled at Palermo; and, after dinner, both the Palermitans and French went in a grand procession to the church of Monreale, about three miles without the city. While they were sporting in the fields, a bride happened to pass by with her train, who being observed by one Drochettus, a Frenchman, he ran to her, and began to use her in a rude manner, under pretence of searching for concealed arms. A young Sicilian, exasperated at this affront, stabbed him with his own sword; and a tumult ensuing, 200 French were immediately murdered. The enraged populace then ran to the city crying out, "Let the French die, let the French die!" and, without distinction of age or sex, slaughtered all of that nation they could find, even such as had fled to the churches. The conspirators then left Palermo, and excited the inhabitants to murder the French all over the island, excepting in Messina, which city at first refused to be concerned in the revolt. But, being invited by the Palermitans to throw off the French yoke, a few weeks after, the citizens in a tumultuous manner destroyed some of the French; and pulling down the arms of Charles, and erecting those of the city, chose one Baldwin for their governor, who saved the remaining French from the fury of the populace, and allowed them to transport themselves, with their wives and children, to Italy. Eight thousand persons are said to have been murdered on this occasion.

Immediately after this massacre, the Sicilians offered their allegiance to the king of Aragon; who accepted of the invitation, and landed with his forces at Trapani. From thence he went to Palermo, where he was crowned king of Sicily with great solemnity, and Charles left the island with precipitation. The day after he landed his army in Italy, the Aragonian fleet arrived, took 29 of his galleys, and the next day burnt 80 transports in presence of his army. Soon after this Charles sent an embassy to Peter, accusing him of perfidy, in invading his dominions in time of peace; and, according to some, challenged him at the same time to decide the matter by single combat. Others say, that the challenge was given by Peter. Certain it is, however, that a challenge was given, and to appearance accepted; but Peter determined to employ much more effectual means in support of his pretensions than trusting to a duel; and therefore pushed on his operations most vigorously, while his adversary trifled away his time: and thus he at last became master of the contested kingdom; which, however, he did not long enjoy, dying about the end of the year 1285.

By his will, Peter left the kingdom of Aragon to his eldest son Alphonus, and Sicily to Don James his other son, who was also to succeed to the kingdom of Aragon in case Alphonus should die without male issue. Accordingly, Don James was solemnly crowned at Palermo the 24 of February 1286. In 1295, however, he deserted them, and tamely resigned up his right to Charles, son to him abovementioned, in a manner perhaps unparalleled. On his resignation the Sicilians conferred the crown upon his brother Don Frederic: after the war continued with great violence till the year 1303, when a peace was concluded, and the kingdoms of Naples and Sicily formally disjoined; Frederic being allowed to keep the latter under the name of Trinacria; and Charles being confirmed in the possession of the former which he quietly enjoyed till his death in 1309.

Naples continued to be governed by its own kings till the beginning of the 16th century, when the kings of France and Spain contended for the sovereignty of this country. Frederic, at that time king of Naples, resigned the sovereignty to Louis XII. on being created duke of Anjou, and receiving an annual pension of 30,000 ducats. But, in 1504, the French were entirely defeated by the Spaniards, and obliged to evacuate the kingdom; and the following year Louis renounced all pretensions to the crown, which from that time hath remained almost constantly in the hands of the Spaniards.

The government of the Spaniards proved no less oppressive to the Neapolitans than that of others had been. The kings of Spain set no bounds to their exactions, and of consequence the people were loaded with all manner of taxes; even the most indelible necessities of life not being exempted. In 1647, a new tax was laid on fruit; which the people looked upon as the most grievous oppression, the chief part of their subsistence, during the summer months, being fruit which in the kingdom of Naples is very plentiful and delicious. The edict for collecting the new duty was sooner published, than the people began to murmur. A general revolt, however, followed, as usual, they surrounded his coach, bawling out to have their grievances redressed. They were encouraged in their sedition, by the news that the citizens of Palermo had actually revolted on account of the imposition of new duties. The viceroy, therefore, apprehensive of greater disorders, began to think of taking off the tax; but those who farmed the taxes, being bribed some of his favourites, he was by their means persuaded not to abolish it. The indignation of the people, who had suspected his intention, was now greatly increased, especially as they were privately excited by several malcontents. The farmers of the revenue, and those concerned in raising the taxes, had incurred the hatred and detestation of the people, particularly of Tommaso Aniello, commonly called Maffaniello, who had been discovered in smuggling a small quantity of meal, was imprisioned, looted, and condemned to pay a fine of one hundred ducats.

Maffaniello, a few years before, had come to Naples from Amalfi, where his father had been a fisherman. At this time he was about 24 years of age, and the father of four children. He was of a middling stature, and an agreeable aspect; was distinguished for his boldness, activity, and integrity; and had a great influence with his companions, by whom he was beloved and esteemed. As he was obliged even to sell his furniture to pay the heavy fine, he had conceived an implacable hatred against the farmers of the taxes, and was also moved with compassion for the miserable state of the city and kingdom. He therefore formed a design, with some of his companions, to raise a tumult in the market-place on the festival-day of the Carmelites, usually celebrated about the middle of July, when between
Naples. between 500 and 600 youths entertain the people by a mock-fight; one half of them in the character of Turks, one half in a Character of Christians. Maffaniello being appointed captain of one of these parties, and one Pione, who was privy to his design, commanding the other, for several weeks before the festival they were very diligent in reviewing and training their followers, who were armed with sticks and reeds: but a small and unforeseen accident tempted them to begin their enterprise without waiting for the festival.

On the 7th of July a dispute happening in the market-place between the tax-gatherers and some gardeners of Pozzuolo who had brought some figs into the city, whether the buyer or seller should pay the duty; after the tumult had continued several hours, Maffaniello, who was present with his company, excited the mob to pillage the office built in the market for receiving the duty, and to drive away the officers with stones. The elder of the people, who by deciding against the gardeners, had incited the tumult ran from it, and informed the viceroy, who most imprudently neglected all means of putting a stop to the commotion. Maffaniello, in the mean time, being joined by great numbers of people, ordered his young troopers to light fire to all the offices for the taxes through the city; which command being executed with dispatch, he then conduited them directly to the palace, where the viceroy, instead of ordering his Spanish and German guards to disperse them, encouraged their insolence by timidly granting their demands. As they rushed into the palace in a furious manner, he fleaped by a private door, and endeavoured to save himself in the Casa del OllO; but being overtaken by the rioters in the streets, he was trampled upon by them, and pulled by the hair and whiskers. However, by throwing some handfuls of gold among them, he again escaped, and took sanctuary in a convent of Minims, where, being joined by the archbishop of Naples, cardinal Filomini, and several nobles by their advice he signed a bond, by which he abolished all taxes upon provisions. As a means to quell the tumult, he likewise desired the cardinal to offer Maffaniello a pension of 2400 crowns, who generously rejected the bribe, and declared, that if the viceroy would keep his word, he would find them obedient subjects.

It was now expected that the tumult would cease; but Maffaniello, upon his return to the market-place, being joined by several malcontents, among whom were Genuino and one Pione, who had formerly been captains of the Sibirri, he advised by them to order the houses of those concerned in raising the tax to be burned; which were accordingly in a few days reduced to ashes, with all their rich furniture. Maffaniello being now absolute master of the whole city, and being joined by great numbers of people of desperate fortunes, he required the viceroy who had retired to the Casa del OllO, to abolish all the taxes, and deliver up the writ of exemption granted by Charles V. This new demand greatly exasperated the viceroy; but to appease the people he drew up a false deed in letters of gold, and sent it to them by their favourite the duke of Matalone, who had before been in confinement. The fraud, however, being discovered, the duke was pulled from his horse and maltreated by the mob, and at length committed as a prisoner to Perone. This accident, to the great joy of the viceroy, enraged the people against the nobility, several of whom they killed, burnt the houses of others, and threatened to extirpate them all. Maffaniello, in the mean time tattered and half naked, commanded his followers, who were now well armed, and reckoned about 100,000 men, with a most absolute sway. He eat and slept little, gave his orders with great precision and judgment, appeared full of moderation, without ambition and interested views. But the duke of Matalone having procured his liberty by bribing Perone, the viceroy imitated his example, and secretly corrupted Genuino to betray his chief. A conspiracy was accordingly formed against Maffaniello by Matalone and Perone; the duke, who was equally exasperated against the viceroy, proposing, that after his death his brother D. Joseph should head the rebels.

Maffaniello in the mean time by means of the cardinal archbishop, was negotiating a general peace and accommodation; but while both parties were bargaining, the banditti hired by Matalone made an unsuccessful attempt upon Maffaniello's life. His folk were immediately killed 150 of them. Perone and D. Joseph being discovered to be concerned in the conspiracy were likewise put to death, and the duke with great difficulty escaped. Maffaniello by this conspiracy was rendered more fupicious and severe. He began to abuse his power by putting several persons to death upon flight, and, to force the viceroy to an accommodation, he cut off all communication with the castles, which were unprovided with provision and ammunition.

The viceroy, whose goods were espoused left the French should take advantage of the commotion, earnestly desired to agree to a treaty: which was accordingly concluded on the fifth day of the inundation, by the mediation of the archbishop. By the treaty it was stipulated that all duties imposed since the time of Charles V. should be abolished; that the writ of exemption granted by that emperor should be delivered to the people; that for the future no new taxes should be imposed; that the vote of the elect of the people should be equal to the votes of the nobility; that an act of oblivion should be granted for all that was past; and that the people should continue in arms under Maffaniello till the ratification of the treaty by the king.

By this treaty, no less than 10,000 persons, who fattened upon the blood of the public, were ruined. The people, when it was solemnly published, manifested an extreme joy, believing they had now recovered all their ancient rights and privileges. Maffaniello, at the desire of the viceroy, went to the palace to visit him, accompanied by the archbishop, who was obliged to threaten him with excommunication, before he would consent to lay aside his arms and assume a magnificent dress. He was received by the viceroy with the greatest demonstrations of respect and friendship, while the duchess entertained his wife, and presented her with a robe of cloth of silver, and some jewels.

The viceroy to preserve some shadow of authority, Maffaniello appointed him captain-general; and at his departure made him a present of a golden chain of great value, which with great difficulty he was prevailed upon to accept.
Naples.

accept; but yielded at length to the intreaties of the cardinal. Next day in consequence of the commission granted him by the viceroy, he began to exercise all the functions of sovereign authority; and having caused a scaffold to be erected in one of the streets, and several gibbets, he judged all crimes, whether civil or military, in the last resort: and ordered the guilty to be immediately put to death, which was the punishment he assigned to all offences. Though he neglected all forms of law, and even frequently judged by phyligion, yet he is said not to have overlooked any criminal or punished any innocent person.

34 His grandeur and prosperity was of very short continuance; for his becoming disdained and dелиritous for two or three days, he committed a great many mad and extravagant actions; and on the 18th of July was assassinated with the consent of the viceroy.

The tumult did not end with the death of Maffaniello; on the contrary, the people now expelled the Spaniards from most of the cities throughout the kingdom; and this general intestine being the subject of discussion at Rome, the duke of Guise, who happened then to be at the pope's court, took the opportunity, at the instigation of his bolines, to offer his service to the Neapolitans against the Spaniards. The duke was prompted by his ambition to engage in this enterprise, especially as he himself had some distant pretensions to the crown. The Spaniards in the mean time made a vigorous attack on the city; but were repelled by the people, who now formally renounced their allegiance to them. In a short time, however, their city being surprized by the new viceroy, the count d'O巨型, and the duke of Guise himself taken prisoner, the people returned to their allegiance, and thus all the attempts of the French on Naples were frustrated. Since that time the Spaniards continued in peaceable possession of the kingdom till the year 1707, when it was taken from them by prince Eugene. It was formally ceded to the emperor by the treaty of Rastadt in 1713; but was recovered by the Spaniards in 1714, and the king of Spain's eldest son is now king of Naples and Sicily, for a particular account of their revolutions, see the articles Spain and Sicily.

The climate of Naples is extremely hot, especially in July, August, and September. In winter there is seldom any ice or snow, except on the mountains. On account of its fertility it is justly termed an earthly paradise; for it abounds with all sorts of grain, the finest fruit and garden productions of every kind, with rice, flax, oil, and wine, in the greatest plenty and perfection. It affords also l'itron, manna, alum, vitriol, sulphur, rock crystal, marble and several sorts of minerals, together with fine wool, and silk. The hordes of his country are famous, and the flocks and herds very numerous. Besides these products, of which a considerable part is exported, there are manufactures of fluff, snap and glass wares. Weighcots, caps, flockings, and gloves, are also made of the hair or filaments of a shell fish, which are warmer than those of wool, and of a beautiful glossy green. In this kingdom likewise is found that called the Phrygian fluff, or pinca, fragilera, which, being laid in a damp place, will yield mushrooms, sometimes of a very large size, especially if the same is sprinkled with hot water. See AGARICUS.

As to the mountains of this country, the principal are those of the Apennine, which traverse it from South to North; and Mount Vesuvius, which, as is well known, is a noted Volcano, five Italian miles from Naples. The site of the mountain next the sea yields wine, particularly the two famed wines called Vino Greco and Lucryma Chisifi. One of the greatest inconveniences to which this kingdom is exposed is earthquakes, which the eruptions of Mount Vesuvius contribute in some measure, to prevent. Another inconvenience, which however is common to it with other hot countries, is the great number of reptiles and other insects, of which some are very poisonous.

With respect to religion, it is on a very bad footing here. The number of convents and monasteries is astonishing. It is said the clergy and convents possess two thirds of the whole kingdom; nay, some maintain, that were the kingdom divided into five parts, four would be found in the hands of the church. Notwithstanding this power and influence of the clergy, they have not been able hitherto to get the inquisition established here. In the year 1731, measures were taken for levying the number of convents; and lately the order of Jesuits have been suppressed. The papal bulls cannot be made public without the king's permission; nor are Protestants compelled to kneel in the churches, or at meeting the hoff; and in Lent they can easily procure fish meat. In the year 1740, the Jews were allowed to settle in the kingdom during the term of 50 years, and several privileges were granted them during that period; but the expiration of which the grant is supposed to be renewed unless they were expressly ordered to quit the country.

The revenue of the kingdom is generally computed at 3,000,000 of crowns: but, as Mr. Addison observes, there is no country in Europe which pays greater taxes, and where, at the same time, the public is left the better for them, most of them going to the enriching of the private persons to whom they are mortgaged.

The military force of this kingdom is said to consist of about 30,000 men of which the Swis regiments are the best. As to the marine, it consists only of a few galleys. The only order here is that of St. Janarius, which was instituted by Don Carlos in the year 1738.

The king of Naples, or of the two Sicilies, is an hereditary monarch. The high colleges are the council of State, the privy-council, the treasury, the Sicily-council, the council of war, &c. This kingdom is a papal fief; and the king in acknowledgment of the pope's feudal right, sends him every year a white palfry, and a purée of 6000 ducats. The title of the king's eldest son is prince of Calabria. The number both of the high and low nobility in the kingdom of Naples is very great. (I am assured, says Dr. Moore.)
The ladies and gentlemen within the coaches glitter in their attendants, the richness of their painted, gilt, varnished, and lined, in either in England or in France. They are often drawn by fix and sometimes by eight horses. Before the carriage, it is the mode to have two running footmen, and behind three or four servants in the richest liveries. The ladies and gentlemen within the coaches glitter in all the brilliance of lace, embroidery, and jewels.—This finery is not confined to the persons within and without the coaches; it is extended to the horses, whole heads, manes, and tails, are ornamented with the rarest plumes, and let off with ribbons and artificial flowers.

We shall mention a circumstance from which an idea may be formed of the grandeur of a Neapolitan palace, and the number of domestics which some of the nobility retain. "I dined (continues our author) at the prince Iacchi's, where we passed through 12 or 13 large rooms before we arrived at the dining-room. There were 36 persons at table served by the prince's domestics, and each guest had a footman behind his chair, while other domestics belonging to the prince remained in the adjacent rooms and in the hall. No estate in England could support such a number of servants, paid and fed as English servants are; but in Naples the wages are very moderate indeed, and the greater number of men-servants, belonging to the first families, give their attendance through the day only, and find beds and provisions for themselves. It must be remembered also, that few of the nobles give any entertainments; and those who do not are said to live very sparingly; so that the whole of their revenue, whatever it may be, is expended on articles of show."

In the kingdom of Naples, the hereditary jurisdiction of the nobles over their vassals subsists in the full rigour of the feudal government. The peasants therefore are poor; and it depends entirely on the personal character of the master, whether their property be not the least of their grievances. As this power is too often abused, the importance of the nobility depends in a great measure on the favour of the king, who, under pretence of any offence, can confine them to their estates, or imprison them at pleasure. Unless this prince were so very impolitic as to disquiet all the nobility at once, and so unite the whole body against him, he has little to fear from their resentment. Even in cases of such an union, as the nobles have left the affection of their vassals, what could they do in opposition to a standing army of 30,000 men, entirely devoted to the crown? The government of Naples, therefore, is in fact a despotic monarchy, though something like the form of a feudal constitution in its ancient purity is still kept up by the biennial summons of the general assembly. This convention, which consists of the nobility and commons, is called together every two years, to deliberate on the customary free-gift to the crown.

The inhabitants of this country have at all times borne but an indifferent character among other nations. "From the few hints dropped by the clastic authors, we collect that the ancient Neapolitans were a race of Ephesians, of a soft indolent turn, averse from martial exercises, passionately fond of theatrical amusements and music, expert in all the refined arts that administer to the caprices of luxury, extravagant in their expensives and costumes, and dupes to various sorts of superstition. If we make allowances for a quantity of northern blood which has joined the original Grecian stream, and imparted a roughness not yet worn off by the mildness of the climate, we shall find the modern Neapolitans very like the ancient—Provisions being here plentiful and cheap, the lower classes of people work but little. Their delight is to bask in the sun, and do nothing. Perfons of a middle rank frequent places of public resort; and very few of any rank attend to their proper business with the zeal and activity we are wont to meet with in the professional men of colder countries. Gluttony is a predominant vice, while infinances of chastity are comparatively rare. In the female sex, the passion for finery is almost superior to every other; and, though chaste is not the characteristic virtue of the country, Mr Swinburne doubts whether a Neapolitan woman would not nine times out of ten prefer a present to a lover. That furious jealousy for which the nation is famous, is now greatly abated. The breach of the conjugal vow sometimes occasions quarrels and affallations among people of an inferior station; and in the metropolis, affallations are often perpetrated from much lefs cogent motives. Of these vices, many are doubtless owing to that slavery and oppression under which they groan, and to a radical defect in the administration of justice, though the kingdom is divided into 12 provinces or jurisdictions.

NAPLES, anciently Parthenope, afterwards Neapolis, the capital of the kingdom of that name in Italy, lies in the province called Terra di Lavoro, which is the richest and best inhabited of the whole kingdom, and comprehends a part of the ancient Campania Felix, or the Happy. This city is fabled to owe its foundation to a syren, and to have received its ancient name from its supernaturalfoundrels. Whatever be its origin, it is the first for neatness, and the second for extent, of all the cities in Italy. It was formerly a place of strength; but its walls at present being of no real defence, its safety depends of course upon the force of its armies. It is most advantageously situated, having a delicious country on one side, and a noble bay of the Mediterranean on the other, with an excellent harbour. The circumference, including the suburbs, is said not to be less than 18 Italian miles, and the number of the inhabitants therein little less than 400,000. The houses are of stone, flat-roofed, and generally lofty and uniform; but many of them have balconies, with lattice-windows. The streets are well paved; but they are not lighted at night, and in the day-time are disfigured, in many places, by stalls on which provisions are exposed to sale. Here are a great number of fine churches, convents, fountains, and palaces of the nobility, many of whom constantly reside here. It is usual to walk on the tops of the houses in the evenings, to breathe the sweet cool air, after a hot sultry day. The climate here is so mild and warm, even in the winter, that plenty of green peas, artichokes, asparagus, and other vegetables, may
may be hazed so early as the beginning of the new year, and even all the winter. This city swarms with monks and nunns of all orders, to such a degree, that there are 10 left than 15 convents of the Dominicans alone, 18 of the Franciscus, 8 of the Augustinians, and an equal proportion of the rest. The magnificence of many of the churches exceeds imagination. In a cloyster of the Cuthonian monastery is a crucifix, said to be done by Michael Angelo, of inimitable workmanship.

To repel hostile attempts by sea, which, from its situation, maritime powers might be tempted to make, Naples has, to the west, the Caftel del Uovo, a con- fused pile of ancient buildings, and some modern batteries. The rock upon which this fortress stands was originally called Magna, then Lucullanum, and was considered as a place of strength so early as in the year 475. Along the line of the f June towards the east are some batteries on the points of land, the bastions of the arsenal, and above it the lofty wall of the Caftel Nuovo. This last fortress has been the usual refuge of the sovereigns and viceroys in all civil wars and tumults; for which reason they have long fixed their residence near its walls. A block-house and Batteries defend the mouth of the harbour, and at the eastern extremity of the town is the Torrione de Carmine, better known by the figure it made in Maffaniello's rebellion than by its extent or military strength. The caftle of Saint Elmo commands Naples in every direction, and is in reality calculated rather to annoy and awe the citizens than to defend them from foreign invaders. The city is indeed far from being secure against a bombardment; for the sea is so deep, that a large vessel may come up to the very mole in a port, and at the extremity has a high lantern to direct ships safely into the harbour. Luxury here is restrained by severe fumptuary laws, and the women are more closely confined than in any other city of Italy. Here is an university and two academies of wits, the one called Gli Ardeni, and the other Gli Otto. The nunnery for ladies of quality is said to be the largest in the whole world, containing no less than 350 nunns, besides servants. The Mount of Piety, or the office for advancing money to the poor, on pledges, at a low interest, or without any, has an income of upwards of 50,000 ducats. The arsenal is said to contain arms for 50,000 men. The walls of the city consist of hard black quarry stones, called piffero. Instead of ice, vast quantities of snow are used for cooling their liquors, not so much as water being drunk without it; so that, it is said, a scarcity of it would as soon occasion a mutiny as a dearth of money.

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NAPLES (anc. geog.), a town of the Volce Tectofages, called also Narbo Martius, from the Legio Martia, the colony led thither 59 years before the confulate of Cæsar, (Velleius) ; increased with a colony of the Decuman or tenth legion by Cæsar. An ancient trading town on the Atax, which discharges itself into the sea through the Lacus Rubreus, or Rubrensis. Capital of the Gallia Narbonensis; formerly called Coniaria Julia Paterna, from Julius Cæsar, the father of Augustus by adoption. Now called Narbonne, a city of Languedoc.

NARBONNE, a city of France in Lower Languedoc, with an archbishop's see, and is particularly famous for its honey. It is seated on a canal cut from the river Aude, which being but three miles from the sea, vessels come up it laden with merchandise, which renders it a place of some trade. But though it pretends to the most remote antiquity under the Celtic kings, in ages anterior even to the Roman conquests, which under these latter matters gave its name to all, the Gallia Narbonensis, and was a colony of the first consideration, it is now dwindled to a wretched solitary town, containing scarce 8000 inhabitants, of whom three fourths are priests and women. The streets and buildings are mean and ruinous; it has indeed a communica-

fiery temper of the inhabitants. There are five piazzas or squares in the city, appropriated to the nobility, viz. those called Capuana, Nido, Montagna, Porta, and Porta Nova. Of all the palaces, that of the king is not only the most magnificent, but also in the best style of architecture. The cathedral, though Gothic, is a very grand splendid edifice. It is here that the head and blood of St. Januarus, the tutelary saint of Naples, are kept, the latter in two glass or crystal vials. The pretended liquefaction of the dried blood, as soon as brought near the head of the saint, is a thing well known; Mr. Addison says, it is one of the most bungling tricks he ever saw. The harbour is spacious, and kept in good repair. It is fortified with a mole, which runs above a quarter of a mile into the sea, and at the extremity has a high lantern to direct ships safely into the harbour. Luxury here is restrained by severe fumptuary laws, and the women are more closely confined than in any other city of Italy. Here is an university and two academies of wits, the one called Gli Ardeni, and the other Gli Otto. The nunnery for ladies of quality is said to be the largest in the whole world, containing no less than 350 nunns, besides servants. The Mount of Piety, or the office for advancing money to the poor, on pledges, at a low interest, or without any, has an income of upwards of 50,000 ducats. The arsenal is said to contain arms for 50,000 men. The walls of the city consist of hard black quarry stones, called piffero. Instead of ice, vast quantities of snow are used for cooling their liquors, not so much as water being drunk without it; so that, it is said, a scarcity of it would as soon occasion a mutiny as a dearth of money.
NARCISSUS. In fabulous fistory, the son of the river Cephisius and Liriope the daughter of Oceanus, was a youth of great beauty. Tiresias foretold that he should live till he saw himself. He despised all the nymphae of the country; and made Echo languish till she became a mere sound, by refusing to return her passion; but one day coming weary and fatigued from the chase, he floated on the bank of a fountain to quench his thirst; when, seeing his own form in the water, he became so in love with the shadowy image that he languished till he died. On which the gods, being moved at his death, changed him into the flower which bears his name.

**Narcissus**, in botany: A genus of the monogynia order, belonging to the herbaceous class of plants; and in the natural method ranking under the 9th order, Spatheceae. There are six petals; the nectarium is funnel-shaped, and monophylous; the flamen are within the nectarium. The most remarkable species are.

1. The bastard narcissus, or common yellow English daffodil, grows wild in great plenty in many of the woods and coppices; and under hedges in several parts of England. In the counties round London the herb folks bring prodigious quantities in the spring of the year, when in bloom, root and all, and sell them about the streets. Its commonness renders it of but little esteem with many; considered, however, as an early and elegant flower, of exceeding hardiness and easy culture, it merits a place in every garden.

2. The bicolor, or two-coloured incomparable narcissus, hath a large, oblong, bulbous root; crowned with long, narrow, dark-green leaves, 12 or 14 inches long; an upright flower-stalk, about 15 inches high, terminated by an uniflorous spathe, protruding one yellow flower, having the nectarium much larger than the petals, and very broad and spreading at the brim; flowering in April. From the large spreading nectarium of this species, which being three or four times longer than the petals, narrow at bottom, and widening gradually to the brim, so as to resemble the shape of some old fashioned hoop peticoats, it obtained the name hoop-petticoat narcissus.

3. The ferotinus, or late-flowering small autumnal narcissus, hath a small bulbous root; crowned with a few narrow leaves; amid them a jointed flower-stalk eight or nine inches high, terminated by an uniflorous spathe, protruding one white flower, having a short, five-parted, yellow nectarium; flowering in autumn.

4. The tazetta, or multiflorous daffodil, commonly called *polyanthus narcissus*, hath a very large, roundish, bulbous root; long, narrow plain leaves; an upright flower-stalk, rising from 10 or 12 inches to a foot and a half high; terminated by a multiflorous spathe, protruding in many large, spreading, white and yellow flowers, in a cluster, having bell-shaped nectaria shorter than the corolla; flowering in February, March and April, and is very fragrant. The varieties of this are very numerous, consisting of about eight or nine principal sorts, each of which having many intermediate varieties: amount in the whole greatly above an hundred in the Dutch florists' catalogues, each variety distinguished by a name according to the fancy of the first raiser of it. They are all very pretty flowers, and make a charming appearance in the flower-borders, &c. they are also finely adapted for blowing in glasses of water, or in pots, to ornament rooms in winter.

5. The jonquilla, or jonquil, sometimes called *raff*, *leaved daffodil*, hath an oblong, bulbous, brown root, fending up several long, semi-taper, ruff-like, bright-green leaves; amid them an upright green flower-stalk, a foot or 15 inches high; terminated by a multiflorous spathe, protruding many yellow flowers, often expanded like a radius, each having a hemispherical, crenated nectarium, shorter than the petals; flowering in April, and profuse of a fine fragrance. The varieties are, jonquil minor with single flower—jonquilla major with single flower—barry flowered—white and yellow flowered—white flowered—semi-double-flowered—double flowered—and large double inodorous jonquil: all of them multiflorous, the fingle in particular; but sometimes the doubles produce only two or three flowers from a spathe, and the singles commonly fix or eight. All the sorts have so fine a shape, so soft a colour, and so sweet a front, that they are some of the most agreeable spring-flowers.

6. The calathinus, or multiflorous yellow narcissus, hath a large bulbous root; crowned with long, narrow, plane leaves; and amid them an erect, robust flower-stalk, terminated by a multiflorous spathe, protruding many large, entire, yellow flowers, having a bell-shaped, slightly crenated nectarium, equal in length with the petals.

7. The odoratus, or sweet-scented, narrow yellow narcissus, hath a bulbous root; narrow leaves; erect flower-stalk, a foot or more high, terminated by a sub-multiflorous spathe, protruding sometimes but

8. The chace, he stopped on the bank

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13. The tazetta, or multiflorous daffodil, commonly called *polyanthus narcissus*, hath a very large, roundish, bulbous root; long, narrow plain leaves; an upright flower-stalk, rising from 10 or 12 inches to a foot and a half high; terminated by a multiflorous spathe, protruding in many large, spreading, white and yellow flowers, in a cluster, having bell-shaped nectarium shorter than the corolla; flowering in February, March and April, and is very fragrant. The varieties of this are very numerous, consisting of about eight or nine principal sorts, each of which having many intermediate varieties: amount in the whole greatly above an hundred in the Dutch florists' catalogues, each variety distinguished by a name according to the fancy of the first raiser of it. They are all very pretty flowers, and make a charming appearance in the flower-borders, &c. they are also finely adapted for blowing in glasses of water, or in pots, to ornament rooms in winter.

14. The jonquilla, or jonquil, sometimes called *raff*, *leaved daffodil*, hath an oblong, bulbous, brown root, sending up several long, semi-taper, ruff-like, bright-green leaves; amid them an upright green flower-stalk, a foot or 15 inches high; terminated by a multiflorous spathe, protruding many yellow flowers, often expanded like a radius, each having a hemispherical, crenated nectarium, shorter than the petals; flowering in April, and profuse of a fine fragrance. The varieties are, jonquil minor with single flower—jonquilla major with single flower—barry flowered—white and yellow flowered—white flowered—semi-double-flowered—double flowered—and large double inodorous jonquil: all of them multiflorous, the single in particular; but sometimes the doubles produce only two or three flowers from a spathe, and the singles commonly fix or eight. All the sorts have so fine a shape, so soft a colour, and so sweet a front, that they are some of the most agreeable spring-flowers.

15. The calathinus, or multiflorous yellow narcissus, hath a large bulbous root; crowned with long, narrow, plane leaves; and amid them an erect, robust flower-stalk, terminated by a multiflorous spathe, protruding many large, entire, yellow flowers, having a bell-shaped, slightly crenated nectarium, equal in length with the petals.

16. The odoratus, or sweet-scented, narrow yellow narcissus, hath a bulbous root; narrow leaves; erect flower-stalk, a foot or more high, terminated by a sub-multiflorous spathe, protruding sometimes but
The triandrus, or triandrous rush-leaved white narcissus, hath a bulbous root; very narrow, rush-like leaves; erect flower-stalk, terminated by an uniflorous spathe, protruding one flowery-white flower, having a bell-shaped, created nectarium, half the length of the petals, and with modestly triandrous or three-flowered leaf-stalks. 

The triolobus, or trilobate yellow narcissus, hath a bulbous root; narrow rush-like leaves; erect flower-stalks, terminated by a sub-multiflorous spathe protruding sometimes but one or two, and sometimes several, yellow flowers, having a bell-shaped, three-lobed nectarium, half the length of the petals.

The minor, or yellow winter daffodil, hath a small bulbous root; plane leaves eight or ten inches long, and more than half a one broad; an erect flower-stalk, terminated by an uniflorous spathe protruding one nodding yellow flower, with spear-shaped petals, having an obconic, fixed-petalled, waved nectarium, equal to the length of the corolla; flowering in winter, or very early in spring.

All these 12 species of narcissus are of the bulbous-rooted tribe, and univerally perennial in root, but annual in leaf and flower-stalk; all of them riling annually in spring, immediately from the crown of the bulb, 1ift the leaves and in the midst of them the flower-stalks, none from each root, entirely naked or leafless, each terminated by a spathe or sheath, which opens on one side to protrude the flowers, and then withers; the flowers, as before observed, are all hexagonal, each furnished with a nectarium in the centre, and are universally hermaphrodite; they are large and conspicuous, appearing mostly in the spring-leaflu, generally from March or April until June, succeeded by ripe seed in July; then the leaves and flower-stalks decay, and the roots defeat from growing for some time; at which period of rest is the only proper time to take up or transplant the roots from one place to another or to separate the offsets; for they all multiply abundantly by offset young bulbs from the main root, infomuch that a single bulb will in one or two years be increased into a large cluster of several bulbs, closely placed together, and which every second or third year should be taken up at the above period in order to be separated; and each offset so separated commences a distinct plant: which being planted again in autumn, produces flowers the following summer, alike in every respect to those of their respective parent bulbs. All the species are so hardy that they proper in any common soil of a garden: observing, however, to allow the finer sorts of polyanthus narcissus, in particular, principally a warm dry situation, all the others may be planted any where in the open dry borders, and flower-beds.

NARCOTICS, in medicine, soporiferous drugs, which bring on a stupefaction. Among narcotics the most eminent are those usually prepared for medicinal uses from the poppy, especially opium; as also all those prepared from mandragoras, hyoscynamus, droso­nomum, and datura.

NARDO, a pretty populous town in the kingdom of Naples, and in the Terra d'Otranto, with the title of a duchy and a bishop's see. E. Long. 18. 27. N. Lat. 45. 28.

In this little city are 8000 inhabitants. The steeple of its cathedral is built in a very uncommon but flowy style of Gothic architecture. Luca Giordano and Sol­limeri have adorned the church with some agreeable painting. This place was part of the Balzo estate. The Aquavras were the next possessors: they are thought to have come from the Marcia di Ancona. In 1401, in consideration of their relationship to Pope Bo­niface IX. Laudalau erected their manor of Ari into a dukedom, an honour till then seldom granted to any but princes of the blood royal. Claudius Aquaviva, a famous general of the Jesuits, who died in 1615, was of this family.

NARDUS, in botany: A genus of the monogy­nia order, belonging to the triandria class of plants; and in the natural method ranking under the 4th order, Gramina. There is no calyx; the corolla is bi-valved.

This plant was highly valued by the ancients, both as an article of luxury and medicine. The unguentum nardum was used at baths and feails as a favourite perfume. Its value is evident from that passage of scripture, where our Saviour's head was anointed with a box of it, with which Judas found fault. From that passage in Horae it appears that this ointment was so valuable among the Romans, that as much as could be contained in a small box of precious stone was considered as a sort of equivalent for a large vessel of wine, and a proper quota for a guest to contribute at an entertainment, according to the ancient custom;

---Nardus ina merebere.

Nardi parues onyx eliciet cadum.

The plant had a great character among the ancients as a medicine, both internally taken and externally applied. It has a place in the list of all antidotes from those of Hippocrates (given on the authority of My­repus and Nicholas Alexandrinus) to the officinals which have kept their ground till lately, under the names of Mithridate and Venice treacle. Galen and Alexander Trallian recommend it in the dropsy and gravel; Cellus and Galen in pains of the stomach and bowels, both internally given and externally applied. Galen prescribed the oleum nardium to the emperor Marcus Aurelius when afflicted with a cholera mor­bus. It was externally applied to the stomach on wool; and the success was so great, that he ever afterwards enjoyed the highest confidence of that emperor. In a work attributed to Galen, also, it is mentioned that a medicine composed of this and some other aromatics was found useful in long protracted fevers; and the natives of India at present consider it as very efficacious remedy in fevers. Its sensible qualities, indeed, promise it to be of considerable efficacy in some feals, as it has a pungency of taste superior to contrayerva, and little inferior to ferpentaria.

But though the name of this plant, with the uses and virtues of it, has long been familiar in the writings of botanists and physicians, the genus and species of the plant have only been ascertained very lately. In the Philosophical Transactions for 1799, Dr Blane gives an account of it from a letter sent him by his brother from Lucknow, dated in December 1798.---

According to this gentleman's relation, being one day
NARDUS

on a hunting party with the nabob viceroy, after crossing the river Rapti, about 20 miles from the foot of the northern mountains, he was surprised to find the air perfumed with an aromatic smell, which, as he was told, proceeded from the roots of the grasses that were bruised or torn out of the ground by the nabob’s elephants and horses. The country was wild, uncultivated, and entirely covered with this kind of grasses, which grew in large tufts close to each other, and from three to four feet long. As none of it was in flower, it being then the winter season, and the grasses having besides been burnt down by order of the nabob, our author caufed some of the roots to be dug up, in order to plant it in his garden at Lucknow. Here it pro provere exceedingly; and shot up spikes to the height of six feet. A specimen was sent to Sir Joseph Banks, who found it to belong to the genus of andropogon, different from any species hitherto described by botanists. “There is great reason, however (says Dr Blane), to think that it is the true nardus Indica of the ancients; for, 1. The circumstance of its discovery corresponds in a striking manner with an occurrence related by Arrian in his History of Alexander’s expedition into India. During the march of that hero through the deserts of Gedrosia, the air was perfumed by the spikenard, which was trampled under foot by the army; and the Phœnicians, who accompanied them, collected great quantities of it, as well as of myrrh, to carry them into their own country to make merchandise of them. This last circumstance seems further to ascertain it to have been the true nardus; for the Phœnicians, who even in war appear to have retained their true genius for commerce, could no doubt distinguish the proper quality of this commodity. I am informed by Major Rennel, that Gedrosia answers to the modern Mackran, or Kedge-mackran, a maritime province of Persia, situated between Kermon (the ancient Carmania), and the river Indus, being of course the frontier province of Persia towards India; and that it appears from Arrian’s account, and from a Turkish map of Persia, that this defart lies in the middle tract of country between the river Indus and the Persian gulf, and within a few days march of the Arabian or Erythraean sea. By this the ancients meant the northern part of the Ethiopic ocean, which washes the southern coasts of Arabia and Persia; not what we now call the Red Sea, as its name would seem to imply, for this by the ancients was called the Arabian Gulf. 2. Though the accounts of the ancients concerning this plant are very defective, it is plain that it was of the natural order of grammica; for the term arisi, so often applied to it, was appropriated by them to the fructification of grains and grasses, and seems to be a word of Greek original, to denote the most excellent portion of those plants, which are the most useful in the vegetable creation for the fullness of animal life; and nature has also kindly made them the most abundant in all parts of the habitable earth. Galen says, that though there are various sorts of nardus, the term saufa, sauz, or spikenard, should not be applied to any but the nardus Indica. It would appear that the nardus Celica was a plant of a quite different habit, and is supposed to have been a species of valeriana.

The description of the Nardus Indica by Pliny does not indeed correspond with the appearance of our specimen; for he says it is frutes radice pingui et rofather, whereas ours has small fibrous roots. But as Italy is very remote from the native country of this plant, it is reasonable to suppose that others more easily procurable used to be substituted for it; and the same author says, that there were nine different plants by which it could be imitated and adulterated. There is a Nardus Africca mentioned by Horace; and Dioscorides mentions the Nardus Syriaca as a species different from the Indian, which certainly was brought from some of the remote parts of India; for both Dioscorides and Galen, by way of fixing more particularly the country from whence it came, call it the Nardus Gangis. 3. Garcias de Herios, a Portuguese who resided many years at Goa in the 16th century, has given a figure of the roots or rather of the lower parts of the spikes, which corresponds with our specimen, and he says that there is but one species of nardus known in India, either for the consumption of the natives, or for exportation to Persia and Arabia. 4. The sensible qualities of this are superior to what commonly passes for it in the shops, being poisseled both of more fragrance and pungency, which seems to account for the preference given to it by the ancients.

“There is a question, concerning which Mathilios, the commentator of Dioscorides, beffows a good deal of argument, viz. whether the roots or spikes were the parts esteemed for use, the testimony of the ancients themselves on this head being ambiguous. The roots of this specimen are very small, and poiffes sensible qualities inferior to the root of the plant; yet it is mentioned in the account above recited, that the virtues reside principally in the hufty roots. It is evident, that by the husky roots must here be meant the lower part of the spikes and leaves, where they unite to the roots; and it is probably a flight ambiguity of this kind that has given occasion to the ambiguity that occurs in the ancient accounts.”

The sensible qualities of this plant do not depend upon an essential oil, but on some fixed principle like those of cardamom or ginger. Dr Blane tried to extract its virtues with boiling water, maceration in wine or proof spirits, but it yielded them sparingly and with difficulty to any of these menstrua. The Indians gave an infusion of it in hot water, with a small quantity of black pepper as a refrefhing.

NAREA, the most southerly province of the empire of Abyssinia; a kingdom still governed by its own princes, who have the title of Benares. Its territory was formerly more extensive than at present, the Galla having almost quite surrounded it, especially on the south-east and north. The country to the west is the most unknown part of Africa; the kingdom itself stands like a fortified place in the middle of a plain, being an high and mountainous country. A great many rivers, rising in the fourth and fifth degrees of north latitude, spread themselves over the level part of the country, and fill it with marshes all the way from south by east to north, or north-west. These marshes are bounded by mountains, of which those nearest the marshes are overgrown with coffee trees, the largest, if not the only ones, which grow in this country. The kingdom of Narea Proper is intersected with many, unequal streams, but very fertile valleys.
NARRATION. [ 638 ]

Narathm. 

valleys. The mountainous country of Caffa adjoins immediately to Narathm, and is said to be governed by a separate prince: but the Galla having settled themselves in all the flat ground to the very edge of the marines, have in a great measure cut off the communication with Abyssinia for a long time past. The Nareans, who inhabit the mountainous country, have the lightest complexion of any people in Abyssinia; but those who inhabit the borders of the marines are perfectly black, and have the features and woolly heads of negroes; but the mountaineers of Narathm, and much more those of Caffa, are fair complexioned, more so than even the Neapolitans or Sicilians. It is said that now has been seen to lie on some of the mountains of Caffa; but Mr. Bruce imagines this to be a mistake, and thinks that it must have been hail.

Narathm abounds with cattle, grain and all kinds of provisions, both in the high and low country. The medium of commerce is gold, which they fell by weight; but the principal articles of trade are coarse cotton cloths, antimony, beads, and incense, which are carried from this country to the kingdom of Angola, and the parts of the African continent towards the Atlantic. The people are exceedingly brave; and though they had been driven out of the low country by multitudes of Galla, they now bid them defiance, and drive them from their frontiers whenever they come too near. The Narean prisoners taken in these skirmishes are sold to the Mahometan merchants at Gondar; and at Constantinople, Cairo, or in India, the women are more esteemed than those of any other part of the world. Both sexes have a cheerful, kind disposition, and attach themselves inviolably to their masters, if properly treated. The people of Narathm and Caffa speak a language peculiar to themselves.

NARRATION, in oratory, poetry, and history, a recital or rehearsal of a fact as it happened, or as it is supposed to have happened. See ORATORY, 

Concerine NARRATION and DESCRIPTION, we have the following rules and observations in the Elements of Criticism:

1. The first rule is, That in history the reflections ought to be chaste and solid; for while the mind is intent upon truth, it is little disposed to the operation of the imagination. Strada's Belge history is full of poetical images, which, being discordant with the subject, are unpleasant; and they have a still worse effect, by giving an air of fiction to a genuine history. Such flowers ought to be scattered with a sparing hand, even in epic poetry; and at no rate are they proper till the reader be warmed, and by an elevated imagination be prepared to relish them: in that state of mind, they are agreeable; but while we are fated and attentive to an historical chain of facts, we reject with disdain every fiction.

2. Vidu, following Horace, recommends a modest commencement of an epic poem; giving for a reason, that the writer ought to husband his fire. Besides, bold thoughts and figures are never relished till the mind be heated and thoroughly engaged, which is not the reader's case at the commencement. Homer introduces not a single simile in the first book of the Iliad, nor in the first book of the Odyssey. On the other hand, Shakespeare begins one of his plays with a sentiment too bold for the most heated imagination:

Bedford. Hung be the heav'n's with black, yield day to night!

Comets, importing change of times and states,

Brandish your crystal tresses in the sky,

And with them scourge the bad revolted stars,

That have contended into Henry's death!

Henry the Fifth, too famous to live long!

England ne'er lost a king of so much worth.

First part Henry V.

The passage with which Strada begins his history, is too poetical for a subject of that kind: and at any rate too high for the beginning of a grave performance.

3. A third rule or observation is, That where the subject is intended for entertainment solely, not for instruction, a thing ought to be described as it appears, not as it is in reality. In running, for example, the impulse upon the ground is proportioned in some degree to the celerity of motion; though in appearance it is otherwise, for a person in swift motion seems to skim the ground, and scarcely to touch it. Virgil, with great taste, describes quick running according to appearance; and raises an image far more lively than by adhering scrupulously to truth:

Hos super adventit volvis de gente Camilla,

Agmen agens equitum et florentes

Ferreet iter; celeris nec tingeret

Grammina: nec teneras curfu

Vel intaete fedegis per summa volaret

Gramminar: nec tenebras curfu aristas;

Vel mare per medium, fluentus tenuit

Ferret iter: celeris nec tingueret sequestra plantas.

Aeneid. vii. 807.

4. In narration as well as in description, objects ought to be painted so accurately as to form in the mind of the reader distinct and lively images. Every niche's circumstance ought indeed to be suppressed, because every such circumstance loads the narration; but if a circumstance be necessary, however slight, it cannot be described too minutely. The force of language consists in raising complete images, which have the effect to transport the reader as by magic into the very place of the important action, and to convert him as it were into a spectator, beholding every thing that passes. The narrative in an epic poem ought to rival a picture in the liveliness and accuracy of its representations: no circumstance must be omitted that tends to make a complete image; because an imperfect image, as well as any other imperfect conception, is cold and intermitting. We shall illustrate this rule by several examples giving the first place to a beautiful passage from Virgil:

Qualis populo matres Philomela sub umbra

Amilios queritur focus, quos durus ara ort

Obiervans nido implumes detract.

Georg. l. 1. 511.

The poplar, plowman, and unshedded young, though not essential in the description, tend to make a complete image, and upon that account are an embellishment.

Again:
Narration.

Again:

Hic viridem Æneas fondoni ex ilice metam
Constituit, signum mutis.

Horace addrefling to fortune:

Te pauper ambit
Sufpiiret: Eheu, ne ruJis agradam
Sponfus
Ruris

— Illum ex mænibus hofitis
Matrona bellantis tyranni
Propficiens, et adulta virgo,
Sufpirat: Eheu, ne ruJis agradam
Sponfus lacef-fat regius alperum
Tacto leonum, quem cruenta
Per medias rapiit ira caedes.

Shakespeare fays, “You may as well go about to turn
the fun to ice by faming in his face with a peacock's
feather.” The peacock’s feather, not to mention the
beauty of the object, completes the image: an accurate
image cannot be formed of that fanciful operation,
without conceiving a particular feather; and
one is at a loss when this is neglected in the defcrip-
tion. Again, “The rogues flighted me into the river
with as little remorse, as they would have drown'd a
bitch's blind puppies, fifteen 'tis litter.”

Old Lady. You would not be a queen.

Anne. No, not for all the riches under heaven.

Old Lady. 'Tis strange: a three-pence bow’d would
hire me, old as I am, to queen it.

Henry VIII. ad. 2. fc. 5.

In the following paffage, the action, with all its ma-
terial circumstances, is reprefented fo much to the life,
that it would scarce appear more diftinct to a real spec-
tator; and it is the manner of defcription that con-
tributes greatly to the fulblimity of the paffage.

He fpake; and, to confirm his words, out flew
Millions of flaming fwords, drawn from the thighs
Of mighty cherubin; the fudden blaze
Far round illum’d hell: highly they rag’d
Againft the Highft, and fierce with graffed arms,
Clad’d on their founding shields the dim of war,
Hurling defiance toward the vault of heav’n.

Milton. b. 1.

The following paffage from Shakespeare falls not
much short of that now mentioned in particularity of
defcription:

O you hard hearts! you cruel men of Rome!
Knew you not Pompey? Many a time and oft
Have you climb’d up to walls and battlements,
To tow'rs and windows, yes, to chimney-tops,
Your infants in your arms: and there have fat
The live-long day with patient expectation
To fee great Pompey pass the streets of Rome;
And when you saw his chariot but appear,
Have you not made an universal shout,
That Tyber trembled underneath his banks,
To hear the replication of your founds,
Made in his concave flore?

Julius Cæsar, adv. 1. fo 1.

The following paffage is scarce inferior to either of Narration.

“Far before the reft, the fon of Offian comes:
bright in the smiles of youth, fair as the firft beams
of the fun. His long hair waves on his back: his
dark brow is half beneath his helmet. The fword
hangs loofe on the hero’s tide; and his spear glitters
as he moves. I fled from his terrible eye, King of
high Temora.”

Fingal.

The Henricade of Voltaire errs greatly against the
foregoing rule; every incident is touched in a fum-
mary way, without ever defcending to circumfances.
This manner is good in a general history, the purpofe
of which is to record important tranfactions: but in a
fable it is cold and uinterefling; because it is imprac-
ticable to form deftrict images of persons or things re-
prefented in a manner fo superficial.

It is obferved above, that every ufefles circumfance
ought to be fuppreffed. The crowding such circum-
fances is, on the one hand, not lefs to be avoided,
than the concifenes for which Voltaire is blamed, on
the other. “In the Æneid, Barce, the nurfe of Si-
claus, whom we never hear of before nor after, is
introduced for a purpofe not more important than to call
Anna to her fifter Dido: and that it might not be
thought unjuft in Dido, even in this trivial circum-
fance, to prefer her husband’s nurfe before her own,
the poet takes care to inform his reader, that Dido’s
nurfe was dead. To this may be oppofed a beautiful
paffage in the fame book, where, after Dido’s laft
speech, the poet, without detaining his readers by de-
scribing the manner of her death, haults to the la-
mentation of her attendants:

Dixerat: atque illum media inter talia ferro
Collapfam afpiciunt comites, enfemque eruore
Spumantem, fparfaque manus. It clamor ad alta
Atria, concufiam bacchatur fama per urbem;
Lamentis gemituque et femineo ululatu
Teeta fremunt, refonat magnis plangoribus æther.

Lib. 4. 1. 66g.

As an appendix to the foregoing rule, may be added
the following obfervation. That to make a fudden and
strong impression, fome fingle circumfance, happily
flected, has more power than the molt laboured de-
scription. Macbeth, mentioning to his lady fome
voices he heard while he was murdering the King,
says,

There’s one did laugh in sleep, and one cry’d Murder!
They wak’d each other; and I ftood and heard them;
But they did fay their prayers, and addrefl them
Again to fleep.

Lady. There are two lodg’d together.

Macbeth. One cry’d, God blefs us! and, Amen!
the other;

As they had feen me with thefe hangman’s hands.
Listening their fear, I could not fay, Amen,
When they did fay, God blefs us.

Lady. Consider it not fo deeply.

Macbeth. But wherefore could not I pronounce
Amen?

I had most need of bleffing, and Amen
Stuck in my throat.

Lady.
In the following passage, a character is completed by

Narration:

Shallow. O the mad days that I have spent; and to see how many of mine old acquaintance are dead.

Silence. We shall all follow, cousin.

Shallow. Certain, 'tis certain, very sure, very sure; Death (as the Psalmist faith) is certain to all: all shall die. How good a yoke of bullocks at Stamford fair?

Silence. Truly, cousin, I was not there.

Shallow. Death is certain. Is old Double of your town living yet?

Silence. Dead, Sir.

Shallow. Dead! see, see; he drew a good bow: and dead. He flot a fine floot. How a score of ewes now?

Silence. Thereafter they be. A score of good ewes may be worth ten pounds.

Shallow. And is old Double dead?

Second Part Henry IV. act 3. sc. 3.

Describing a jealous husband:

Congreve has an inimitable stroke of this kind in his comedy of Love for Love:

Ben Legend. Well, father, and how do all at home? how does brother Dick, and brother Val?

Sir Sampfon. Dick, body o' me, Dick has been dead these two years. I writ you word when you were at Leghorn.

Ben. Mefs, that's true; marry, I had forgot. Dick's dead, as you say.

Shallow. And is old Double dead?

Second Part Henry IV. act 3. sc. 3.

Falstaff speaking of Ancient Pifto:

"He's no swaggerer, ho!tels; a tame chearier i'faith; you may troo him as quietly as a puppy-greyl.; and he will not swagger in a Barbary hen, if her feathers turn back in any show of relintence."

Second Part Henry IV. act 2. sc. 9.

Offian among his other excellencies is eminently succesful in drawing characters; and he never fails to delight his reader with the beautiful attitudes of his heroes. Take the following instances:

"O Ofcar! bend the strong in arm; but spare the feeble hand. Be thou a dream of many tides against the foes of thy people; but like the gale that moves the grafs to those who ask thine aid.—So Tremnor lived; fuch Trathal was; and fuch has Fingal been. My arm was the support of the injured; and the weak refled behind the lighting of my feel."

"We heard the voice of joy on the coast, and we thought that the mighty Cathmor came. Cathmor the friend of strangers! the brother of red-haired Cairbar! But their foes were not the fame; for the light of heaven was in the bofom of Cathmor. His towers rofe on the banks of Atha; seven paths led to his hills; seven chiefs flood on thefe paths, and called the stranger to the feat. But Cathmor dwelt in the wood to avoid the voice of praise."

"Dermid and Ofcar were one: they reaped the battle together. Their friendfhip was strong as their
As words are intimately connected with the ideas they represent, the emotions raised by the sound and by the sense ought to be concordant. An elevated subject requires an elevated style; what is familiar, ought to be familiarly expressed: a subject that is serious and important, ought to be clothed in plain nervous language: a description, on the other hand, addressed to the imagination, is susceptible of the highest ornaments that sounding words and figurative expression can bestow upon it.

We shall give a few examples of the foregoing rules.

A poet of any genius is not apt to dress a high subject in low words; and yet blemishes of that kind are found even in classical works. Horace observing that men are satisfied with themselves, but seldom with their condition, introduces Jupiter indulging to each his own choice:

Jam faciam quad vultis; eris tu, qui modo miles, Mercator; tu, confultus modo, ruficus; hic vos, Vos hinc mutatis dicetides partes: eia,
Quid static? nolint: atqui licet esse beatis.
Quid caufe et, merito quin illius Jupiter ambas
Irvius bucas inflet? neque fe fore pothac
Tam facienc dicat, votis ut praebat aurem?

Sat. lib. 1. sat. 1. l. 16.

Jupiter in wrath puffing up both cheeks, is a low and even ludicrous exprefion, far from suitable to the gravity and importance of the subject; every one must feel the discordance. The following couplet, finding far below the subject, is no less ludicrous:

Not one looks backward, onward full he goes.
Yet ne'er looks forward farther than his nose.

Essay on man, ep. iv. 223.

On the other hand, to raise the expression above the tone of the subject, is a fault than which none is more common. Take the following instances:

Orcan le plus fidel à fervir les defeins,
Ne fous le ciel brillant des plus noirs Africains.

Bajazet alt 3. ft. 8.

Les ombres par trois fois ont obscure cette
Depuis que le fommeil n'a point entre dans vos yeux;
Et le jour a trois fois châble la nuit obscure.
Depuis que vos corps languis dans nourriture.

Phedra, alt 1. f. 7.

Affarirs. Ce mortel, qui montra tant de zele pour moi, Vit-il encore?

Afaph.—Voil l'autre qui vous clairea.

Efsber, alt 2. ft. 3.

Oui, c'est Agamemnon c'est ton roi qui te tivre;
Viens, reconnais la voix qui frappe ton oreille.

Epigone.

No jocund health that Denmark drinks to-day,
But the great cannon to the clouds shall tell;
And the king's rowde the heav'n shall bruit again,
Repeaking earthly thunder.

Hamlet, alt 1. f. 2.

——— In the inner room,
If yf a winking lamp, that weakly strikes
The ambient air, scarce kindling into light.
Southerne, Fate of Cupid, alt 3.

In the funeral orations of the bishop of Meaux, the following passages are raised far above the tone of the subject:

"L'Oceane ettomé de fe voir traversé tant de fois, en
The passage we have in view begins l. 116. But let

It is proper to be observed upon this head, that writers of inferior rank are continually upon the stretch to enliven and enforce their subject by exaggeration and superlatives. This unluckily has an effect contrary to what is intended: the reader, dazed with language that swells above the subject, is led by contrast to think more meanly of the subject than it may possibly deserve. A man of prudence, before, will be no less careful to hush his strength in writing than in walking: a writer, too liberal of superlatives, exhausts his whole stock upon ordinary incidents, and reserves no share to express, with greater energy, matters of importance.

Many writers of that kind abound so in epithets, as if poetry consisted entirely in high-sounding words. Take the following instance:

When black-brow'd night her dusky mantle spread,
And wrapt in solemn gloom the sable sky;
When soothing sleep her opiate dews had shed,
And fear'd in silken flumber every eye;
Nor the sweet bliss of soft oblivion share:
But watchful wo disfraits my aching breast,
My heart the subject of corroding care:
From haunts of men with wandering steps and flow
I solitarily steal, and soothe my penive wo.

Here every substantive is faithfully attended by some tumatic epithet.

We proceed to a second remark, not less important than the former. No peron of reflection but must be sensible, that an incident makes a stronger impression on an eye witness, than when heard at second hand. Writers of genius, sensible that the eye is the beat avenue to the heart, represent every thing as passing in our sight; and, from readers or hearers, transform us as it were into spectators: a skilful writer conceals himself, and presents his personages: in a word, every thing becomes dramatic as much as possible. Plutarch, de gloria Atheniense, observes, that Thucydides makes his reader a spectator, and inspires him with the same passions as if he were an eye-witness.

In the fine arts, it is a rule to put the capital objects in the strongest point of view; and even to present them oftener than once, where it can be done. In history-painting, the principal figure is placed in the front, and in the belt light: an equestrian statue is placed in a centre of streets, that it may be seen from many places at once. In no composition is there greater opportunity for this rule than in writing:

--- Sequitur pulcherrimus Aitur,
Aitur quo fidens et verificoloribus armis.

--- Full many a lady
I've ey'd with belt regard, and many a time
Th' harmony of their tongues hath into bondage
Brought my too diligent ear: for several virtues
Have I lik'd several women; never any
With so full soul, but some defect in her
Did quarrel with the noblest grace the ow'n'd,
And put it to the foil. But you, 0 you,
So perfect, and so peerless, are created
Of every creature's belt.
Narration.

Odesse. — Whate'er you are
That, in the dear incredible,
Under the shade of melancholy boughs,
Lost and neglected the creeping hours of time;
If every hour you have look'd on better days;
If ever been where bells have knoll'd to church;
If ever sat at any good man's feast;
If ever from your eye-lids wip'd a tear,
And know what 'tis to pity, and be pity'd;
Lost gentleness by strong inclemence be,
In which I hope I blin'd, and hide my sword.

Duke fen. True is it that we have seen better days;
And have with holy bell been knoll'd to church;
And fat on good men's feasts; and wip'd our eyes
Of drops that faced pity had engender'd;
And therefore you down in gentleness,
And take upon command what help we have,
That to your wanting may be ministr'd.

As you like it.

With thee conversing I forget all time;
All taxes and their change, all plea'se alike.
Sweet is the breath of morn, her rising sweet;
With charm of carill'd birds; pleasant the fun.
When first on this delightful land he spreads
His orient beams on herb, tree, fruit, and flow'r;
Glistring with dew; fragrant the fertile earth
After soft show'rs; and sweet the coming on
Of grateful evening mild, the silent night
With this her solemn bird, and this fair moon,
And the gems of heav'n, her ftarry train:
The blaze of armour fha'd with the red sun,
As when the piercing blasts of Boreas blow.
And like the moon, the broad refulent shield
Blaz'd with long rays, and gleam'd athwart the field.

The blaze of armour fha'd against the day.

As when the piercing blasts of Boreas blow.
And like the moon, the broad refulent shield
Blaz'd with long rays, and gleam'd athwart the field.

No—could our swiftness o'er the winds prevail,
Or beat the pinions of the western gale,
All were in vain——
The humid fweat from ev'ry pore descends.

A concife comprehensive stile is a great ornament
in narration; and a superfluity of unnecessary words,
not less than of circumstances, a great nuisance. A
judicious felection of the striking circumstances, clothed
in a nervous stile, is delightful. In this stile, Tacitus
exceeds all writers, ancient and modern. Infances are
number'd: take the following fir'ment:

"Crebra hinc praefidet, et sefius in modum latrecinii:
per faltus, per paludes: ut cuife fors aut virtus: te-
meré, provifio, ob iurnm, ob pradam, jiffus el aliquid
ducibus."


After Tacitus, Oflian in that respects judily merit the
place of dilinition. One cannot go wrong for ex-
mples in any part of the book.

If a concife or nervous stile be a beauty, tautology
must be a blemish; and yet writers, fettered by verfe,
are not sufficiently careful to avoid this flowo'ny prac-
tice: they may be pitted, but they cannot be jufified.
Take for a fir'ment the following infances, from the
bell poet, for verification at leafl, that England has
boast'd off:

High on his helm celestial lightnings play,
His beamy shield emits a living ray:
Th' unweary'd blaze incessant streams supplies,
Like the red fcar that fires the autumnal fikes.

Ibid. v. 5.

Strength and omnipotence invect thy throne.

Ibid. viii. 576.

So silent fountains, from a rock's tall head,
In fable freams foft trickling waters fhad.

Ibid. ix. 19.

His clanging armour rung.

Ibid. xii. 94.

Fear on their cheet, and horror in their eye.

Ibid. xv. 4.

The blaze of armour fha'd against the day.

Ibid. xii. 736.

As when the piercing blasts of Boreas blow.

Ibid. xix. 380.

And like the moon, the broad refulent shield
Blaz'd with long rays, and gleam'd athwart the field.

Ibid. xix. 406.

No—could our swiftness o'er the winds prevail,
Or beat the pinions of the western gale,
All were in vain——
The humid fweat from ev'ry pore descends.

Ibid. xix. 627.

We close this article with a curious inquiry. An ob-
ject, however ugly to the fight, is far from being fo
when repreffented by colours or by words. What is
the caufe of this difference? With refpect to painting,
the caufe is obvious: a good picture, whatever the
objeet be, is agreeable by the pleafure we take in
 imitation; and this pleafure overbalancing the dis-
agreeableness of the objeet, makes the picture upon
the whole agreeable. With refpect to the decription
of an ugly objeet, the caufe follows. To connec't indi-
viduals in the focial flate, no particular contributes
more than language, by the power it poiffes of an
expeditious communication of thought, and a lively
repreffentation of transac'tions. But nature hath not

4 M 2

been
Narration, been satisfied to recommend language by its utility merely: independent of utility, it is made susceptible of many beauties, which are directly felt, without any intervening reflection. And this unfolds the mystery; for the pleasure of language is so great, as in a lively description to overbalance the disagreeableness of the image raised by it. This, however, is no encouragement to choose a disagreeable subject; for the pleasure is incomparably greater where the subject and the description are both of them agreeable.

The following description is upon the whole agreeable, though the subject described is in itself dismal:

Nine times the space that measures day and night
To mortal men, he with his horrid crew
Lay vanquish'd, rolling in the fiery gulf,
Confounded though immortal! but his doom
Referr'd him to more wrath; for now the thought
Both of loft happiness and lafiting pain
Torments him; round he throws his baleful eyes
That witness'd huge affliction and difmay:
Mix'd with obdurate pride and fledfast hate:
At once as far as angels ken he views
The diabolical situation waite and wild:
A dungeon horrible, on all sides round
As one great furnace flam'd; yet from those flames
No light, but rather darknes visible
Serv'd only to discover lights of wo,
Regions of sorrow, dolorous shades, where peace
And reit can never dwell, hope never comes
That comes to all; but torture without end
Still urges, and a fiery deluge, fed
With ever-burning sulphur unconsum'd
Such place eternal justice had prepar'd
For those rebellious. Paradise Lost, book 1. l. 50.

An unmanny depreffion of spirits in time of danger
is not an agreeable sight; and yet a fine description or representation of it will be relished.

K. Richard. What must the king do now? must he submit?
The king shall do it; must he be depos'd?
The king shall be contented: must he lose
The name of king? o' God's name let it go;
I'll give my jewels for a fet of beads;
My gorgeous palace for a hermitage;
My gay apparel, for an almsman's gown;
My gar'dens, for a dirth of wood;
My sceptre, for a palmer's walking-staff;
My mbjects, for a pair of carved fants;
And my large kingdom, for a little grave;
A little, little grave.—an obscure grave.
Or I'll be bury'd in the king's highway;
Some way of common tred, where subjects feet
May hourly trample on their sovereign's head;
For on my heart they tread now, whilst I live;
And, bury'd once, why not upon my head?

Richard II. act. 3. fe. 6.

Objects that strike terror in a spectator, have in poetry and painting a fine effect. The picture, by raising a flight emotion of terror, agitates the mind; and in that condition every beauty makes a deep impression. May not contrariety heighten the pleasure, by opposing our present security to the danger of encountering the object represented?

The other shape,
If shape it might be call'd that shape had none
Distinguishing in member, joint, or limb;
Or substance might be call'd that shadow feem'd,
For each feem'd either; black it flood as night,
Fierce as ten furies, terrible as hell,
And shook a dreadful dart. Par. Left, b. 2. l. 666.

Now flaming fury roar,
And clamour such as heard in heaven till now
Was never: arms on clamour claffing Bray'd
Horrible discord, and the madding wheels
Of brazen chariots rage; dire was the noise
Of conflict; overhead the diabolical
Of fiery darts in flaming volleys flew,
And flying vaulted either hoft with fire.
So under fiery copre together ruth'd
Both battles main, with ruinous assault
And inextinguishable rage: all heaven
Refounded, and had earth been then, all earth
Had to her centre shook. Ibid. book 6 l. 207.

Ghoft. But that I am forbid
To tell the secrets of my prinon-house
I could a tale unfold, whole lightest word
Would scarce a word, froze thy young blood,
Make thy two eyes, like flars, dart from their spheres;
Thy knotty and combined locks to part,
This sight would make him do a desperate turn:
Yea, curse his better angel from his side,
And fall to reprobation.

Othello, act. 5. fe. 8.

Objects of horror must be excepted from the foregoing theory; for no description, however lively, is sufficient to overbalance the delight raised even by the idea of such objects. Everything horrible ought therefore to be avoided in a description.

NARSES, the eunuch who rivalled Belisarius in heroism under the reign of the emperor Julian, emerged from obscurity A. D. 538. From the domestic service of the palace, and the administration of the private revenue, he was suddenly exalted to the head of an army. He is ranked among the few eunuchs who have refused that unhappy name from the contempt and hatred of mankind. A feeble diminutive body concealed the soul of a statesman and a warrior. His youth had been employed in the management of the loom and didiaf, in the cares of the household, and the service of female luxury; but, while his hands were busy, he secretly exercised the faculties of a vigorous and discerning mind. A stranger to the schools and the camp, he studied in the palace to diffuse, to flatter, and to persuade; and as soon as he approached the person of the emperor, Julian listened with surpris and pleasure to the manifold counsels of his chamberlain and private treasurer. The talents of Narfes were tried and improved in frequent embassys; he led an army into Italy, acquired a practical
Nasés

Nassau.

Nasés defeated the Goths, the Franks, and the Alemannii: the Italian cities opened their gates to the conqueror; he entered the capital in triumph: and having Established the seat of his government at Ravenna, continued 15 years to govern Italy under the title of Emperor.

His virtues, we are told, were stained with avarice: and in this province he accumulated a treasure of gold and silver which surpassed the modesty of a private fortune. His government was oppressive or unpopular: and the general discontent was expressed with freedom by the deputies of Rome. Before the throne of Justinian they boldly declared, that their prince, on account of this principality also and Dietz, had princes of its own; but unless their father succeeded to a seat of his government at Orange, the inhabitants would consult their allies, and the preparations were not unworthy of the ancient majesty of the empire.

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confident with that order which we are apt to consider as inseparably connected with good economy, yet we must certainly allow them to have been at least so far frugal as not commonly to have spent their whole income. Some part of this money, perhaps, they spent in purchasing the few objects of vanity and luxury with which the circumstances of the times could furnish them; but some part of it they seem commonly to have hoarded. They could not well indeed do any thing else but hoard whatever money they saved. To trade was disgraceful to a gentleman; and to lend money at interest, which at that time was considered as usury and prohibited by law, would have been still more so.

The same disposition to save and to hoard prevailed in the sovereign as well as in the subjects. Among nations to whom commerce and manufactures are little known, the sovereign is in a situation which naturally disposes him to the parsimony requisite for accumulation. In that situation the ex pense even of a sovereign cannot be directed by that vanity which delights in the gaudy finery of a court. The ignorance of the times affords but few of the trinkets in which that finery delights. Standing armies are not then necessary; so that the ex pense even of a sovereign, like that of any other great lord, can be employed in fearce any thing but bounty to his tenants and hospitality to his retainers. But bounty and hospitality very seldom lead to extravagance: though vanity almost always does. All the ancient sovereigns of Europe accordingly had treasuries. Every Tartar chief in the present times is said to have one.

In a commercial country abounding with every sort of expensive luxury, the sovereign, in the same manner as almost all the great proprietors in his dominions, naturally spends a great part of his revenue in purchasing those luxuries. His own and the neighbouring countries supply him abundantly with all the costly trinkets which compose the splendid but insignific ant pageantry of a court. His ordinary ex pense becomes equal to his ordinary revenue, and it is well if it does not frequently exceed it. The amassing of treasure can no longer be expedient; and when extraordinary exigencies require extraordinary expenses, he must necessarily call upon his subjects for an extraordinary aid. The late king of Prussia and his father as principals, on a very large sum of money to government. Hence the ability in the subjects of a commercial state to lend.

The progress of the enormous debts which at present oppresses, and will in the long run probably ruin, all the great nations of Europe has been pretty uniform. In England, after the Revolution, when new connexions with Europe introduced a new system of foreign politics, the ex pense of the nation, not only in settling the new establishments, but in maintaining long wars, as principals, on the continent, for the security of the Dutch barrier, reducing the French monarchy, settling the Spanish succession, supporting the house of Austria, maintaining the liberties of the German body, and other purposes, increased to an unual degree; insomuch that it was not thought advisable to raise all the ex pense of any one year by taxes to be levied within that year, lest the unaccustomed weight of them should create mur murs among the people. It was therefore the policy of the states to anticipate the ex pense of that year by the revenue of the next.
National sums for the current service of the state, and to lay no more taxes upon the subject than would suffice to pay the annual interest of the sums so borrowed; by this means converting the principal debt into new specie of property, transferable from one man to another at any time and in any quantity. This system indeed seems to have had its original in the state of Florence, A.D. 1344: which government then owed about L.60,000 Sterling; and being unable to pay it, formed the principal into an aggregate sum, called metaphorically a mount or bank, the shares whereof were transferable like our stocks, with interest at 5 per cent., the prices varying according to the exigencies of the state. This laid the foundation of what is called the national debt: for a few long annuities created in the reign of Charles II. will hardly deserve that name.

Nations, like private men, have generally begun to borrow upon what may be called perpetual credit, without affigning or mortgaging any particular fund for the payment of the debt; and when this resource has failed them, they have gone on to borrow upon affignments or mortgages of particular funds.

What is called the unfunded debt of Great Britain, is contrived in the manner of those two ways. It consists partly in a debt which bears, or is supposed to bear, no interest, and which resembles the debts that a private man contracts upon account; and partly in a debt which bears interest, and which resembles what a private man contracts upon his bill or promissory note. The debts which are due either for extraordinary services, or for services either not provided for or not paid at the time when they are performed; part of the extraordinaries of the army, navy, and ornavance, the arrears of subsidies to foreign princes, those of seamen wages, &c. usually constitute a debt of the first kind. Navy and exchequer bills, which are issued sometimes in payment of a part of such debts, and sometimes for other purposes, constitute a debt of the second kind; exchequer bills bearing interest from the day on which they are issued, and navy bills six months after they are issued. The bank of England, either by voluntarily discounting those bills at their current value, or by agreeing with government for certain considerations to circulate exchequer bills, that is, to receive them at par, paying the interest which happens to be due upon them, keeps up their value, and facilitates their circulation, and thereby frequently enables government to contract a very large debt of this kind. During the great reconage in King William's time, when the bank of England thought proper to put a stop to its actual transations, exchequer bills and tallies are said to have sold from 25 to 60 per cent. discount; and partly, no doubt, to the supposed infallibility of the new government established by the Revolution, but partly too to the want of the support of the bank of England.

When this resource is exhausted, and it becomes neccessary, in order to raise money, to affign or mortgage some particular branch of the public revenue for the payment of the debt, government has upon different occasions done this in two different ways. Sometimes it has made this affignment or mortgage for a short period of time only, a year or a few years, for example; and sometimes for perpetuity. In the one case, the fund was supposed sufficient to pay within the limited time both principal and interest of the money borrowed: In the other, it was supposed sufficient to pay the interest only, or a perpetual annuity equivalent to the interest; government being at liberty to redeem at any time this annuity upon paying back the principal sum borrowed. When money was raised in the one way, it was said to be raised by anticipation; when in the other, by perpetual funding, or, more shortly, by vending.

In the reign of King William, when the debt began to be amass'd, and during a great part of that of Queen Anne, before we had become so familiar as we are now with the practice of perpetual funding, the greater part of the new taxes were imposed but for a short period of time (for four, five, six, or seven years only); and a great part of the grants of every year con/med in loans upon anticipation of the produce of those taxes. The produce being frequently insufficient for paying within the limited term the principal and interest of the money borrowed, deficiencies arose; to make good which it became necessary to prolong the terms.

On the 3d of December 1697, the funded and unfunded debts amounted to L.215,157,742: 13: 8½: at the same time, in 1714, they were L.53,681,027, 56. 6½: d. In 1755, before the breaking out of the war, they amounted to L.72,389,673; and on the 2d of January 1763, at the conclusion of the peace, they had accumulated to L.122,603,356; 8: 24 of funded debt, and of unfunded L.130,027,589; 2: 2 more. In 1775, they were nearly 130 millions; and the late American war added upwards of 120 millions more to that enormous sum: to pay the interest of which, and the charges of management, amounting annually to nearly eight millions and an half, the extraordinary revenues elsewhere enumerated (excepting only the land-tax and annual malt-tax) are in the first place. ven! mortgaged and made perpetual by parliament. Perpetual we say; but still redeemable by the same authority that imposed them; which, if it at any time can pay off the capital, will abolish those taxes which are raised to discharge the interest.

By this means, then, the quantity of property in the kingdom is greatly increased in idea compared with former times; yea, if we coolly consider it, not at all increased in reality. We may boast of large fortunes, and quantities of money in the funds. But where does this money exist? It exists only in name, in paper, in public faith, in parliamentary security; and that is undoubtedly sufficient for the creditors of the public to rely on. But then what is the pledge which the public faith has pawned for the security of these debts? The land, the trade, and the personal industry of the subject; from which the money must arise that supplies t.c several taxes. In these, therefore, and the only, the property of the public creditors does really and intrinsically exist; and of course the land, the trade, and the personal industry of individuals, are diminished in their true value just so much as they are pledged to answer. If A's income amounts to L.100 per annum; and he is so far indebted to B, that he pays him L.50 per annum for his interest; one half of the value of A's property is transferred to B the creditor. The creditor's property exists in the demand which he has upon the debtor, and no where else; and the debtor is only a trustee to his creditor for one half
of the value of his income. In short, the property of a creditor of the public consists in a certain portion of the national taxes; by how much therefore he is the richer, by so much the nation, which pays these taxes, is the poorer.

The only advantage that can result to a nation from public debts, is the increase of circulation, by multiplying the cash of the kingdom, and creating a new species of currency, available at any time and in any quantity; always therefore ready to be employed in any beneficial undertaking, by means of this its transferrable quality; and yet producing some profit even when it lies idle and unemployed. A certain proportion of debt seems to be highly useful to a trading people; but what that proportion is, it is not for us to determine. This much is indubitably certain, that the present magnitude of our national incumbrances very far exceeds all calculations of commercial benefit, and is productive of the greatest inconveniences. For, firstly, the enormous taxes that are raised upon the necessaries of life for the payment of the interest of this debt, are a hurt both to trade and manufactures, by raising the price as well of the artificers' subsistence as of the raw material, and of course in a much greater proportion, the price of the commodity itself. Nay, the very increase of paper-circulation itself, when extended beyond what is requisite for commerce or foreign exchange, has a natural tendency to increase the price of provisions as well as of all other merchandise. For as its effect is to multiply the cash of the kingdom, and this to such an extent that much must remain unemployed, that cash (which is the universal measure of the respective values of all other commodities) must necessarily sink in its own value, and every thing grow comparatively dearer. Secondly, if part of this debt be owing to foreigners, either they draw out of the kingdom annually a considerable quantity of specie for the interest; or else it is made an argument to grant them unreasonable privileges in order to induce them to reside here. Thirdly, if the whole be owing to subjects only, it is then charged on the active and industrious subject, who pays his share of the taxes to maintain the indolent and idle creditor who receives them. Lastly, and principally, it weakens the internal strength of a state, by anticipating those resources which should be reserved to defend it in case of necessity. The interest we now pay for our debts would undoubtedly be sufficient to maintain the most vigorous war that any national motives could possibly require. If indeed our ancestors in King William's time had annually paid, so long as their exigencies lasted, a far less sum than we now annually raise upon their accounts, they would not in time of war have borne so great burdens as they have been hallowed to and saddled upon their posterity in time of peace; and might have been eased the inestimable hindrance the exaction was ever. See Funds.

On the whole, then, the national debt is undoubtedly a subject of vast importance, and as such it has been always considered; for much of it has been laid and written upon it, and many schemes have been proposed at various times and by various persons for gradually removing it, being considered by the most judicious as a most pernicious incumbrance to a commercial country. Some we are aware, think it of vast utility; but this opinion is too eccentric, and in our estimation too feebly supported to be convincing. The public debt is indubitably a great grievance; and every lever of his country must freely wish to see it removed; the period, however, when this blessing shall take place, if indeed it ever arrive, must at least be very distant.

It is neither our business nor intention (even if the limits prescribed to the article did not prevent it) to be minute on the subject, or to propose any schemes for alleviating the burdens of the nation. That indeed has been already done by far abler hands than we profess to be: we must therefore refer such as wish for farther information on this interesting topic to those (and they are not a few) who have treated of it at full length. Smith's Wealth of Nations, and Sir John Sinclair's History of the Revenue, go to the bottom of the matter. The writings of Dr Price likewise deserve considerable attention, especially as one of his plans for the reduction of the debt has in fact been adopted, and in consequence established, by the legislature: His three plans may be found in a late pamphlet by William Morgan, intitled, A Review of Dr Price's Writings on the Subject of the Finances of this Kingdom.

NATIVITY, or NATAL DAY, the day of a person's birth. The word nativity is chiefly used in speaking of the facts; as, the nativity of St John the Baptist, &c. But when we say the nativity, it is understood of that of Jesus Christ, or the feast of Christmas.

Nativity, nativitas, in ancient law-books, signifies bondage or servitude.

Nativity, in astrology, the theme or figure of the heavens, and particularly of the twelve houses, at the moment when a person was born; called also the horoscope.

Calling the nativity, or by calculation seeking to know how long the queen should live, &c. was made felony, an. 23 Eliz. c. 2.

NATIVO NASENDO, in law, a writ directed to the sheriff, for a lord compensated for the inherited in any villain, when a villain was run away from the lord. For the apprehending and restoring him to the lord.

NATIX, in natural history, a name given by some old writers to the serin.

NATOLIA, the modern name of the Lesser Asia, being the most westerly part of Turkey in Asia, and confilting of a large peninsula which extends from the river Euphrates as far as the Archipelago, the seas of Marmora, the straits of Galipoli and of Constantinople, which separate it from Europe on the west. It is bounded on the north by the Black sea, and on the south by the Mediterranean.

NATRIX, in botany, the name given by Rivinus to a genus of plants nearly allied to the anonis, and comprehended with it in one genus by Linnaeus, under the name of anonis. See Rist-harrow

Natrix, in zoology, the name of the common or water-snake, called also torquata, from the ring about its neck. It is not a water animal, properly speaking, but a land one, which being able to swim very well, often takes the water to hunt about for frogs, which are its principal food. It grows to be much longer and larger than the viper, and does not bring forth live young ones, but great numbers of eggs, which it lays in dung-
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regard to its influence on the passions and affection, *is to rear a tree for its blossoms, which is capable of yielding the richest and most valuable fruit.* Physical and moral beauty bear to intimate a relation to each other, that they may be considered as different gradations in the scale of excellence: and the knowledge and relish of the former should be deemed only a step to the nobler and more permanent enjoyments of the latter.

"Whoever has visited the Leafoves, in Warwickshire, must have felt the force and propriety of an inscription which meets the eye at the entrance into those delightful grounds.

Would you then taste the tranquil scene?  
Be sure your blossoms be serene;  
Devoid of hate, devoid of strife;  
Devoid of all that poisons life;  
And much it *val* you, in their place,  
To graft the love of human race.

"Now such scenes contribute powerfully to inspire that serenity which is necessary to enjoy and to heighten their beauties. By a secret contagion, the foul catches the harmony which he contemplates; and the frame within assimilates itself to that which is without. For,  
Who can forbear to smile with Nature? Can  
The formy passions in the bosom roll,  
While every gale is peace, and every grove  
Is melody?

"In this state of sweet composure, we become susceptible of virtuous impressions, from almost every surrounding object. The patient ox is viewed with generous complacency; the guileless sheep with pity; and the playful lamb raises emotions of tenderness and love. We rejoice with the horse, in his liberty and exemption from toil, while he ranges at large through enamelled pastures; and the frolicks of the colt would afford unmixed delight, did we not recollect the bondage which he is soon to undergo. We are charmed with the song of birds, footed with the buzz of insects, and pleased with the sportive motions of flies, because these are expressions of enjoyment; and we exult in the felicity of the whole animated creation. Thus an equal and extensive benevolence is called forth into exultation; and having felt a common interest in the gratifications of inferior beings, we shall be no longer indifferent to their sufferings, or became wanton interminably in producing them.

"It seems to be the intention of Providence, that the lower order of animals should be subservient to the comfort, convenience, and safety of man. But his right of dominion extends no farther; and if this right be exercised with mildness, humanity, and justice, the subjects of his power will be no less benefited than himself. For various species of living creatures are annually multiplied by human art, improved in their perceptive powers by human culture, and plentifully fed by human industry. The relation, therefore, is reciprocal between such animals and man: and he may supply his own wants by the use of their labour, the produce of their bodies, and even the sacrifice of their lives, whilst he co-operates with all-gracious Heaven in promoting happiness, the great end of existence.

"But though it be true, that partial evil, with respect to different orders of sensitive beings, may be universal good; and that it is a wife and benevolent institution of nature, to make destruction itself, within certain limitations, the cause of an increase of life and enjoyment: yet a generous perfon will extend his compassionate regards to every individual that suffers for his sake: and, whilst he figths

Even for the kid or lamb that parts its life
Beneath the bloody knife,  
he will naturally be solicitous to mitigate pain, both in duration and degree, by the gentlest modes of inflicting it.

"We are inclined to believe, however, that this sense of humanity would soon be obliterated, and that the heart would grow callous to every soft impression, were it not for the benignant influence of the smiling face of nature. The count de Lauzun, when imprisoned by Louis XIV. in the castle of Pigecrol, assisted himself, during a long period of time with catching flies, and delivering them to be devoured by a rapacious spider. Such an entertainment was equally singular and cruel.

Such an entertainment was equally singular, and cruel.  
For various species of living creatures are at times  
employed for their sport; for naturahbeauty is

"Most of these are at times employed for their sport; for natural beauty is

"It is useful, so it is a continual source of real enjoyment; for a more rational pleasure cannot possibly occupy the attention or captivate the affections of mankind, than that which arises from a due consideration of the works of nature. Pleasure, we know, is a necessary ingredient in human life, in order in some measure to counterbalance the pains, the evils, and little necessities, which are at times perhaps unavoidable, and in order to render life tolerable. It is the part then of the


NATURAL HISTORY.

Natural history, in its most extensive signification, denotes a knowledge and description of the whole universe. Matters of fact respecting the heavens, meteors; the atmosphere, the earth, respecting all the phenomena, indeed, which occur in the world, and even of the external parts and actions of man himself, as far as reason can discover them, belong to the province of natural history; but when we leave the simple recital of effects, and endeavour to investigate the causes of such and such phenomena, we then leave natural history, and enter on philosophy. The object of our article, therefore, in the sense we have here given it, is as extensive as nature itself. But, in its more appropriated sense, it is well known that its province obly extends to the surface of the earth, the works on it, and the inhabitants of it. It treats of those substances of which, as far as our researches have led us, the earth is composed, and of those organized bodies, whether vegetable or animal, which adorn its surface, which rise into the air, or live in the bosom of the waters. But as a science so various and comprehensive could neither with propriety nor advantage be completely discussed under the general title, we have to refer the reader to the article Kingdoms (in Natural History), where he will be directed to the different articles which constitute either the branches or the objects of the science, and which are all treated under their respective names. In the present article it is proposed to give a general and philosophical view of the subject: To set forth, in a summary way, whatever curious, worthy to be known; or not obvious to every observer, occurs in the three kingdoms of nature: with their constitution, laws, and economy; or, in other words, that all-wise disposition of the Creator in relation to natural things, by which they are fitted to produce general ends and reciprocal uses.

Sect. I. Of the Terraqueous Globe in general, and its changes.

The world, or the terraqueous globe, which we inhabit, is everywhere surrounded with elements, and contains in its superficies the three Kingdoms of Nature, as they are called: the fossil, which constitutes the crust of the earth; the vegetable, which adorns the face of it, and draws the greatest part of its nourishment from the fossil kingdom; and the animal, which is sustained by the vegetable kingdom. Thus, then, these three grand divisions, or, as they are commonly called, kingdoms; cover, adorn, and vary, the surface of the earth.

As to the strata of the earth and mountains, as far as we have hitherto been able to discover, the upper parts consist of rhyolite; the next of slate; the third of marble filled with petrifactions; the fourth again, of slate; and lastly, the lowest of tree stone.
The habitable part of the earth, though it is scooped into various inequalities, yet is everywhere high in comparison with the sea; and the farther it is from the sea it is generally higher. Thus the waters in the lower places are not at rest, unless some obstacle confines them, and by that means form lakes and marishes. The sea surrounds the continent, and takes up the greatest part of the earth's surface, as geographers inform us. Nay, that it once spread over much of the greatest part, we may be convinced by its yearly decrease, by the rubbish left by the tides, by shells, strata, and other circumstances.

The sea-shores are usually full of dead terebaceous animals, wreck, and such like bodies, which are yearly thrown out of the sea. They are also covered with sand of various kinds, stones, &c. It happens, moreover, that while the more rapid rivers run through narrow valleys, they wear away the tides; and thus the friable and soft earth falls in, and its ruins are carried to distant and winds up. This happens sooner when the scene is continued their way.

The clouds collected from exhalations, chiefly from the sea, but likewise from other waters, and moist grounds, and condensed in the lower regions of the atmosphere, supple the earth with rain; but since they are attracted by the mountainous parts of the earth, it necessarily follows, that those parts must have, as is fit, a larger share of water than the rest. Springs, which generally run out at the foot of mountains, take their rise from this very rain-water, and vapours condensed, that trickle through the holes and interstices of loose bodies, and are received into caverns.

These afford a pure water purged by straining; and rarely dry up in summer, or freeze in winter, so that animals never want a wholesome and refreshing liquor.

The chief sources of rivers are fountains and rills growing by gradual supplies into still larger and larger streams; till at last, after the confluent of a vast number of them, they find no stop, but falling into the sea with such rapidity, they there deposit the united foles they have gathered, along with foreign matter, and such earthly substan rices as they tore off in their way. Thus the water returns in a circle whence it first drew its origin, that it may act over the same scene in continued succession.

Marishes arising from water retained in low grounds, are filled with moistumps, which are brought down by the water from the higher parts, or are produced by putrefied plants.

We often see new meadows arise from marshes dried up. This happens sooner when the sodagnum (a kind of moss) has laid a foundation; for this in process of time changes into a very porous mould, till almost the whole marsh is filled with it. After that the rush strikes root, and along with the cotton-grasses constitutes a turf, raised in such a manner that the roots get continually higher, and thus lay a more firm foundation for other plants, till the whole marsh is changed into a fine and delightful meadow; especially if the water happens to work itself a new passage.

Hilllocks, that abound in low grounds, occasion the earth to increase yearly, more than the countryman would wish, and seem to do hurt; but in this the great industry of nature deserves to be taken notice of. For by this means the barren spots become fomer rich meadow and pasturage land. Thee hilllocks are formed by the ant, by stones and roots, and the trampling of cattle; but the principal cause is the force of the winter-cold, which in the spring raises the roots of plants so high above the ground, that being exposed to the air, they grow, and perish; after which the golden-maidenhairs fill the vacant places.

Mountains, hills, valleys, and all the inequalities of the earth, though some think they take away much from its beauty, are so far from producing such an effect, that on the contrary they give a more pleasing aspect, and confer great advantages. For thus the terrestrial superficies is larger; different kinds of plants thrive better, and are more easily watered; and the rain-waters run in continual streams into the sea; not to mention many other uses in relation to winds, heat, and c. &d. Alps are the highest mountains, that reach to the second region of the air, where trees cannot grow erec. The higher these Alps are, the colder they are. Hence the Alps in Sweden, Siberia, Switzerland, Peru, Brazil, Armenia, Asia, Africa, are perpetually covered with snow, which becomes almost as hard as ice. But if by chance the summer heat be greater than ordinary, some part of these fles melts, and runs through rivers into the lower regions, which by this means are much refreshed.

It is scarcely to be doubted, but that the rocks and stones dispersed over the globe were formed originally in, and from, the earth; but when torrents of rain have softened, as they easily do, the soluble earth, and carried it down into the lower parts, we imagine it happens, that these solid and heavy bodies, being laid bare, stick out above the surface. We might also take notice of the wonderful effect of the tide, such as we see happen from time to time on the sea-shore, which being daily and nightly assaulted with repeated blows, at length gives way, and breaks off. Hence we see in most places the rubble of the sea, and shores.

The winter by its frost prepares the earth and mould, which thence are broken into very minute particles, and thus, being put into a mouldering state, become more fit for the nourishment of plants; nay, by its snow it covers the seeds and roots of plants, and thus by cold defends them from the force of cold. We must add also, that the piercing frost of the winter purifies the atmosphere and putrid waters, and makes them more wholesome for animals.

The perpetual succession of heat and cold with us renders the summers more pleasing: and tho' the winter deprives us of many plants and animals, yet the perpetual summer within the tropics is not much more agreeable, as it often destroys men and other animals by its immoderate heat; though it must be confessed, that those regions abound with exquisite fruits. Our winters though very troublesome to a great part of the globe on account of their vehement and intense cold, yet are less hurtful to the inhabitants of the northern parts, as experience testifies. Hence it happens,
en pens, that we may live very conveniently on every part of the earth, as every different country has different advantages from nature.

The seasons, like every thing else, have their vicissitudes; their beginnings, their progress, and their end.

The age of man begins from the cradle; pleasuring childhood succeeds; then active, youth; afterwards manhood, firm, severe, and intent upon felt preservation; lastly, old age creeps on, debilitates, and at length totally destroys our towering bodies.

The seasons of the year proceed in the same way. Spring, the jovial, playful infancy of all living creatures, represents childhood and youth; for then plants spread forth their luxuriant flowers, flies exult, birds sing, every part of nature is intent upon generation. The summer, like middle age, exhibits plants, and trees every where cloathed with green; it gives vigour, to animals, and plumps them up; fruits then ripen, on the quarters. The day proceeds with the autumn, the here and there in fields and pastures; the heat puts them upon indulging their ease, and even necessity obliges them to. Evening follows, and makes every thing more sluggish; flowers shut up*, and animals retire to their lurking places. Thus the firing, the morning, and youth are proper for generation; the summer, noon, and manhood, are proper for preservation; and autumn, evening, and old age, are not unfittedly likened to destruction.

In order to perpetuate the established course of nature in a continued series, the Divine Wisdom has thought fit that all living creatures should constantly be employed in producing individuals: that all natural things should contribute and lend a helping hand towards preserving every species: and lastly, that the death and destruction of one thing should always be subservient to the production of another. Hence the objects of our present inquiry fall to be considered in a threefold view, that of propagation, preservation, and death or destruction.

Sect. II. The Fossil Kingdom.

1. Propagation.

It is agreed on all hands, that stones are not organical bodies, like plants and animals; and therefore it is as clear that they are not produced from an egg, like the tribes of the other kingdoms. Hence the variety of fossils is proportionate to the different combinations of calcareous particles; and hence the species in the fossil kingdom are not so distinct as in the other two. Hence also the laws of generation in relation to fossils have been in all ages extremely difficult to explain; and lastly, hence have risen so many different opinions about them, that it would be endless to enumerate them all. We therefore, for the present, shall content ourselves with giving a very few observations on this subject.

Some people suppose that clay is the sediment of the sea; and observation so far seems to go along with this opinion, for great plenty of it is generally found along the coasts. Seamen who have been so accurate as to keep journals, have observed, that a very minute sand covers the bottom of the ocean; and seem to think that it is daily crystallized from the water. It is now generally acknowledged, that extensive bodies and petrifications resembling animals were once real animals or vegetables. It has been supposed indeed, that shells being of a calcareous nature, changed the adjacent clay, sand, or mould, into the same kind of substance. Hence it appears certain, that marbles may be generated from petrifactions; and therefore it is often full of them. Ragstone, the common matter of our rocks, appears to be formed from a sandy kind of clay; most frequently, however, this appears to happen where the earth is impregnated with iron. Free-stone seems to be the product of sand: and, the deeper the bed where it is found, the more compact it becomes; and the more dense the sand, the more easily it concretizes. But if an alkaline clay chances to be mixed with the sand, the freestone is generated more readily, as in that called calcairet particuus argille-grése. The flint is almost the only kind of stone, certainly the most common, in chalky mountains. It would appear therefore from this to be produced from chalk: but whether it can be reduced to chalk again, is left for others to enquire.

Stalactites, or drop-stone, is composed of calcareous particles, adhering to a dry, and generally a vegetable body, and is deposited by dropping water; from which circumstance it seems to have derived its vulgar name.

Incrustations (Syf. Nat. 32. 5. 6. 7. 8.), are, in general, it appears, generated where a vitriolic water connects clayey and earthy particles together. Slate, by the vegetables that are often enclosed in it, seems to take its origin from a marly mould. Metals vary according to the nature of the matrix in which they adhere; e. g. the pyrites cupri Fahlmenus contains frequently sulphur, arsenic, iron, copper, a little gold, vitriol, alum, sometimes lead ore, silver and zinc. Thus gold, copper, iron, zinc, arsenic, pyrites, vitriol, come out of the same vein. That very rich iron ore, at Normark in Vermilionia, where it was cut directly by a vein of clay, was changed into pure silver. The number therefore of species and varieties of fossils, each serving different purposes according to their different natures, will be in proportion as the different kinds of earths and stones are variously combined.

II. Preservation.

As fossils are definite of life and organization, are hard, and not obnoxious to petrifaction; so they last longer than any other kind of bodies. How far the air contributes to this duration, it is easy to perceive; since air hardens many stones upon the surface.
face of the earth, and makes them more solid, compact, and able to refit the injuries of time. Thus it is known from vulgar observation, that lime that has been long exposed to the air becomes hardened. The chalky marl which they use in Flanders and about Bath for building houses, as long as it continues in the quarry is friable; but when dug up and exposed to the air it grows gradually harder.

However ignorant we may be of the cause why large rocks are everywhere to be seen split, whence wall fragments are frequently torn off; yet we may observe, that figures are closed up by water, which gets between them, and is detained there; forming crytal and spar. Hence we scarcely ever find any crytal, but in those stones which have retained for some time in its chips, water loaded with stony particles. In the same manner crytal fills the cavities in mines, and concrete into quartz or a debarded crytal.

It is manifest that stones are not only generated, augmented, and changed perpetually, from inculations brought upon moss, but are also increased by crytal and spar. Not to mention that the adjacent earth, especially if it be impregnated with iron particles, is commonly changed into a solid stone.

It is said, that the marble quarries in Italy, from whence fragments are cut, grow up again. Ores grow by little and little, whenever the mineral particles conveyed by the means of water through the crests of mountains are retailed there, so that adhering to the homogenous matter a long while, as last they take its figure, and are changed into a similar substance.

III. Destruction.

Fossils, although they are the hardest of bodies, yet are found subject to the laws of destruction, as well as all other created substances. For they are dissolved in various ways by the elements exerting their force upon them, as by water, air, and the solar rays; as also by the rapidity of rivers, violence of cataracts, and eddies which continually beat upon, and at last reduce to powder the hardest rocks. The agitation of the seas and lakes, and the vehemence of the waves, excited by turbulent winds, together with these, as evidently appears by their roundness along the shore. Nay, as the poet says,

The hardest stone intenbly gives way To the last drops that frequent on it play. So that we ought not to wonder that these very hard bodies moulder away into powder, and are obnoxious like others to the consuming tooth of time.

Sand is formed of free-stone, which is destroyed partly by frost, making it friable; partly by the agitation of water and waves, which calieth away, disolve, and reduce into minute particles what the frost had made friable.

Chalk is in general supposed to be formed of rough marble, which the air, the sun, and the winds have dissolved. Tho flat earth, or humus schiif, (Synt. Nat. 512.) owes its origin to flat, flowers, air, and snow melted.

Olive is formed of metals dissolved, and presents the very same colors which we always find the ore tinting when exposed to the air. Vitriol in the same manner mixes with water from ore destroyed.

The musa fascilis (Synt. Nat. 14. 6.), a kind of talky stone, yielding fowl in the parts that are turned to the fun, is dissolved into sand, which falls by little and little upon the earth till the whole is consumed; not to mention other kinds of fossils. Lastly, from these there arise new fossils, as we mentioned before; so that the destruction of one thing serves for the generation of another.

Teffaceous worms ought not to be passed over on this occasion, for they eat away the hardest rocks. That species of shell-fish called the roser-fell bores through stones in Italy, and hides itself within them so that the people who eat them are obliged to break the stones before they can come at them. The coxlews, (Faenh. Succ. 1292.), a kind of snail that lives on craggy rocks, eats and bores through the chalky hills, as worms 'do through wood. This is made evident by the observations of the celebrated de Geer. It ought to be observed here, that there are often found dead insects in the hearts of the hardest rocks, without any visible trace of the manner of their getting there; from whence many have supposed that stones were originally fluid. Concerning such matters, about which we have but little data, there will always be a great diversity of opinions. It's not our business, at least in this place, to give an opinion on a doubtful subject: the fact is so; of the cause let others judge.

T. Propagation.

Anatomy abundantly proves, that all plants are organic and living bodies, and that all organic bodies are propagated from an egg has been sufficiently demonstrated by the industry of modern writers. We therefore the rather, according to the opinion of the skillful, reject the equivocal generation of plants, and the more so, as it's certain that every living thing is produced from an egg. Now the seeds of vegetables are called eggs, there are different in every different plant, that the means being the same, each may multiply its species, and produce an offspring like its parent. We do not deny, that very many plants pull forth from their roots fresh offsets for two or more years. Nay, not a few plants may be propagated by branches, buds suckers, and leaves, fixed in the ground, as likewise many trees. Hence their stems being divided into branches, may be looked on as roots above ground for in the same way the roots creep under ground, and divide into branches. And there is the more reason for thinking so, because we know that a tree will grow in an inverted situation, viz. the roots being placed upwards, and the head downwards, and buried in the ground; for then the branches will become roots, and the roots will produce leaves and flowers. The lime-tree will serve for an example, on which gardeners have chiefly made an experiment. Yet this by no means overturns the doctrine, that all vegetables are propagated by seeds; since it is clear, that is each of the foregoing influences nothing vegetates but what was
NATURAL HISTOR Y.

was the part of a plant, formerly produced from seed; for that accurately speaking, without seed no new plant is produced.

Then again plants produce seeds; but they are entirely unfit for propagation, unless fecundation precedes, which is performed by an intercourse between different sexes, as experience testifies. Plants therefore must be provided with organs of generation; in which respect they are analogous to animals.—

Since in every plant the flower always precedes the fruit, and the fecundated seeds visibly arise from the fruit; it is evident that the organs of generation are contained in the flower, which organs are called anthera and stigma, and that the impregnation is accomplished within the flower. This impregnation is performed by means of the dust of the anthera falling upon the moist stigma, where the dust adheres, is built, and sends forth a very subtle matter, which is absorbed by the style, and is conveyed down to the rudiments of the seed, and thus renders it fertile. When this operation is over, the organs of generation wither and fall, may a change in the whole flower from fleshes. We must, however, observe, that in the vegetable kingdom one and the same flower does not always contain the organs of generation of both sexes, but oftentimes the male organs are on one plant and the female on another. But that the benefits of impregnation may go on successfully, and that no plant may be deprived of the necessary dust, the whole most elegant apparatus of the anthera and stigma in every flower is contrived with wonderful wildom.

For in moist flowers the stamina surround the pistilla, and are of about the same height: but there are many plants in which the pistilla is longer than the stamina; and in these it is wonderful to observe, that the Creator has made the flowers recline, in order that the dust may the more easily fall into the stigma, e.g. in the campanula, cowslip, &c. This curious phenomenon did not escape the poetical eye of Milton, who describes it in the following enlivened imagery:

With cowslips wan, that hang the penitve head.

But when the fecundation is completed, the flowers rise again, that the ripe seeds may not fall out before they are dispersed by the winds. In other flowers, on the contrary, the pistilla is shorter, and there the flowers preserve an erect situation; nay, when the flowering comes on, they become erect, though before they were drooping, or immersed under water. Lastly, whenever the male flowers are placed below the female ones, the leaves are exceedingly small and narrow, that they may not hinder the dust from flying upwards like smoke; as we see in the pine, fir, yew, fea-grape, juniper, cypress, &c. And when in one and the same species one plant is male and the other female, and consequent-ly may be far from one another; there the dust, without which there is no impregnation, is carried in abundance by the help of the wind from the male to the female; as in the whole dircocious clas. Again, a more difficult impregnation is compensated by the longevity of the individuals, and the continuation of life by buds, suckers, and roots; so that we may observe every thing most wisely disposed in this affair. Moreover, we cannot without admiration observe, that moist flowers expand themselves when the sun shines forth; whereas when clouds, rain, or the evening comes on, they close up, lest the genial dust should be coagulated

Vid. a treatise on the Spongii, 

Although all such kinds of metamorphoses are repugnant to the laws of generation; not considering, that there is another cause of this phenomenon, viz. that the ground perhaps has been manured with horse-dung, in which the seeds of oats, coming entire from the horse,
NATURAL HISTORY.

Sect. III.

Greenland Alps. And Tournefort found at the bottom of Mount Ararat the common plants of Armenia, a little way up those of Italy, higher those which grow about Paris, afterwards the Swedish plants, and lastly on the top the Lapland Alpine plants; and myself, adds the author, from the plants growing on the Dalecarlian Alps could collect how much lower they were than the Alps of Lapland. He then proceeds to show how from one plant of each species, the immense number of individuals now existing might arise. He gives some instances of the furprising fertility of certain plants; e.g. the elecampane, one plant of which produced 3000 seeds; of spelt, 2000 seeds; of the funflower, 4000; of the poppy, 3200; of tobacco, 40,520. But supposing any annual plant producing yearly only two seeds, even of this, after 20 years, there would be 1,048,576 individuals. For they would increase yearly in a duplicate proportion, viz. 2, 4, 8, 16, 32, &c. He then gives some instances of plants brought from America, that are now become common over many parts of Europe. Lastly, he enters upon a detail of the several methods which nature has taken to propagate vegetables, which is extremely curious, but too long to insert in this place.

II. Preservation.

The great Author and Parent of all things decreed, that the whole earth should be covered with plants, and that no place should be void, none barren. But since all countries have not the same changes of feasons, and every soil is not equally fit for every plant; he therefore, that no place should be without some, gave to every one of them such a nature, as might be chiefly adapted to the climate; so that some of them can bear an intense cold, others an equal degree of heat; some delight in dry ground, others in moist, &c. Hence the same plants grow only where there are the same feasons of the year, and the same soil.

The Alpine plants live only in high and cold situations; and therefore often on the Alps of Armenia, Switzerland, the Pyrenees, &c. whose tops are equally covered with eternal snows as those of the Lapland Alps, plants of the same kind are found, and it would be in vain to seek for them anywhere else. It is remarkable, in relation to the Alpine plants, that they blow, and ripen their seeds very early, left the winter, should feast upon them a sudden, and destroy them.

Our northern plants, although they are extremely rare everywhere else, yet are found in Siberia, and about Hudson's Bay; as the arbutus, bramble, wintergreen, &c.

Plants impatient of cold live within the torrid zones; hence both the Indies, though at such a distance from one another, have plants in common. The Cape of Good Hope, we know not from what cause, produces plants peculiar to itself; as all the meSEMBRYTHANMA, and almost all the species of aloes. Grafts, the most common of all plants, can bear almost any temperature of air; in which the good providence of the Creator particularly appears; for all over the globe, they above all plants are necessary for the nourishment of cattle; and the same thing is seen in relation to our moist common grains.

Thus neither the scorching sun, nor the pinching cold, hinders any country from having its vegetables.
be a shelter to animals in the winter. They lose their leaves only every third year, as their seeds are sufficiently guarded by the moths, and do not want any other covering. The palms in the hot countries perpetually keep their leaves, for there the seeds stand in no need of any shelter whatever.

Many plants and shrubs are armed with thorns, e.g., the buckthorn, hawthorn, carduus, cotton-thistle, &c., that they may keep off the animals which otherwise would destroy their fruit. These at the same time cover many other plants, especially of the annual kind, under their branches. Nay it has frequently been observed upon commons where forage grows, that wherever there was a bulwark untouched for years by the commoner, some tree has sprung up being favored by the prickles of that shrub from the bite of cattle. So that while the adjacent grounds are robbed of all plants by the voracity of animals, some may be preferred to ripe flowers and fruit, and flock the parts about with seeds, which otherwise would be quite extinguished.

All herbs cover the ground with their leaves, and by their shade hinder it from being totally deprived of that moisture which is necessary to their nourishment. They are moreover an ornament to the earth, especially as leaves have a more agreeable verdure on the upper than on the under side.

The moths which adorn the most barren places, at the same time, prefer the leffer plants when they begin to shoot, from cold and drought; as we find by experience in our gardens, that plants are preferred in the same way. They also hinder the fermenting earth from forcing the roots of plants upwards in the spring, as we see happen annually to trunks of trees, and other things put into the ground. Hence very few moths grow in the warmer climates, as not being so necessary to that end in those places.

The English sea mat-wood, or marram, will bear no foil but pure sand, which nature has allotted to it. Sand, the produce of the sea, is blown by winds oftentimes to very remote parts, and deluges, as it were, woods and fields. But where this grafs grows, it frequently fixes the sand, gathers it into hillocks, and thrives so much, that by means of this alone at last an entire hill of sand is raised. Thus the sand is kept in bounds, other plants are preferred free from it, the ground is increased, and the sea is repelled by this wonderful disposition of nature. This seems to be the same plant which is called in Scotland lent, and is particularly useful for the purpose above-mentioned, and only grows among sand along the sea-coast.

How folicitous nature is about the preservation of graffes is abundantly evident from hence, that the more the leaves of the perennial graffes are eat, the more creep by the roots, and sends forth offsets. For the Author of nature intended that vegetables of this kind, which have very slender and erect leaves should be copious, and very thick set, covering the ground like a carpet; and thus afford food sufficient for so vast a quantity of grazing animals. But what chiefly increases our wonder is, that although the graffes are the principal food of such animals, yet they are forbid as it were to touch the flower and seed-bearing items, that to the seeds may ripen and be sown.

The caterpillar or grub of the moth, although it feeds upon graffes, to the great destruction of them
in meadows yet it seems to be formed in order to keep a due proportion between these and other plants; for graffes, when left to grow freely, increase to that degree, that they exclude all other plants; which would consequently be extirpated, unless this insect sometimes prepared a place for them. Hence always more speces of plants appear in those places where this caterpillar has laid waife the pastures the preceding year than at any other time.

III. Destruction.

Daily experience teaches us, that all plants, as well as other created things, must submit to death. They spring up, they grow, they flourish they ripen their fruit, they wither, and at last, having finished their course they die, and return to the dust again, from whence they first took their rise. Thus all black mould, which everywhere covers the earth, for the greatest part is owing to dead vegetables. For all roots descend into the sand by their branches, and after a plant has loft its item the root remains; but this too rots at last; and changes into mould. By this means this kind of earth is mixed with sand, by the contrivance of nature, nearly in the same way as dung thrown upon fields is wrought into the earth by the industry of the husbandman. The earth thus prepared offers again to plants from its bosom what it has received from them. For when seeds are committed to the earth, they draw to themselves, accommodate to their nature, and turn into plants, the more subtle parts of this mould by the co-operation of the fun and rains; so that the tallest tree is, properly speaking, nothing but mould wonderfully compounded with air and water, and modified by a virtue communicated to a small feed by the Creator. From these plants when they die, just the same kind of mould is formed as gave birth to them originally; whence fertility remains continually uninterrupted. Whereas the earth could not make good its annual consumption, unless it were constantly recruited by new supplies.

The crustaceous liverworts are the first foundation of vegetation; and therefore are plants of the utmost consequence in the economy of nature, though so despised by us. When rocks first immerse out of the sea, they are so polished by the force of the waves, that scarce any herb can find a fixed habitation upon them; as we may observe every where near the sea. But the very minute crustaceous liverworts begin soon to cover these dry rocks, although they have no other nourishment but that small quantity of mould and imperceptible particles which the rain and the air bring thither. Their liverworts dying at last turn into very fine earth; on this earth the imbricated liverworts find a bed to strike their roots in. Their alse die after a time and turn to mould; and then the various kinds of mosses, e.g. the hypna, the brya, polychrissa, find a proper place and nourishment. Lastly thetce ihning in their turn, and rotting, afford such plenty of new-formed mould, that herbs and shrubs easily root and live upon it.

That trees, when they are dry or are cut down, may not remain useless to the world, and lie as it were melancholy spectacles, nature hailsen on their destruction in a singular way: first, the liverworts begin to strike root in them; afterwards the moss is drawn out of them; whence putrefaction follows. Then the mushroom kinds find a fit place for nourishment on them and corrupt them still more. The beetle called der-vejtos next makes himself a way between the bark and the wood. The milk-beetle, the copper tale-beetle, and the caterpillar or coffa 812 (S. N.) bores an infinite number of holes through the trunk. Lastly, the woodpeckers come, and, while they are seeking for insects, wear away the tree already corrupted: till the whole paifies into earth. Such industry does nature use to destroy the trunk of a tree! Nay, trees immered in water would scarcely ever be destroyed, were it not for the worm which eats chips, which performs this work; as the sailor knows by fad experience.

Thistles, as the most useful of plants, are armed and guarded by nature herself. Suppose there were a heap of clay, on which for many years no plant has sprung up; let the seeds of the thistle blow there, and grow, the thistles by their leaves attract the moisture out of the air, fend it into the clay by means of their roots, will thrive themselves, and afford a shade. Let now other plants come hither, and they will soon cover the ground.

All succulent plants make ground fine, of a good quality, and in great plenty; as sedum, crafula, aloe, alge. But dry plants make it more barren, as heath, pines, mois; and therefore nature has placed the succulent plants on rocks and the driest hills.

Sect. IV. The Animal Kingdom.

I. Propagation.

1. The generation of animals holds the first place among all things that raise our admiration when we consider the works of the Creator; and chiefly that appointment by which he has regulated the conception of the foetus, and its exclusion, that it should be adapted to the disposition and way of living of each animal, is most worthy of our attention.

We find no species of animals exempt from the flings of love, which is put into them to the end that the Creator's mandate may be executed, Increase and multiply: and that the egg, in which is contained the rudiment of the foetus, may be fecundated; for without fecundation all eggs are unfit to produce any offspring.

Foxes and wolves, struck with these flings, every where howl in the woods; crowds of dogs follow the female, bulls show a terrible convenience, and very different from that of oxen. Stags every year have new horns, which they lose after rutting time. Birds look more beautiful than ordinary, and warble all day long through lasciviousness. Thus small birds labour to outing one another, and cocks to outcrow. Peacocks spread forth again their gay and glorious trains. Fitches gather together, and exult in the water; and grasshoppers chirp, and pipe, as it were, amongst the herbs. The ants gather again into colonies, and repair to their citadels. We pass over many other particulars which this subject affords, to avoid prolixity.

2. The fecundated egg requires a certain and proportionate degree of heat for the expansion of the flamina
The cetaceous and animal framina.

The females of quadrupeds have an uterus, contrived for early gestation, temperate and cherishing warmth, and proper nourishment of the fetus, as most of them live upon the earth, and are there fed.

Birds, in order to get subsistence, and for other reasons, are under a necessity of shifting place; and that not upon their feet, but wings. Gestation therefore would be barrenfome to them. For this reason they lay eggs, covered with a hard shell. These they fit upon by a natural instinct, and cherish till the young one comes forth.

The ostrich and cassowary are almost the only birds that do not observe this law; these commit their eggs to the sand, where the intense heat of the sun excludes the fetus.

Fishes inhabit cold waters, and most of them have cold blood; whence it happens that they have not heat sufficient to produce the fetus. The all-wise Creator therefore has ordained, that most of them should lay their eggs near the shore, where, by means of the solar rays, the water is warmer, and also fit for that purpose; and also because water-insects abound more there, which afford the young fry nourishment.

Salmon, when they are about to lay their eggs, are led by instinct to go up the stream, where the water is fresh and more pure.

The butterfly-fly is an exception, for that brings forth its fetus alive.

The fish of the ocean, which cannot reach the shores by reason of the distance, are also exempt from this law. The Author of nature has given to this kind eggs that swim; so that they are hatched amidst the swimming fauna, called argoze. The cetaceous fish have warm blood; and therefore they bring forth their young alive, and suckle them with their teats.

Many amphibious animals bring forth live fetuses, as the viper and the toad, &c. But the species that lay eggs, lay them in places where the heat of the sun supplies the warmth of the parent.

Thus the red of the frog kind, and the lizard kind, lay their eggs in warm waters; the common salamander, in dungdrills, and such like warm places; and give them up to nature, as a provident nurse, to take care of them. The crocodile and sea-tortoises go ashore to lay their eggs under the sand, where the heat of the sun hatches them.

Most of the insect kind neither bear young nor hatch eggs; yet their tribes are the mostnumerous of all living creatures; insomuch, that if the bulk of their bodies were proportionate to their quantity, they would scarce leave room for any other kind of animals. Let us see therefore with what wisdom the Creator has managed about the propagation of these minute creatures. The females by natural instinct meet and copulate with the males; and afterwards lay their eggs; but not indiscriminately in every place. For they all know how to choose such places as may supply their offspring in its tender age with nourishment, and other things necessary to satisfy their natural wants: for the mother, soon after she has laid her eggs, dies; and were she to live, she would not have it, in her power to take care of her young.

Butterflies, moths, some beetles, weevils, bugs, cock-combs, insects, galls-insects, tree-bugs, &c. lay their eggs on the leaves of plants, and every different tribe chooses its own species of plant. Nay, there is scarce any plant which does not afford nourishment to some insect; and still more, there is scarcely any part of a plant which is not preferred by some of them. Thus one insect feeds upon the flower; another upon the trunk; another upon the root; and another upon the leaves. But we cannot help wondering particularly, when we see how the leaves of some trees and plants, after eggs have been let into them, grow into galls; and form dwellings, as it were, for the young ones. Thus when the gall-insect has fixed her eggs in the leaves of an oak, the wound of the leaf swells, and a knob like an apple arises, which includes and nourishes the embryo.

When the tree-bug has deposited its eggs in the boughs of the fir-tree, excrences rise shaped like pearls. When another species of the tree-bug has deposited its eggs in the mouse-ea hickweed or the speedwell, the leaves contract in a wonderful manner into the shape of a head. The water-spider excludes eggs either on the extremities of the juniper, which from thence forms a lodging, that looks like the arrow-headed grass; or on the leaves of the poplar, from whence a red globe is produced. The tree-loose lays its eggs on the leaves of the black poplar, which turn into a kind of inflated bag; and so in other instances. Nor is it upon plants only that insects live and lay their eggs. The gnats commit theirs to flagrating waters. The water-insect called monocusus often increases so immensely on pools, that the red legions of them have the appearance of blood. Others lay their eggs in other places: e.g. the beetle, in dungdrills; the dermetles, in skins; the flesh fly, in putrified flesh; the cheese-maggot, in the cracks of cheese, from whence the caterpillars issuing forth, oftentimes consume the whole cheese, and deceive many people, who fancy the worms are produced from the particles of the cheese itself, by a generation called equusovis, which is extremely absurd. Others exclude their eggs upon certain animals. The mill-beetle lays its eggs between the scales of fishes; the species of grasshopper, upon the back of cattle; the species 1025 (S. N.) on the back of the rein-deer; the species 1026, in the nozes of sheep. The species 1028 lodges during the winter in the intestinal tube, or the throat of hares, nor can it be driven out till the summer comes on. Nay, insects themselves are often surrounded with the eggs of other insects, infomuch that there is scarcely an animal to be found which does not afford food for other animals. Almost all the eggs of insects, when laid, are ordained to undergo, by a wonderful law of nature, various metamorphoses, e.g. the egg of the butterfly, being laid in the cabbage, first of all becomes a caterpillar, that feeds on the herb, crawls, and has 16 feet. This afterwards changes into a nymph, that has no feet, is smooth, and eats nothing; and lastly, this bursts into a butterfly that flies, has variety of colours, is hairy, and lives upon honey. What can be more worthy of admiration than that one and the same animal should appear on the stage of life under so many characters,
The laws of generation of worms are still very obscure; as we find they are sometimes produced by eggs, sometimes by offsets, just in the same manner as happens to trees. It has been observed with the greatest admiration, that the polypus or hydra (S. N. 221) lets down floats and live branches, by which it is multiplied. Nay more, if it be cut into many parts, each segment, put into the water, grows into a perfect animal; so that the parts which were torn off are restored, and form a complete and perfect animal like that from which it was torn.

3. The multiplication of animals is not tied down to the same rules in all; for some have a remarkable power of propagating, others are confined within narrow limits in this respect. Yet in general we find, that nature observes this order, that the least animals, and those which are useful and serve for nourishment to the greatest number of other animals, are endowed with a greater power of propagating than others.

Mites, and many other insects, will multiply to a thousand within the compass of a very few days; while the elephant scarcely produces one young in two years.

The hawk-kind generally lay not above two eggs, at most four; while the poultry kind produce from 50 to 100.

The diver, or loon, which is eaten by few animals, lays also two eggs; but the duck kind, the moor-game, partridges, &c. and small birds, lay a very large number.

If you suppose two pigeons to hatch nine times a year, they may produce in four years 14,760 young. They are ended with this remarkable fertility, that they may serve for food, not only for man, but for hawks and other birds of prey. Nature has made harmless and efculent animals fruitful. She has forbid the bird kinds to fall short of the number of eggs allotted to each species; and therefore, if the eggs which they intend to fit upon be taken away a certain number of times, they presently lay others in their room, as may be seen in the swallow, duck, and small birds.

II. Preservation.

1. Preservation follows generation: this appears chiefly in the tender age, while the young are unable to provide for their own support. For then their parents, though otherwise ever so fierce in their disposition, are affected with a wonderful tenderness or sense of love towards their progeny, and spare no pains to provide for, guard, and preserve them; and that not by an imaginary law, but one given by the Lord of nature himself.

Quadrupeds give suck to their tender young, and support them by a liquor perfectly easy of digestion, till nature enables them to digest what is more solid. Nay, their love toward them is so great, that they endeavor to repel with the utmost force every thing which threatens danger or destruction to them. The ewe, which brings forth two lambs at a time, will not admit one to her teats unless the other be present and suck also; left one should famish, while the other grows fat.

Birds build their nests in the most artificial manner, and line them as soft as possible, for fear the eggs should get any damage. Nor do they build promiscuously in any place, but there only where they may quietly lie concealed and be safe from the attacks of their enemies.

The hanging bird makes its nest of the fibres of withered plants, and the down of the poplar seeds, and fixes it upon the bough of some tree hanging over the water, that it may be out of reach.

The diver places its swimming nest upon the water itself, amongst the rushes. We designedly pass over many instances of the like kind.

Again, birds sit on their eggs with so much patience, that many of them choose to perish with hunger, rather than expose the eggs to danger by going to seek for food.

The male rooks and crows, at the time of incubation, bring food to the females.

Pigeons, small birds, and other birds which pair, sit by turns; but where polygamy prevails, the males scarcely take any care of the young.

Most of the duck kind pluck off their feathers in great quantity, and cover their eggs with them, lest they should be damaged by the cold when they quit their nests for the sake of food; and when the young are hatched, who knows not how solicitous they are in providing for them till they are able to fly and shift for themselves?

Young pigeons would not be able to make use of hard seeds for nourishment, unless the parents were to prepare them in their crops, and thence feed them.

The owl called the eagle-owl makes its nest on the highest precipices of mountains, and in the warmest spot, facing the sun; that the dead bodies brought there may by the heat melt into a soft pulp, and become fit nourishment for the young.

As an exception indeed to this fostering care of animals, may be mentioned the cuckow, which lays its eggs in the nest of other small birds, generally the wag-tail, yellow hammer, or white-throat, and leaves the incubation or preservation of the young to them. This custom of the cuckow is so extraordinary, and out of the common course of nature, that it would not be credible were it not for the testimony of the most knowing and curious natural-historians, such as Ray, Willoughby, Gessner, Aldrovandus, Arifolce, &c. But this seeming want of instinct is accounted for from the structure and situation of its stomach, which disqualifies it for incubation; and its infignitive care is still conspicuous in providing a proper, though a foreign, nidus for its eggs.

Amphibious animals, fishes, and insects, which cannot come under the care of their parents, yet owe this to them, that they are put in places where they easily find nourishment.

2. As soon as animals come to maturity, and want no longer the care of their parents, they attend with the utmost labour and industry, according to the law and economy appointed for every species, to the preservation.
fervation of their lives. But so great a number of them, which occur everywhere, may be supported, and a certain and fixed order may be kept up amongst them, behold the wonderful disposition of the Creator, in assigning to each species certain kinds of food, and in putting limits to their appetites. So that some live on particular species of plants, which particular regions and soils only produce; some on particular animalcula; others on carcasses; and some even on mud and dung. For this reason, Providence has ordained that some should swim in certain regions of the watery element; others should fly; some should inhabit the torrid, the frigid, or the temperate zones; and others should frequent deserts, mountains, woods, pools, or meadows, according as the food proper to their nature is found in sufficient quantity. By this means there is no terrestrial tract, no sea, no river, no country, but what contains and nourishes various kinds of animals. Hence also an animal of one kind cannot rob those of another kind of its aliment; which, if it happened, would endanger their lives or health; and thus the world at all times affords nourishment to so many and so large inhabitants, at the same time that nothing which it produces is useless or superfluous.

It will not be here amiss to produce some instances by which it will appear how providentially the Creator has furnished every animal with such clothing as is proper for the country where they live, and also how excellently the structure of their bodies is adapted to their particular way of life; so that they seem to be defined solely to the places where they are found. Monkeys, elephants, and rhinoceroses, feed upon vegetables that grow in hot countries, and therefore therein they have their allotted places. When the fun darts forth its most fervid rays, these animals are of such a nature and disposition, that it does them no manner of hurt; nay, with the rest of the inhabitants of those parts, they go naked; whereas, were they covered with hairy skins, they must perish with heat.

On the contrary, the place of rein-deer is fixed in the coldest part of Lapland, because their chief food is the livewort, which grows nowhere abundantly as there; and where, as the cold is most intense, the rein-deer are clothed, like the other northern animals, with skins filled with the densest hair, by the help of which they easily defend the keenest of the winter. In like manner the rough-legged partridge paves its life in the very Lapland Alps, feeding upon the seeds of the dwarf birch; and, that they may run up and down safely amidst the snow, their feet are feathered.

The camel frequents the sandy and burning desarts, in order to get the barren camel's-hay. How wisely has the Creator contrived for him! he is obliged to go through the desarts, where oftentimes no water is found for many miles about. All other animals would perish with thirst in such a journey; but the camel can undergo it without suffering; for his belly is full of cells, where he reserves water for many days. It is reported by travellers, that the Arabs, when in travelling they want water, are forced to kill their camels, and take water out of their bellies that is perfectly good to drink, and not, at all corrupted.

The pelican likewise lives in desert and dry places; and is obliged to build her nest far from the sea, in order to procure a greater share of heat to her eggs. She is therefore forced to bring water from afar for herself and her young; for which reason providence has furnished her with an extremity most adapted to this purpose: She has a large bag under her throat, which the fills with a quantity of water sufficient for many days; and this she pours into the nest, to refresh her young, and teach them to swim.

The wild beasts, lions, and tygers, come to this nest to quench their thirst, but do no hurt to the young.

Oxen delight in low grounds, because there the food most palatable to them grows. Sheep prefer naked hills, where they find a particular kind of grases called the fijina, which they love above all things.

Goats climb up the precipices of mountains, that they may browse on the tender shrubs; and in order to fit them for it, they have feet made for jumping.

Horses chiefly resort to woods, and feed upon leafy plants.

Nay, so various is the appetite of animals, that there is scarcely any plant which is not chosen by some and left untouched by others. The horse gives up the water-hemlock to the goat. The cow gives up the long-leaved water-hemlock to the sheep. The wild goat gives up the monks-head to the horse, &c.; for that certain animals grow fat upon, others abhor as poison. Hence no plant is absolutely poisonous, but only respectively. Thus the spurge, that is noxious to man, is a most wholesome nourishment to the caterpillar. That animals may not destroy themselves for want of knowing this law, each of them is guarded by such a delicacy of taste and smell, that they can easily distinguish what is pernicious from what is wholesome; and when it happens that different animals live upon the same plants, still one kind always leaves something for the other; as the mouths of all are not equally adapted to lay hold of the grass; by which means there is sufficient food for all. To this may be referred an economical experiment well known to the Dutch, that when eight cows have been in a pasture, and can no longer get nourishment, two horses will do very well there for some days; and when nothing is left for the horses, four sheep will live upon it.

Swine get provision by turning up the earth: for there they find the succulent roots, which to them are very delicious.

The leaves and fruits of trees are intended as food for some animals, as the floth, the squirrel; and these last have feet given them fit for climbing.

Besides myriads of fishes, the callor, the sea-call, and others, inhabit the water, that they may there be fed; and their hinder-feet are fit for swimming, and perfectly adapted to their manner of life.

The whole order of the goose-kind, as ducks, merganser, &c. pass their lives in water, as feeding upon water-insects, fishes, and their eggs. Who does not see, that attends ever so little, how exactly the wonderful formation of their beaks, their necks, their feet, and their feathers, suit their kind of life; which...
The way of living of the sea-swallow deserves to be particularly taken notice of; for as he cannot so commodiously plunge into the water, and catch fish, as other aquatic birds, the Creator has appointed the sea-gull to be his caterer, in the following manner: When this bird is pursued by the former, he is forced to throw up part of his prey, which the other catches; but in the autumn, when the silkes hide themselves in deep places, the merganer supplies the gull with food, as being able to plunge deeper into the sea.

The chief granary of small birds is the knot-grass, that bears heavy seeds, like those of the black-bindweed. It is a very common plant, not easily destroyed, either by the road-side by trampling upon it, or any where else; and is extremely plentiful after harvest in fields, to which it gives a reddish hue by its numerous seeds. These fall upon the ground, and are gathered all the year round by the small birds. To which we may add, that many small birds feed upon the seeds of plantain, particularly Linnet. It is generally known that the goldfinch lives upon the feed of thistles, from which he has its name in Latin and French. Thus bountiful nature feeds the numerous seeds.

The Creator has taken no less care of some amphibious animals, as the snake and frog kind; which, as they have neither wings to fly, nor feet to run swiftly and commodiously, would scarcely have any means of taking their prey, were it not that some animals run, as it were, of their own accord, into their mouths. When the rattle-snake, a native of America, with open jaws fixes his eyes upon a bird, fly, or squirrel, sitting on a tree, they fly down his throat, being rendered stupefied, and giving themselves up as delitute of all refuge. How dreadful this serpent is to other animals will appear by an account we have in a treatise entitled, Radix Sanguis. Where the author (Aman. Academ. tom. 2.) says, one of these terrible serpents got clandestinely into the house of governor Blake at Carolina; where it would have long lain concealed, had it not been that all the domestic animals, as dogs, hogs, turkeys, and fowls, admittid the family by their unusual cries, equally showing their horror and consternation, their hair, brittles, and crests, standing up on end. On the other hand, we cannot but adore the Creator's great goodness towards man, when we consider the rattle which terminates this serpent's tail; for by means of that we have an opportunity of guarding against this dreadful enemy; the found warning us to fly; which if we were not to do, and we should be wounded by him, the whole body would be turned into a putrid corruption in fix hours, nay sometimes in half an hour.

The limits of this article will not permit us to produce more examples of this kind. But whoever will be at the pains to take ever so slight a view of the wonderful works of the Author of nature, will readily see how wisely the plan, order, and fitness of things with divine ends, are disposed.

3. We cannot without the utmost admiration behold how providentially the Creator has acted as to the preservation of those animals which, at a certain time of the year, are by the rigours of the season excluded from the necessaries of life. Thus the bear in the autumn creeps into the moos which he has gathered, and there lies all winter; subsisting upon no other nourishment but his fat, collected during the summer in the cellular membrane, and which without doubt, during his fast, circulates through his vessels, and supplies the place of food; to which perhaps is added that fat juice which he eats out of the bottom of his feet.

The hedge-hog, badger, and mole, in the same manner fill their winter-quarters with vegetables, and sleep during the frosts. The bat seems cold and quite dead all the winter. Most of the amphibious animals get into dens, or to the bottom of lakes and pools.

In the autumn, as the cold approaches, and insects disappear, swallows migrate into other climes in search of food and a temperature of air more friendly to their constitution: though the latter hatches, or those young birds which are incapable of distant flights, seek for an asylum against the violence of the cold in the bottom of lakes amidst the reeds and rushes; from whence, by the wonderful appointment of nature, they come forth again. See the article Hirundo. The periodic motion of the bowels ceases in all these animals while they are obliged to fast; whence the appetite is diminished, and so they suffer the least from hunger. To this head may be referred the observation of the celebrated Linf_on concerning those animals. That their blood, when let into a vessel, does not congeal, as that of all other animals; and so is no less fit for circulation than before.

The moor-fowls work themselves out walks under the very snow. They moult in the summer; so that about the month of August they cannot fly, and are therefore obliged to run into the woods; but then the moor-berryba and bilberries are ripe, from whence they are abundantly supplied with food. Whereas the young do not moult the first summer; and therefore, though they cannot run so well, are able to escape danger by flight.

The seat of the birds who feed upon insects migrate every year to foreign regions, in order to seek for food in a milder climate; while all the northern parts, where they live well in the summer, are covered with snow.

By these migrations, birds also become useful to many different countries, and are distributed over almost all the globe. And it must excite our admiration that all of them exactly observe the times of coming and going, and that they do not mistake their way.

Insects in the winter generally lie hid within their caves, and are nourished by the surrounding liquor like the fustus of other animals; from whence, at the approach of spring, they awake, and fly forth, to the abonishment of every one.

However, all animals which lie hid in winter do not observe these laws of falling. Some provide florefous!es in summer and autumn, from which they take what is necessary; as mice, jays, squirrels, bees.

III. DESTRUCTION.

1. We have observed above, that all animals do not live upon vegetables, but that there are some which feed
It deserves also to be remarked, how much some animals confult their safety by night. When horses sleep in woods, one by turn remains awake, and, as it were, keeps watch. When monkeys in Brazil sleep upon trees, one of them keeps awake, in order to give the sign when the tiger creeps towards them; and in case the guard should be caught asleep, the rest tear him to pieces. Hence rapacious animals are not always successful in their hunting, and are often obliged to labour for a whole day to no purpose. For this reason the Creator has given them such a nature, that, they can bear fasting a long time. Thus the lion lurks for many days without famishing; and the wolf, when he has once well satisfied his hunger, can fast for many weeks without any difficulty.

If we consider the end for which it pleased the Supreme Being to constitute such an order of nature; that some animals should be, as it were, created only to be miserably butchered by others, it seems that his Providence not only aimed at sustaining, but also keeping a just proportion among all the species; and to prevent any one of them from increasing too much, to the detriment of men and other animals. For if it be true, as it most assuredly is, that the surface of the earth can support only a certain number of inhabitants, they must all perish if the same number were doubled or trebled.

There are some viviparous flies which bring forth 1000 young. These in a little time would fill the air, and like clouds intercept the rays of the sun, unless they were devoured by birds, spiders, and many other animals.

Storks and cranes free Egypt from frogs, which, after the inundation of the Nile, cover the whole country. Falcons clear Palæstine of mice. Belzoni on this subject says: “The storks come to Egypt in such abundance, that the fields and meadows are white with them. Yet the Egyptians are not displeased with this fidget; as frogs are generated in such numbers there, that did not the storks devour them, they would over-run every thing. Besides, they also catch and eat serpents. Between Belba and Gaza, the fields of Palæstine are often deferted on account of the abundance of mice and rats; and were they not destroyed by the falcons that come here by instinct, the inhabitants could have no harveft.”

The white fox is of equal advantage in the Lapland Alps; as it destroys the Norway rats, which are generated there in great abundance, and thus hinder them from increasing too much in proportion, which would be the destruction of vegetables.

It is sufficient for us, that nothing is made by Providence in vain; and that whatever is made, is made with supreme wisdom. For it does not become us to pry too boldly into all the designs of God. Let us not imagine, when these rapacious animals sometimes do us mischief, that the Creator planned the order of nature according to our private principles of economy; for the Laplanders have one way of living; the European husbandman another, the Hottentots and savages a third; whereas the stupendous economy of the Deity is one throughout the globe; and if Providence does not always calculate exactly according to our way of reckoning, we ought to consider this affair in the same light, as when different elements,
men wait for a fair wind, every one with respect to the part he is bound to, who plainly fear cannot all be satisfied.

2. The whole earth would be overwhelmed with carcasses and flinking bodies, if some animals did not delight to feed upon them. Therefore, when an animal dies, bears, wolves, foxes, ravens, &c. do not lose a moment till they have taken all away. But if a horse dies near the public road, you will find him, after a few days, swin, burial, and at last filled with innumerable grubs of carnivorous flies, by which he is entirely consumed, and removed out of the way, that he may not become a nuisance to passengers by his poisonous stench.

When the carcasses of fishes are driven upon the shore, the voracious kinds, such as the thornback, the hound-fish, the conger-eel, &c. gather about and eat them. But because the flux and reflux soon change the state of the sea, they themselves are often detained in pits, and become a prey to the wild beasts that frequent the shores. Thus the earth is not only kept clean from the putrefaction of carcasses, but at the same time, by the economy of nature, the necessaries of life are provided for many animals. In the like manner many insects at once promote their own good, and that of other animals. Thus gnats lay their eggs in stagnant water, putting the grubs in one, and taking them all out of the other; for then he will soon find the water that is full of grubs pure and without any stench, while the water that has no grubs will continue flinking.

Lice increase in a wonderful manner in the heads of children that are scabby; nor are they without their use, for they consume the redundant humours.

The beetle kind in summer extract all moist and glutinous matter out of the dung of cattle, so that it becomes like dust, and is spread by the wind over the ground. Were it not for this, the vegetables that lie under the dung would be so far from thriving that all that is put would be rendered barren.

As the excrements of dogs is of so filthy and feculent a nature that no insect will touch them, and therefore they cannot be dispersed by that means, care is taken that these animals should exonerate upon flies, trunks of trees or some high place that vegetables may not be hurt by them.

Cats bury their dung. Nothing is so mean, nothing so little in which the wonderful order and wise disposition of nature do not shine forth.

Lastly, all these treasures of nature, so artfully contrived, so wonderfully propagated, so providentially supported throughout her three kingdoms, seem intended by the Creator for the fake of man. Every thing may be made subservient to his use, if not immediately, yet mediately; not fo to that of other animals. By the help of reason man tames the fiercest animals; pursues and catches the fwietsell; nay, he is able to reach even those which lie hid in the bottom of the sea.

By the help of reason, he increases the number of vegetables immediaety, and does that by art which nature left to herfelf, could scarcely effect. By ingenuity he obtains from vegetables whatever is convenient or necessary for food, drink, clothing, medicine, navigation, and a thousand other purposes.

He has found the means of going down into the abyss of the earth, and almost searching its very bowels. With what artifice has he learned to get fragments from the most rocky mountains, to make the hardest stones fluid like water, to separate the useful metal from the useless dross, and to turn the finest sand to some use! In short, when we follow the series of created things, and consider how providentially one is made for the fake of another, the matter comes to this, that all things are made for the fake of man; and for this end more especially, that he, by admiring the works of the Creator, shall extol his glory, and at once enjoy all those things of which he stands in need, in order to pass his life conveniently and pleasantly.

Besides general natural histories, which we have here given a specimen of, as those of Pliny, &c. there are likewise particular ones, and those of two kinds. The first, those which only consider one kind of things; such as the History of Shells, by Dr Lillie; of Fishes, by Willougby; that of Birds, by the same; that of Plants, by Ray; those of insects, by Swammerdam and Moufett; that of Animals, by Gifner; that of Pollis, by Agricola, Mercatus, &c.

The second, those which consider the several kinds of natural things found in particular countries or provinces: as, the Natural History of Dauphine, by Chrier; the Natural History of the Antilles, by F. De Tettre, and M. Louisilliers De Poincy; that of Oxfordshire and Staffordshire, by Dr Plot; that of Lancashire, by Leigh of Northamptonshire, by Morton; that of the Western Islands, by Martin, &c.

The natural history only of one particular place is a subject very extensive in its materials, and not to be set about without great care and circumspection. Mr Boyle has favoured the world with a list of the heads under which to arrange things, and what to enquire after on such an occasion.

The general heads under which he comprehends the articles of this history are four; the things which regard to the heavens, the air, the waters and the earth. To these general heads Mr Boyle imagines should be added, inquires into traditions in the country, of any thing relating to it, whether peculiar to it, or only more common there than elsewhere; and where those require learning or skill in the answerer, the utmost care is to be taken to put the people in a way to give their accounts in a satisfactory manner; for a false or bad account of any thing is always much worse than no account at all.

This subject concerning the works of nature, a very small part of which we have been able to touch upon, is of such importance and dignity that if it were to be properly treated in all its parts, men would find where withal to employ almost all the powers of the mind; nay, time itself would fail before, with the mott acute human sagacity, we should be able to discover the amazing economy, laws, and exquisite structure, even of the least insect, since, as Pliny observes, nature nowhere appears more herself than in her most minute works.

Summary
Sec. IV.

NATURAL HISTORY.

We shall add to this article the following description of a museum: The windows ought to be in the two longest sides of the building; that it may be equally lighted during the whole day.

On one wing of the museum must be placed eleven presses, with shelves supported on wooden brackets. These presses are intended for containing the eleven following classes of the mineral kingdom (a kingdom which forms the original basis of every thing pertaining to this globe: minerals have neither organization nor life).

1. Waters.
2. Earths.
3. Sands.
4. Stones.
5. Salts.
6. Pyrites.
7. Semimetals.
10. Volcanic productions.
11. Petrifications, fossils, and minerals.

We at once perceive the advantage of such an arrangement, where every thing is distinct and distributed in the manner most advantageous for the inspection of the student. The presses must be provided with a wire grate, or covered with glafs: and each of them must have a title on the cornice, indicating the class which it contains. Besides this, each shelf in the press ought to have a small title on the edge, specifying the kind of substances which are placed on it; and these should be kept in clear glass-bottles, well sealed and furnished with proper titles also. In them are to be seen earths, clays, turfs, ochres, chalks, marls, lapis, malachite, and pyrites; the whole produced by a natural cause and after its kind, as in the various kinds of opaque, green, &c. lead, the ore of nickel, collections of coloured pyrites, the stone called the Isa's stone, beautiful specimens of cobalt, bismuth, zinc, antimony, ore of fluid quicksilver, and cinna bar in crystals; the whole properly titled and arranged according to their classes.

The presses for metals ought to present us in the same order with feldspar and rare specimens of the ores of white, green, &c. lead, the ore of nickel, collections of crystallized tin, the flores ferris, beautiful needles of hematite, a powerful rough leadstone, with some platiniferous, the filky copper of China, and a collection of malachite; likewise virgin silver, in vegetation and red silver, together with a collection of golden ore. These substances form a spectacle equally varied and instructive: in this department of her works nature is as rich and brilliant as in the various kinds of stones.

The presses for bitumens may in like manner contain specimens of jet polished on one side: amber of different colours (which when it is transparent, and contains defects, ought to be polished on the two opposite surfaces); a beautiful specimen of ambergris, together with pieces of transparent red and yellow sulphur.

In the presses for petrifications or for fossils, we must likewise place, on semicircular shelves, the rarest and
The best preserved pieces? such as lilium lapideum and kreopes, transparent belemnites, fossil urchias, the articulated nautilis, cornua ammonis fawed and polished, hydrolitic, lapis lenticulari, gyryphites calculi or bezoars, turquoites, leadstones, glio-petrites; in short all kinds of figured stones, and also petrified wood.

In the press for fences, which has a similar apparatus of shelves, we see different kinds of crystals, and all the precious stones in the matrix. Those which are detached and cut are placed in cabinets or watch-glasses; but those which have been cut and set are to be put in a jewel box or open case for rings. The same polished be observed with regard to pieces, cups, cisterns or polished plates of agate, cornelian, jade, fardosyx, onyx, chaledony, jasper, porphyry, granite, lapis lazuli, marble, alabaster, and Iceland crystal. Here likewise are to be placed the Bologna stone, the Labrador stone, the serpentine stone, tare, amianthus, zeolite, basaltes, touch-stone, together with Egyptian and English flints. With regard to impressed petrifications, large arborizations, and Florence stones, if they are in good preservation: they should be framed and suspended by hooks on the pilasters which connect the press of the mineral kingdom. These press are of an uniform height; but their breadth is proportioned to the size or number of the materials composing the clasts which it contains, and they are supported as well as those which are placed all around, on a chest of drawers below high. These drawers must correspond to the press above them, and contain substances of the same clasts. This methodical arrangement is a great help to the memory: because it occasionally supplies the place of a numbered catalogue, and because in a great multitude of objects it is the only means of finding at once what we want.

In the mineral kingdom, these drawers are very useful for containing earths, belemnites, entroches, affroites, and other polymorphous fossils, univalve, bi-valve, and multivalve shells, polished petrifications of bones and pieces of wood, collections of marbles and polished flints, collections of fluel, sands, and amber, together with pieces procured from the melting of ores, such as regulus, drôts, &c. Some parts of the mineral kingdom, such as the earths and certain clasts, make not a brilliant figure in a museum; they are notwithstanding the most scientific parts of it, and the most interesting to those who prefer the solid satisfaction of tracing nature in her most important productions, and her fundamental operations, to the empty spectacle of gaudy colours and agreeable figures.

Minerals in general require to be kept with great care, and so as not to be intermixed. Some of them, such as the faith, easily dissolve; and others, as the pyrites, are subject to efflorescence. Vegetables and animals are likewise more or less liable to corruption; and to prevent this inconvenience, great pains must be taken in preserving certain pieces which are subject to speedy decay.

On the second wing of the cabinet are to be placed ten press, distributed like those of the mineral kingdom, and intended for containing the ten following divisions of the vegetable kingdom. Vegetables are organized bodies, but they possess not, like animals spontaneous motion or feeling.

1. Roots.
2. Barks.
3. Woods and stalks.
4. Leaves.
5. Flowers.
6. Fruits and seeds.
7. Parasite plants, also agaries and mushrooms.
8. The juices of vegetables; such as balsams and solid resins, resinous, gums, and gums properly so called.
10. Marine plants, and plants growing on the shores of the sea.

In this kingdom, the same order of press, the same symmetrical arrangement, are to be observed as in the mineral kingdom. The semicircular shelves in the bottom of the press are here very useful for containing in small square phials China varnish, essential oils, and other peculiar aromatics, whether of Arabia or India; together with the roots of cumbou, mandragora, certain fruits either monstrous or natural, which grow in the East Indies, and which the natives ripen in large bottles with narrow necks, preserved in spirits, such as the cashew-nut, &c. Here likewise are placed a number of fruits, remarkable for their rarity or great size; as cocoa nuts, gourds, the fruit of the baltard locust-tree, the fruit of the sand-box-tree, banana figs, pine-apples, coloquintida apple, dogbane, vegetable tumors or wens, and a branch of los de dentes, in which the three parts of the bark, especially the liber, are distinctly separated.

As the number of vegetables greatly exceeds that of minerals, we seldom put any thing in bottles but the dried parts of exotic plants, which are used either in medicine or in the arts, and those likewise which we cultivate merely from curiosity. With regard to indigeneous plants, an herbat is formed of land and sea plants, pasted or laid between leaves of paper collected in a book, and arranged according to the system of the botanists. To make this herbal as convenient as possible, it is proper to put the dried plants between two folds of dry paper, and, arranging them according to their families, genera, and species, to pile them one upon another, either openly on the shelves or in large band-boxes. On the back of these band-boxes must be a title indicating the family, at the extremity another with the name of the genus, and on each leaf the name of the species which it contains: the paper must be loose, that they may be changed at pleasure. The drawers are useful partly for holding different kinds of woods with the bark, cut in such a manner as that the grain and contexture of it may easily be distinguished, and for containing a collection of the woods of both Indies in small polished pieces with proper titles. One part of the drawers has several divisions within for the purpose of holding seeds; and a small title is inscribed on each of these divisions.

Sea-weeds, and small marine plants of an elegant shape, which from their colour and variety form agreeable pictures, may be framed and suspended by hooks to the pilasters of the presses. In the animal kingdom, particularly insects, it is well known, are attended with irreparable devatations. Butterflies,
Sec. IV.  

Natural History.

Animal Kingdom.  

Still more than the most beautiful birds, are not only subject to destruction in this way, but are also exposed to great danger from the rays of the sun, either direct or reflected, which alter their colour, make them lose all their splendor, and, in some species, render it impossible to distinguish them. In general, we cannot prevent the destruction of vegetables and animals, but by drying them as much as possible, or by putting them in prepared liquors, which must not be allowed to evaporate. But dried animals and vegetables require still a greater care: a great multitude of insects, which are bred in the month of April feed upon them and destroy them internally before they are perceived; they ought to be carefully watched during the continuance of this plague, which is about five months. In like manner, the moister of winter and the heat of summer make it necessary that the presses of museums should be kept carefully shut, except perhaps those which front to the north. Besides, the vapour of sulphur in combustion will kill these destructive insects either before or after they become perfect ones: the fumigations must be carefully performed during dry weather, and in a box made on purpose, into which only the specimens involved are introduced.  

On the third wing of the cabinet are placed presses for containing the ten following divisions of the animal kingdom (the kingdom which derived the substance necessary to its existence either mediately or immediately from the vegetable kingdom.—Animals possess feeling and spontaneous motion.)


In the presses the fame external decoration and distribution may be observed as in the preceding ones.

The presses for the Lythophytes must be arranged in such a manner as to present at one view the history of the lythophytes, madrepores, and coral, either rough or smooth, their covering; the whole placed on small wooden pedestals, blackened or gilded. Coralines, as well as lythophytes, may be pafted on a bit of paper, and put into a frame; such pictures, when suspended by hooks to the outside of the cabinets, always attract the attention of the spectators. If we have a considerable collection of them, it will be necessary to make a kind of herbal of them.

The presses for Zoophytes contains sponges, the marine jet d'eau, the Lena marina, holothurias, and all those substances which are called animal plants, mollusks, worms, &c. These productions must be preserved in rectified spirit of wine, which will be sufficiently weakened by the water contained in them. Upon the sponges are sea-plants, both prickly and smooth, with several sorts, from the corals, &c.  

The Tefaceous animals are preserved in bottles among fungoids. On the semicircular shelves at the bottom of the presses are placed large shells, and small ones with their marine covering.  

The presses for Crustaceous animals contain almost entirely of semicircular shelves, and contain crabs, cray.  

Small lobsters, squilla, and all small crustaceous animals, excepting the hermit crab, are put in frames.

Two kinds of insects are found in the presses delineated for them. The first kind, after being dried, are put in small wooden frames, which are varnished and glazed on two sides, that we may have in our power to examine the insect on both sides; of this kind are flies, mantises, beetles, butterflies with their nymphs or chrysalides, &c. (These animals form the most brilliant part of the cabinet, while the presses for bird is the most striking; but great pains must be used in their preservation.) Other insects, such as grasshoppers, scorpions, salamanders, spiders, tarantulas, caterpillars, and especially all soft insects, must be preserved in spirits, and placed on semicircular shelves at the bottom of the presses. Here also are deposited honey-combs, wasps' nests, and branches furnished with the nests of those insects, which produce the gum-lac.  

In the presses for Fishes are to be seen bottles containing foreign fishes, which are always few, three in spirits. The soft fishes of our own country are preserved in the same manner. The skin of large fishes, whether found in salt or fresh water, is taken off and printed on a bit of paper: the two parts are sometimes folded together, and the colours are renewed by means of varnish. The flying fish must be suspended about the top of the presses; and armed fishes, with otarion, on the shelves below.  

The presses for Amphibious animals contains, in bottles full of spirit of wine diluted with alum water, serpents, vipers, adders, frogs, toads, lizards, small land or water turtles, and a small tortoise with its shell. The lower shelves are furnished with a small rattle-shake, a camelion, a crocodile, a beaver, a sea-lion, a sea cow, &c. The presses for Birds is filled with animals of that class both foreign and natives, stuffed and provided with glass eyes. The skin covered with the feathers may be preserved perfect and dry by being fitted to a mould of tree moss, or filled with cotton and sprinkled on the inside with pepper, camphor, and corrosive sublimate, to diftend it from the attack of moss, grubs, woodlice, and desmidies. The spring and autumn are the best seasons for this operation; the mussel's spring is very improper, because it is unfavorable to the beautiful colour and the preservation of the feathers, which moreover are then full of blood. The birds, when thus prepared, and when the brain has been taken out, are then placed on their supports.—Some females may be placed in their nests in the attitude of incubation; these which are accustomed to perch may be placed on artificial trees; a wooden supporter covered with moss, turf, or artificial reeds, may be given to those which live among such places.  

Swimming birds are placed on the lower shelf, which must be covered with pieces of mirrors or silver glasses, in imitation of water. We must be careful to give each animal the most fructiferous attitude: to preserve the proportions, together with the natural position of the legs, wings, head, body, and tail; to observe an equilibrium in those which are attached, and to avoid it in those which have a fighting attitude. We must characterize the animal, represent his habits, 

Clavubus,
dispositions, graces, boldness, or timidity. In short, we must endeavour to express that beautiful tout ensemble which gives the appearance of life and motion to the whole. The deception ought to be such, that those who examine the particulars of the collection may apply to each what was said on another occasion—Nature is dead, but Art is alive. THESE obserations on birds are equally applicable to the other animals; but all of them must be arranged in a methodical order, which posesses the advantage necessary in such collections of uniting pleasure with instruction.

The lower shelves contain the eggs and nests of birds; and a collection of feathers is made in a book in the same manner as an herbal.

The press for quadrupeds contains, preserved in bottles, small animals, such as mice, rats, the opossum, &c. Other animals are stuffed, such as the cat, the squirrel, the hedge hog, the porcupine, the armadillo, the Guinea pig, the wolf, the fox, the roe-buck, the hare, the dog, &c.

The press containing the history of man consists of a complete mythology of a head separately injected, of a brain and the organs of generation in both sexes, of a head separately injected, of a human body.

The preservation of subjects in bottles with spirit of wine does not always succeed, because they spoil as the spirit of wine evaporates, unless particular care be taken to examine the vessels wherein they are contained, which requires time and pains, and is attended with expense. Mr. Lewis Nicola, in the Philadelphia Transactions for the year 1771, recommends, after using the different methods pointed out by M. Reaumur of putting subjects intended for preservation in bottles filled with spirit of wine, to wipe well the neck of the bottle, and put a layer of putty, two lines thick, over the piece of skin or bladder which covers it. The bottle is then revered in a wooden cup, which they fill with melted tallow, or with a mixture of tallow and wax to prevent the spirit of wine from evaporating.

The drawers under the press of the animal kingdom contain small detached parts of animals, such as teeth, small horns, jaw-bones, claws, beaks, nails, vertebrae, hairs, scales, balls of hair, and a collection of bones remarkable for blows, fractures, deformities, and diseases.

To decorate a cabinet to the greatest advantage, and to make one complete whole, the walls must be furnished throughout their whole extent. For this purpose the tops of the pressies are commonly ornamented with shells of a very great size, foreign wafis-hives, the horn of a rhinoceros, an elephant's trunk, the horn of an unicorn, horns and buils of alabaster, jasper, marble, porphyry, or serpentine stone. Here likewise are placed figures of antique bronze, large lyophytes, animals made of shells, bouquets made of the wings of Scarabeus, grulls cut into two, painted, and made into bowls, plates, vases, and as they are used by savages; little trunks of bark, books made of the leaves of the palm-tree, globes, spheres, &c. The multiplicity and singularity of the objects never fail to arrest the attention of the spectator.

The circumference of the cabinet being furnished in the manner we have described, the floor may likewise be paved with different kinds of common stones which are susceptible of a polish.

The ceiling, which must be very white, is divided into three spaces, furnished with hooks and brass wires. Here may be distributed in order different vegetable and animal productions, which are of too great a size to be contained in the pressies; such as,

1. The sugar-cane, a branch of the palm-tree, together with that called the Chine's fan, large cossos both simple and with a double lobe, the leaf of the banana-tree, Indian and European flocks, remarkable for the knots, tubercles, and spiral wreaths, which cover their whole length, a bamboo root divided longitudinally into two parts, and the different species of reed-canes.

2. The skins of large animals: also stuffed animals, such as lizards, whether a crocodile or caiman and scaly lizard, a shark, a sword-fish, a sea-calf, a sea-tortoise, large and long serpents, the horns of deer, wild goats, roe-bucks, and reindeer.

3. The third space is filled with Indian rackets, hampmocks, dressers, and tufts of feathers; with calumets or pipes; with quivers, bows, and arrows; with head-pieces, cups with feathers, aprons, necklaces, Chineze necessaries, fans made of the leaves of the palm-tree, a gargeoulette of Indo-pan, a Polish whip, Indian canoes, Chineze musical instruments, lances, weapons, Indian furniture and utensils; and in short, various curiosities from nations ancient and modern, if they can be found; various furniture and utensils of different nations, ancient and modern.

As the great extent of a fine collection requires that there be no empty space, stands may be placed in different parts of the room, especially at the corners, for supporting large vertebre, the head of a sea-cow, very large madreporos, or considerable collections of rock chrysal or of minerals.

In the middle of the room is placed a receptacle for shells, which is a large table or bureau with raised edges. The surface of this table is divided into 27 separate cases, of different sizes, and proportioned to the 27 families of marine shells to be deposited in them. These divisions are made with wood or pasteboard painted blue, and are sometimes in the form of shelves; the bottom is covered with blue cotton or green flaxen, or, what is still simpler, with white linen, sufficiently rough to keep the shells in their place. In some cabinets, these shelves are covered with mirrors on all their different surfaces, which shows the objects double, and gives us an opportunity of viewing them on the two opposite sides. In other cabinets the cases for each family are distributed into a number of smaller divisions, for containing the several species separate from each other. The sea-shells, contained in the receptacle for shells, are all cleaned and preserved, in the variety of their figure and colours, together with their inequality, an agreeable and enchanting picture, so much the more charming that it unites a methodical distribution to a symmetrical order. The upper part of this table is filled by a net-work
work of braids wire covered with forge, or, what is still better, by a glass frame, to defend the shells from dust.

We must not omit to mention, that in the middle of the table there is a long elevated square box, containing land and river shells. From the middle of each compartment, or at each family of shells, arises a pyramidal wooden pillar, on the top of which is an elevated piece of plate glass, or of flat glass, denoting the kind of shells belonging to that division. Each family is distinguished from the adjoining one by those kind of ornaments of silk called catterpillars. By means of the different tints, we perceive the limits and extent of each family in the same manner as the colours in a geographical map enable us to distinguish the several provinces of the same empire. An exhibition of this kind was to be seen from 1768 to 1774, in a museum belonging to the prince of Condé at Chantilly.

Under the table for shells, on the side of the windows, is a glazed cage, large enough to contain the skeletons of an animal belonging to each class, viz., a fish, an amphibious animal, a reptile, a bird, and a quadruped. When to these we can add, for the fake of the comparative zoology, the skeletons of the intermediate individuals of these animals, together with those which make the neatest approaches to man, such as the monkey and the bear, we greatly increase both the pleasure and instruction. Below this table are likewise placed the best books connected with the different branches of natural history, especially such as have illuminated plates. The difficulty of acquiring the most valuable objects, and of preventing their destruction when once acquired, obliges us to have recourse to figures, in order to preserve a representation of them. This is an infallible method of communicating, not only to our cotemporaries, but also to posterity, the discoveries of the age in which the work was composed. Here also may be deposited the herbarium and the collection of feathers, arranged in the form of books.

The space above the door is furnished with a large frame, filled with the skins of rare fishes, which are dried, varnished, and pasted on paper. The piers of the windows are furnished with one or two shelves, which are provided with shelves, and contain different kinds of instruments employed in physics, such as an air-pump, a burning mirror, a perspective glass, a magnifier, a microscope, a telescope, magnets both natural and artificial, &c.

On the semicircular shelves below are placed stones formerly used by savages for hatchets. Some curious pieces of lacquer work, Indian pagodas, trinkets belonging to the savages of the north and to the Chinese, which are made of ivory or yellow amber, or of coral mounted with gold, silver, porcelain-clay, kr Ark's of Siam, and Turkish rings, which are kind of pendants, Indian curiosities of silver, and the gildings which the Turks and Persians use in smoking tobacco and aloe.

The drawers under this shelf contain a collection of medals, china ink, lachrymatory phials, and the most beautiful engraved stones of Europe, or an impression of them in wax or sulphur, counters, cameos, antiquities, talismans, ancient weights and measures, idols, urns, lamps, instruments of sacrifice, and false jewels.

A glance at the whole, the embasures of the windows must be furnished with pictures of stones in connected pieces. Here likewise, as well as in the embasures and pannels of the door, may be put tubes hermetically sealed, containing rare reptiles preferred in proper liquors.

The reader will by this time have some idea of the prodigious extent of the science of natural history; it is extensive is it, indeed, that the longest life is far from being sufficient to enable us to acquire a perfect knowledge of it: it is important beyond dispute, because its business is with the works of God. In all the articles connected with the present, as forming particular parts of it, and to which we refer, we have made great use of the works of the celebrated Linnaeus, who is well known arranged the three kingdoms into regular systems, of which botany is the most complete. The world in general seems to have been most satisfied with the animal kingdom: he himself, in the course of a variety of editions, made many important alterations. Some men of considerable note, for example Buffon, have written on this subject without any regard to systematic arrangement. Dr. Berkenhout's work on this part of science are very useful; in a particular manner, because he translates Latin names, &c. Bonn's new edition of his Natural History, in 19 vols. octavo, a work of considerable importance, was published in 1791.

The most complete system, however, of natural history which has been yet given to the public, is undoubtedly that of Linnaeus, in his Systema Naturæ, of which a new and improved edition is actually publishing by — Gmelin. A short view of this elaborate work will, we presume, not be unacceptable to the reader, as it will present him, in a very small compass, an abstract of whatever is at present known in the six first classes of natural history.

**Class I. Mammalia.**

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<tr>
<td>Primates</td>
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<td>Pecora</td>
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**Class II. Aves.**

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**Class III. Amphibia.**

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Natural Philosophy, is commonly defined to be that art or science which considers the powers and properties of natural bodies, and their mutual actions on one another. The province of moral philosophy is the mind of man; its inquiries and researches are into the nature of virtue, the causes and effects of vice, to propose remedies for it, and to point out the mode of attaining happiness, which only can be the result of virtuous conduct. The Naturalist, on the contrary, has nothing to do with spirit; his business is solely about body or matter; and he ought to have a solid and accurate knowledge of all material substances, together with their affections and properties; and, if possible, he is to investigate the reasons of such and such appearances.—Indeed, the first and principal part of this science is to collect all the manifold and sensible appearances of things, and reduce them into a body of natural history. Philosophy, it has often been said, and it is even now very generally thought, to mean an inquiry into all the causes of things; but experience informs us, that though we are acquainted with a good number of effects, we can trace but few of their causes; so that philosophy itself will really be found to be in general but a collection of facts. Still, however, it differs from natural history in its appropriated sense; the business of which is only to observe the appearances of natural bodies separately; and from these appearances to clafs them with other bodies: natural philosophy goes farther, and recites the action of two or more bodies of the same or different kinds upon one another; and though it can never investigate nor point out the causes of those effects, whatever they are, yet, from mathematical reasoning combined with experience, it can be demonstrated, that in such circumstances such effects must always take place. There are evidently two ways of making observations on the material world: the first is, when we view things nearly as they happen to turn up, without any design or intervention of our own; in which way, indeed, no great improvements can be expected in the art, because chance having the direction, only exhibits occasional or extemporary properties. The other method is, when, after a thorough acquaintance with bodies, we apply them to other bodies equally known, diligently attending to the result, and observing whether any thing new arises. Such seems to be in general the nature of our article; nor is it our intention to be much more particular at present. We must therefore refer our readers respettively to those parts of the subject, respecting which they will for more satisfaction and minute details. The ancient and modern definitions of the word "philosophy," together with its origin, as well as the manner of philosophizing in former times as well as at present, with the gradual improvement of science, particularly natural, we shall introduce, we think, more properly under the words "philosophy" and "physics." We need only add under the present article, what however is well known, that natural philosophy was till lately divided only into four parts, commonly called the four branches, viz. 1. Mechanics; 2. Hydrostatics; 3. Optics; and 4. Astronomy; and these again are subdivided into various parts. Modern discoveries have added, however, two more parts to the number, viz. magnetism and electricity, whose properties and effects, &c. have been wunderfully unfolded of late years.—It is remarkable, that in the English universities these two latter branches are never taken notice of in lecturing on natural philosophy, the old division being still retained, without any mention of these two important articles. The reason may be, that they are only subject to experiment; and not yet reduced to mathematical reasoning; which is the method of teaching philosophy in one of these celebrated seminaries. Of these branches of this extensive science, it is not our intention to take even a general view in this place. We must

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In the new French Encyclopédie par ordre de Matières, the editors promised to give a description of more than 18,000 plants. Dr. Berkenhout, in the last edition of his Synopsis, says, that in Great Britain and Ireland there are about 54 species of the mammalia, 250 of birds, 50 of the amphibia, 600 of insects, 150 of fishes, and 1600 species of plants; but in every class he is probably much within the number.
NATURALIZATION, in the English law, the act of naturalizing an alien, or putting him into the condition of a natural born subject, and investing him with the rights and privileges thereof. But none can be naturalized unless they have received the sacrament within one month before the bringing in of the bill, and taken the oaths of allegiance and supremacy in the presence of the parliament. A person who is naturalized may have lands by descent, as heir at law, as well as obtain them by purchase; but he is disenabled from being a member of the privy council or parliament; or from holding offices, 7 Jac. I. cap. 2. Will. III. cap. 2. All children born out of the king's dominions, whose fathers were or are subjects of this kingdom at the time of their birth, are adjudged to be natural born subjects of this realm, except children of parents attainted of treason, or that in the actual service of a foreign prince at enmity with us, 4 Geo. II. cap. 21. Every foreign seaman, who in time of war serves two years on board an English ship, is ipso facto naturalized, 13 Geo. II. cap. 3. And all foreign Protestants and Jews upon their residing seven years in any of the British colonies, without being absent above two months at a time, or serving two years in a military capacity there, are upon taking the oaths naturalized to all intents and purposes, as if they had been born in this kingdom; and therefore are admissible to all such privileges, and no other as Protestants or Jews born in this kingdom are intituled to. See ALIEN and DESIGNE.

In France, before the Revolution, naturalization was the king's prerogative; in England it is only done by act of parliament. In the former of those places, before their government was overturned, Swift, Savoyards, and Scots, did not require naturalization, being reputed regicides, or natives.

NATURALS, among physicians, whatever naturally belongs to an animal, in opposition to non-naturals. See NON-NATURALS.

NATURE, according to Mr. Boyle, has eight different significations; it being used: 1. For the Author of nature, whom the schoolmen call Natura Naturae, being the same with God. 2. By the nature of a thing, we sometimes mean its essence; that is, the attributes which make it what it is, whether the thing be corporeal or not; as when we attempt to define the nature of a fluid, of a triangle, &c. 3. Sometimes we confound that which a man has by nature with what accrues to him by birth; as when we say, that such a man is noble by nature. 4. Sometimes we take nature for an internal principle of motion; as when we say, that a stone by nature falls to the earth. 5. Sometimes we understand, by nature, the established course of things. 6. Sometimes we take nature for an aggregate of powers belonging to a body, especially a living one, in which sense physicians say, that nature is strong, weak, or spent; or that, in such or such diseases, nature left to herself will perform the cure. 7. Sometimes we use the term nature for the universe, or whole system of the corporeal works of God; as when it is said of a phoenix, or chimera, that there is no such thing in nature.

Sometimes too, and that most commonly, we express by the word nature a kind of semi-deity, or other strange kind of being.

If, says the same philosopher, I were to propose a notion of nature less ambiguous than those already mentioned, and with regard to which many axioms relating to that word may be conveniently understood, I should first distinguish between the universal and the particular nature of things. Universal nature I would define to be the aggregate of the bodies that make up the world in its present state, considered as a principle; by virtue whereof they act and suffer, according to the laws of motion prescribed by the Author of all things. And this makes way for the other subordinate notion; since the particular nature of an individual consists in the general nature applied to a distinct portion of the universe; or, which is the same thing, it is a particular embellishment of the mechanical properties of matter, as figure, motion, &c.

Kingdoms of Nature. See Kingdoms.

Conduct or operations of Nature. See Natural History.

NAVA (anc. geog.) Tacitus; a river of Belgica, which runs north-east into the left or west side of the Rhine. Now the Nahe, rising at the village of Naheweiler, on the borders of the bishopric of Trier, running through the Lower Palatinate, the duchy of Simmeren, by the small town of Beng, into the Rhine.

NAVA, something relating to a ship; whence, Naval Architecture. See Ship-Building.

Naval-Camp, in antiquity, a fortification, consisting of a ditch and parapet on the land side, or a wall built in the form of a semicircle, and extended from one point of the sea to another. This was sometimes defended with towers, and beautified with gates, through which they issued forth to attack their enemies. Homer has left us a remarkable description of the Grecian fortifications of this fort, in the Trojan war, beginning at v. 436, Iliad.

Then, to secure the camp and naval powers,
They rais'd embattled walls with lofty towers:
From space to space were ample gates around,
For pacing chariots; and a trench profound,
Of large extent, and deep in earth below;
Strong piles inclin'd flood adverse to the foe.

Pope's Translat.

Towards the sea, or within it, they fixed great pales of wood, like those in their artificial harbours; before these the vessels of burden were placed in such order, as that they might be instead of a wall, and give protection to those within; in which manner Nicias is reported by Thucydides to have encompassed himself: but this seems only to have been practised when the enemy was thought superior in strength, and raised great apprehensions of danger in them. When their fortifications were thought strong enough to defend them from the assaults of enemies, it was frequent to drag their ships to shore, which the Greeks called XERAXION, the Romans campitum. Around the ships the soldiers pitched their tents, as appears every where in Homer: but this seems only to have been practised in winter, when their enemy's fleet was laid up and could not assail them; or in long sieges, and when they lay in no danger from their enemies by sea;
as in the Trojan war, where the defenders of Troy never once attempted to encounter the Grecians in a sea-fight.

The adjacent places were usually filled with inns and flew well flocked with females, that profited themselves to the mariners, merchants, and artificers of all sorts who flocked thither in great numbers; this, however, appears to have happened only in times of peace.

**NAVARRE.**—See TACTICS (Naval).

**NAVAL Stores,** comprehend all those particulars made use of, not only in the navy, but in every other kind of navigation; as timber and iron for shipping, pitch, tar, hemp, cordage, full-cloth, gunpowder, ordnance, and fire-arms of every fort, ship-chandlery wares, &c.

**Naval Tactics,** the military operations of fleets. See TACTICS (Naval.).

**NAVAN,** a borough, port, and fair town of Ireland, in the county of Meath and province of Leinster; situated about 23 miles north-west of Dublin, on the river Boyne. It consists of two chief streets, which intersect each other at right angles. The Tholsel, or town-house, is a handsome stone building. This place was formerly in great repute, and walled in by Hugh de Lacy. An abbey for regular canons, dedicated to the Virgin Mary, was erected here; but whether antecedent to the end of the 12th century is not certain; about that period, however, it was either founded or re-edified by Joceline de Angulo or Nangle. In the burial-ground are the remains of many ancient tombs, with figures in alto relievo; and the present barric for one troop of horse is built on the site of the abbey. Navan sends two members to parliament; patronage in the Presbyterian family. Here are four fairs held.

**NAVARRE,** a province of Spain, part of the ancient kingdom of Navarre, erected soon after the invasion of the Moors; and is otherwise called Upper Navarre, to distinguish it from Lower Navarre belonging to the French. It is bounded on the south and east by Arragon, on the north by the Pyrenees, and on the west by Old Castile and Biscay; extending from south to north about 80 miles, and from east to west about 75. It abounds in sheep and cattle; game of all kinds, as boars, flags, and roebucks; and in wild-fowl, horses, and honey; yielding also some grain, wine, oil, and a variety of minerals, medicinal waters, and hot baths. Some of the ancient chiefs of this country were called Sobrarbes, from the custom, as it is supposed which prevailed among some of those free nations of chafing and swearing their princes under some particular tree. The name of the province is supposed to be a contraction of Navia Errata, signifying, in the language of the Viscanes, its ancient inhabitants, "a land of valleys."—For the particulars of its history, see the article Spain.

**NAVARRE (Peter),** an officer of eminence in the 16th century, and particularly celebrated for his dexterity in the direction of springing of mines. He was a native of Biscay, and of low extraction. According to Paul Jove, who affirms that he had an account of the matter from his own mouth, he was first a laborer; but being disguised with that employment, he fought his fortune in Italy, when poverty compelled him to become footman to the cardinal of Arragon. He afterwards relieved himself a folder in the Housline army; and having served there for some time, went to sea again, and distinguished himself by his courage. The reputation of his valor having reached the ears of Gonfulvo de Cordova, this general employed him in the war against Naples, and raised him to the rank of a captain. Having contributed greatly to the taking of that city by very opportunely springing a mine, the emperor rewarded him for this signal service with the cardinal of Alvieta, situated in that kingdom, and gave him the title of count of Navarre. Having the command of a naval expedition against the Moors in Africa, he was at first very successful, and took possession of Oran, Tripoli, and some other places; but being afterwards shipwrecked on the island of Gerbes, the great heat and the Moorish cavalry destroyed a part of his army. Our hero was equally unfortunate in Italy: He was made prisoner at the famous battle of Ravenna, in 1512, and languished in France for the space of two years. When finding that the king of Spain, who had been prejudiced against him by his couriers, would do nothing towards his ransom, he went into the service of Francis I who gave him the command of twenty companies of infantry, consisting of Gafoons, Biscayans, and the inhabitants of the Pyrenean mountains. He distinguished himself in several successful expeditions, until the year 1522, when having been sent to the relief of the Geneves, he was taken by the Imperialists. They conducted him to Naples, where he remained a prisoner for three years in the castle of Oeuf. From this confinement he was released by the treaty of Madrid, and afterwards fought at the siege of Naples under Ludovic in 1528; but being again made prisoner at the unfortunate retreat from Averia, he was conducted a second time to the castle of Oeuf. Here the prince of Orange having, by order of the emperor, caused several persons of the Aragonian faction to be beheaded, our hero would undoubtedly have suffered the same fate, if the governor, seeing his distressed situation, and feeling for the misfortunes of so great a man, had not saved him the flame of this last punishment by allowing him to die a natural death. Others pretend that he was strangled in his bed, having arrived at a very advanced age. Paul Jove and Philip Thomafini have written his life. This last informs us, that he was of a tall size, had a swarthy countenance, black eyes, beard, and hair. A duke of Seffa, in the last century being desirous to honour his memory and that of the marshal de Lautree, caused a monument to be erected to each of them in the church of Sainte-Marie-le-Neuve at Naples, where they had been interred without any funeral honours.

**NAVARRE (furnamed Martin Aspilcutti),** became a monk in the kingdom which bears that name, successively professor of jurisprudence at Toulouse, Salamanca, and Coimbra, was confuted from all quarters as the oracle of law. For a part of his knowledge he was indebted to the schools of Caibors and Toulouse,
in which he had studied. His friend Barthelmi Carewza, a D. minican, and archbishop of Toledo, having been charged with heresy by the court of inquisition at Rome, Navarre set out at the age of 80 years to defend him. Pius V. appointed him a peer of cardinal Francis Aciat, vice-penitentiary. Gregory XIII. never paid his gate without finding for him; and sometimes would converse with him for an hour together on the street: he even deigned to visit him, accompanied by several cardinals. These honours did not render him more haughty. His character became so eminent, that even in his own time the greatest encomium that could be paid to a man of learning was to say that he was a Navarre: this name thus included the idea of erudition, as that of Rofcius formerly marked an accomplished comedian. Azpilcucta was the oracle of the city of Rome, and of the whole Christian world. For the influence which he had acquired, he was indebted not only to his knowledge, but also to his probity and virtue. Faithful to the duties which the church prescribed, his temperance and frugality preferred him a vigorous constitution; and at a very advanced age his genius was equal to the severest study. His savings enabled him to give liberal assistance to the poor. His charities, indeed, were so great, that his mule, it is said, would drop as soon as the perceived a beggar. He died at Rome in 1586, at the age of 92. His works were collected and printed in 6 vols folio at Lyons in 1597, and at Venice in 1602. They display more learning than judgement, and are now very seldom consulted. Navarre was uncle by the mother's side to St Francis of Sales. See Sales.

NAUCRATES (John), defended of a noble family of Suabia, was professor of the university of that city. His original name was Vergy; but this name, which in German signifies "sailor," he changed into Nauclerus, a word of the same signification in Greek. He was alive in 1501. We have from him a Latin Chronicle from Adam to the year 1500, of which Basilio wrote a continuation down to 1514, and Surius to 1564. It possesses greater accuracy than any historical compilation which had appeared prior to his time; but still it is only a compilation. It is chiefly valued for what regards the occurrences of the 15th century. It was printed at Cologne in folio in 1564 and 1579.

NAUCRARI, among the Athenians, was the name given to the chief magistrates of the city, "boroughs or townships," called Neuropolis, because each was obliged, besides two horsemen, to furnish out one ship for the public service.

NAUCRATES, a Greek poet, who was employed by Artemia to write a panegyric upon Mauelous. An orator who endeavoured to alienate the cities of Lycia from the interest of Brutus.

NAUCRATIS, a city of Egypt on the left side of the Canopic mouth of the Nile. It was celebrated for its commerce, and no ship was permitted to land at any other place, but was obliged to sail directly to the city there to deposit its cargo. It gave birth to Athenaeus.

NAUCRATITES Nomos (anc. geog.), Pliny; Vol. XIL

a division of the Delta, so called from the town Naukratis; though Ptolemy comprises it under the Nomos Saites.

NAUCYDES, a statuary who lived about four centuries before the Christian era.

NAUDE (Gabriel), descended of a respectable family, and born at Paris, February 12th, 1600. His parents observing his fondness for reading and inclination to letters, resolved to breed him in that way; and accordingly sent him to a religious community, to learn the first rudiments of grammar and the principles of Christianity. Thence he was removed to the university; where he applied himself with great success to classical learning; and having learned philosophy, was created master of arts very young. As soon as he had finished his course in philosophy, he remained some time at a fland what profession to choose, being advised by his friends to divinity; but his inclination being more turned to physic, he fixed at length upon that faculty. However, this choice did not prevent him from indulging his genius in other branches of learning: in reality, the plan of his studies was very extensive, suited to his comprehensive talents and indefatigable industry: and he soon distinguished himself therein so much, that Henry de Meieres, president a mortier, hearing his character, made him keeper of his library, and took him into his family. Naude was the more pleased with this post, as it gave him an opportunity of gratifying his bookish taste in general, and at the same time furnished him both with means and leisure to improve himself as he could with, in the science which he had embraced in particular. He quitted it in 1625, in order to go to Padua to perfect himself therein: but he did not continue long in that university, the death of his father and his domestic affairs calling him back to Paris before the expiration of the year.

In 1628 the faculty of physic appointed him to make the customary discourse on the reception of licentiates; which performance entirely answered their expectations from him, and was made public. In 1631, Cardinal Bagno made him his librarian and Latin secretary, and carried him with him to Rome in the spring of that year. Naude continued in this service till the death of the cardinal, which happened July 24, 1641; and in the interim made an excursion to Padua, to take his doctor of phyllic's degree, in order to support with a better grace the quality with which he had been honoured by Louis XIII. who had made him his physician. The ceremony of this appointment was performed March 25, 1633, and we have the speech he pronounced on the occasion. After the death of his patron, he had thoughts of returning to France; but was detained in Italy by several advantageous offers made to him by persons of consideration in that country. Among these he preferred those of Cardinal Barberini, and closed with his eminence. However, as soon as Cardinal Richelieu sent for him to be his librarian, he immediately returned to Paris; but he happened not to be long in the service of the prime minister, if it be true that he arrived at Paris in March 1642, since Cardinal Richelieu died in December following; notwithstanding, he succeeded to the like post under Mazarine, for whom he

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formed a most rich library, which he raised from the first volume in the space of seven years to the number of 40,000.

His design was nearly completed before the Cardinal gave him two small benefices, a canonry of Verdun and the priory of Artigue in the Limousin; and we know how much this ungenerosity affected him, from a letter of Patin to Charles Spon, dated March 22, 1648, where he writes thus of our librarian: "I have seen one thing in him which I am very sorry for; especially as I have known him along lightherto at a great distance from such a disposition: it is, that he begins to complain of his fortune, and of his master's avarice, from whom he had never received any more than 1200 livres a year in benefices; not forbearing to declare, that his life was sacrificed for too small a matter. I think (continues Patin) what grieves him is, the apprehension of dying before he has raised something for his brothers and his nephews, of whom he has a great number. However that be, Naude had the grief to see this library, which he had collected with so much pains and care, totally disfigured. Upon the disgrace of Mazarine it was sold: Patin, in a letter of March 5, 1651, observes, that Naude had bought all the books in physic for 3500 livres. Christinna queen of Sweden, who sent herseft to draw into her dominions all the literati of Europe, procured a proposal to be made to Naude of being her library keeper: and as he was then out of all employ, he accepted the proposal, and went to Cop. But he soon grew out of humour with his residence in Sweden: the manners of the people, so very different from his, gave him great disgust; and seeing France become more quiet than it had been: he resolved to return. Accordingly he quitted Sweden loaded with presents from the queen, and several perfons of distinction; but the fatigue of the journey threw him into a fever, which obliged him to flop at Abbeville; and he died there July 29, 1653.

As to his character, he was very prudent and regular in his conduif, sober, never drinking any thing but water. Study was his principal occupation, and he was indeed a true Helesto librorum: so that he understood them perfectly well. He spoke his mind with great freedom, and that freedom sometimes showed itself upon religious subjects, in such a manner as might have occasioned some disadvantageous thoughts of him; but the Christian sentiments in which he died left room to believe that his heart was never corrupted, and had no share in the free expressions which sometimes escaped from him; especially in the philosophical raillery which passed sometimes between him, Guy Patin, and Gaffendi. He wrote a great number of books, a catalogue of which may be seen in Niceron's Memoires, tom. ix. Voltaire says, that "of all his books, the Apologie des grands Hommes et cceurs de Magie is almost the only one which continues to be read."

NAVE, in architecture, the body of a church, where the people are disposed, reaching from the baluster, or rail of the door, to the chief choir. Some derive the word from the Greek &gamma; &alpha; τεμπλον, and others from &alph; &upsilon; a ship," by reason the vault or roof of a church bears some resemblance to a ship.

NAVEL, in anatomy, the centre of the lower part of the abdomen; being that part where the umbilical vessels passed out of the placenta of the mother. See ANATOMY, p. 725.

NAVEL-Wort in botany. See COXYLEDON.

NAVEW, in botany. See BRASSICA, of which it is a species.

NAVIGATION.

IS the art of conducting or carrying a ship from one port to another.

HISTORY.

The poets refer the invention of the art of navigation to Neptune, some to Bacchus, others to Hercules, others to Jason, and others to Janus, who is said to have made the first ship. Historians ascribe it to the Egyptians, the Phoenicians, Tyrians, and the ancient inhabitants of Britain. Some will have it, the first hint was taken from the flight of the kite; others, as Oppian, De pfeibulis, lib. 1.) from the fish called nau­tilus others ascribe it to accident. Scripture refers the origin of so useful an invention to God himself, who gave the first specimen thereof in the ark built by Noah under his direction. For the raillery the good man underwent on account of his enterprise shows evidently enough the world was then ignorant of any thing like navigation, and that they even thought it impossible. However, profane history represents the Phoenicians, especially those of their capital Tyre, as the first navigators; being urged to seek a foreign commerce by the narrowness and poverty of a slip of ground they possessed along the coasts; as well as by the convenience of two or three good ports, and by their natural genius to traffic. Accordingly, Lebanon, and the other neighbouring mountains, furnishing them with excellent wood for ship-building, in a short time they were masters of a numerous fleet; and constantly hazarding new navigations, and setting new trades, they soon arrived at an incredible pitch of opulence and populousness: insomuch as to be in a condition to send out colonies, the principal of which was that of Carthage; which keeping up their Phoenician spirit of commerce, in time not only equalled Tyre itself, but vastly surpassed it; sending its merchant-fleets through Hercules's pillars, now the straits of Gibraltar, along the western coasts of Africa and Europe; and even, if we believe some authors, to America itself.

Tyre, whose immense riches and power are represented in such lofty terms both in sacred and profane authors, being destroyed by Alexander the Great, its navigation and commerce were transferred by the conqueror to Alexandria, a new city, admirably fituated for those purposes; proposed for the capital of the empire of Asia, which Alexander then meditated. And
And thus arose the navigation of the Egyptians; which was afterwards so cultivated by the Phcenicians, that Tyre and Carthage were quite forgotten.

Egypt being reduced into a Roman province after the battle of Actium, its trade and navigation fell into the hands of Augustus; in whose time Alexandria was only inferior to Rome: and the magnificence of the capital of the world were wholly supplied with merchandizes from the capital of Egypt.

At length, Alexandria itself underwent the fate of Tyre and Carthage; being surprized by the Saracens, who, in spite of the emperor Heracleus, overpassed the northern coasts of Africa, &c. whence the merchants being driven, Alexandria has ever since been in a languishing state, though it still has a considerable part of the commerce of the Christian merchants trading to the Levant.

The fall of Rome and its empire drew all with it not only that of learning and the polite arts, but that of navigation; the barbarians, into whose hands it fell, contenting themselves with the spoils of the industry of their predecessors.

But no sooner were the more brave among those nations well settled in their new provinces; some in Gaul, as the Franks; others in Spain, as the Goths; and others in Italy, as the Lombards; but they began to learn the advantages of navigation and commerce, and the methods of managing them, from the people they subdued; and this with so much success, that in a little time some of them became able to give new lessons, and set on foot new institutions for its advantage. Thus it is to the Lombards we usually ascribe the invention and use of banks, book-keeping, exchanges, rechanges, &c.

It does not appear which of the European people, after the settlement of their new masters, first betook themselves to navigation and commerce.—Some think it began with the French; though the Italians seem to have the juiciest title to it; and are accordingly ordinarily looked on as the forerunners thereof, as well as of the polite arts, which had been banished together from the time the empire was torn asunder. It is the people of Italy then, and particularly those of Venice and Genoa, who have the glory of this invention; and it is to their advantageous situation for navigation, that they in great measure owe their glory. In the bottom of the Adriatic were a great number of marshy islands, onely separated by narrow channels, but those well formed, and almost inaccessible, the residence of some fishermen, who here supported themselves by a little trade of fish and salt, which they found in some of these islands. Thither the Veneti, a people inhabiting that part of Italy along the coasts of the Gulf, retired, when Alaric king of the Goths, and afterwards Attila king of the Huns, ravaged Italy.

These new settlers, little imagining that this was to be their fixed residence, did not think of compositing any body politic; but each of the 73 islands of this little Archipelago continued a long time under its several masters; each making a distinct commonwealth. When their commerce was become considerable enough to give jealousy to their neighbours, they began to think of uniting into a body. And it was this union first begun in the sixth century, but not completed till the eighth, that laid the sure foundation of the future grandeur of the state of Venice. From the time of this union, their fleets of merchantmen were sent to all the parts of the Mediterranean; and at last to those of Egypt, particularly Cairo, a new city, built by the Saracen princes on the eastern banks of the Nile, where they traded for their spices and other productions of the Indies. Thus they flourished, increased their commerce, their navigation, and their conquests on the terra firma, till the league of Cambrai in 1509, when a number of jealous princes joined to their ruin; which was the more easily effected by the diminution of their East India commerce, of which the Portuguese had got one part and the French another. Genoa, which had applied itself to navigation at the same time with Venice, and that with equal success, was a long time its dangerous rival, disputed with it the empire of the sea, and shared with it the trade of Egypt and other parts both of the east and west.

Jealousy soon began to break out; and the two republics coming to blows, there was almost continual war for three centuries before the superiority was ascertained; when, towards the end of the 14th century, the battle of Chioza ended the strife; the Genoese, who till then had usually the advantage, having now loft all; and the Venetians, almost become desperate, at one happy blow, beyond all expectation, secured to themselves the empire of the sea, and superiority in commerce.

About the same time that navigation was retrieved in the southern parts of Europe, a new society of merchants was formed in the north, which not only carried commerce to the greatest perfection; it was capable of till the discovery of the East and West Indies, but also formed a new scheme of laws for the regulation thereof, which still obtains under the names of juris et Customs of the Sea. This society is that famous league of the Hanse-towns, commonly supposed to have begun about the year 1164. See Hanse.

For the modern state of navigation in England, Holland, France, Spain, Portugal, &c. See Commerce, Company, &c.

We shall only add, that, in examining the reasons of commerce's falling successively from the Venetians, Genoese and Hanse towns, to the Portuguese and Spaniards, and from these again to the English and Dutch, it may be established as a maxim, that the relation between commerce and navigation, or, if we may be allowed to say it, their union is so intimate, that the fall of the one inevitably draws after it that of the other; and that they will always either flourish or dwindle together. Hence so many laws, ordinances, statutes, &c. for its regulation; and hence particularly that celebrated act of navigation, which an eminent foreign author calls the poladim or tat for deely of the commerce of England; which is the standing rule not only of the British among themselves, but also of other nations with whom they traffic.

The art of navigation hath been exceedingly improved in modern times, both with regard to the form of the vessels themselves, and with regard to the methods of working them. The use of towers is now entirely superceded by the improvements made in the formation of the sails, rigging, &c. by which the
the ships can not only fail much faster than formerly, but can tack in any direction with the greatest facility. It is also very probable that the ancients were neither so well skilled in finding the latitudes, nor in steering their vessels in places of difficult navigation, as the moderns have over the ancients are from the mariner’s compass, by which they are enabled to find their way with as great facility in the midst of an immeasurable ocean, as the ancients could have done by creeping along the coast, and never going out of sight of land. Some people indeed contend, that this is no new invention, but the ancients were acquainted with it. They say, that it was impossible for Solomon to have sent ships to Ophir, Tarshish, and Parvaim, which last they will have to be *Perú,* without this useful instrument. They infer, that it was impossible for the ancients to be acquainted with the attractive virtue of the magnet, and to be ignorant of its polarity. Nay, they affirm, that this property of the magnet is plainly mentioned in the book of Job, when the loadstone is mentioned by the name of *topas,* or the stone that turns itself. But it is certain, that the Romans, who conquered the Juedes, were ignorant of this instrument, and it is very improbable, that such an useful invention, if once it had been commonly known to any nation, would have been forgot, or perfectly concealed from such a prudent people as the Romans, who were so much interested in the discovery of it.

Among those who do agree that the mariner’s compass is a modern invention, it hath been much disputed who was the inventor. Some give the honour of it to Flavio Gioia of Amalfi in Campania*, who lived about the beginning of the 14th century; while others say that it came from the east, and was earlier known in Europe. But, at whatever time it was invented, it is certain, that the mariner’s compass was not commonly used in navigation before the year 1420. In that year the science was considerably improved under the auspices of Henry duke of Viseo, brother to the king of Portugal. In the year 1485, Roderic and Joseph, physicians to John II. king of Portugal, together with one Martin de Bohemia, a Portuguese, native of the island of Faro, and scholar to Regiomontanus, calculated tables of the sun’s declination for the use of sailors, and recommended the astrolabe for taking observations at sea. Of the instructions of Martin, the celebrated Christopher Columbus is said to have availed himself, and to have improved the Spaniards in the knowledge of the art; for the further progress of which a lecture was afterwards founded at Seville by the emperor Charles V.

The discovery of the variation is claimed by Columbus, and by Sebastian Cabot. The former certainly did observe this variation without having heard of it from any other person, on the 14th of September 1492, and it is very probable that Cabot might do the same. At that time it was found that there was no variation at the Azores, where some geographers have thought proper to place the first meridian; though it hath since been observed that the variation alters in time. The use of the crofs-staff now began to be introduced among sailors. This ancient instrument is described by John Werner of Nuremberg, in his annotations on the first book of Ptolemy’s Geography, printed in 1514. He recommends it for observing the distance between the moon and some star, in order thence to determine the longitude.

At this time the art of navigation was very imperfect on account of the inaccuracies of the plane chart, which was the only one then known, and which, by its great errors, must have greatly misled the mariner, especially in voyages far distant from the equator. Its precepts were probably at first only set down on the sea-charts, as is the custom at this day: but at length there were two Spanish treatises published in 1545; one by Pedro de Medina; the other by Martin Cortes, which contained a complete system of the art, as far as it was then known. These seem to have been the earliest writers who fully handled the art; for Medina, in his dedication to Philip prince of Spain, laments that multitudes of ships daily perished at sea, because there were neither teachers of the art nor books by which it might be learned; and Cortes, in his dedication, boasts to the emperor, that he was the first who had reduced navigation into a compendium, valuing himself much on what he had performed. Medina defended the plane chart; but he was opposed by Cortes, who showed its errors, and endeavoured to account for the variation of the compass, by supposing the needle to be influenced by the magnetic pole (which he called the *point attracteur*) different from that of the world; which notion hath been farther prosecuted by others. Medina’s book was soon translated into Italian, French, and Flemish, and served for a long time as a guide to foreign navigators. However, Cortes was the favourite author of the English nation, and was translated in 1561; while Medina’s work was entirely neglected, though translated also within a short time of the other. At that time the system of navigation consisted of the following particulars, and others similar: an account of the Ptolemaic hypothesis, and the circles of the sphere; of the roundness of the earth, the latitudes, climates, &c, and eclipses of the luminaries: a calendar; the method of finding the prime, equinoctial, moon’s age, and tides; a description of the compass, an account of its variation, for the discovering of which Cortes said an instrument might easily be contrived; tables of the sun’s declination, calculated for the equinoctial, in order to find the latitude from his meridian altitude; directions to find the sun by certain stars; of the course of the sun and moon; the length of the days; time and its divisions; the method of finding the hour of the day and night; and lastly, a description of the sea-chart, on which to discover where the ship is, they made use of a small table, that showed, upon an alteration of one degree of the latitude, how many leagues were run in each thumb, together with the departure from the meridian. Besides, some instruments were described, especially by Cortes; such as one to find the place and declination of the sun, with the days, and place of the moon; certain dials, the astrolabe, and crofs-staff; with a complex machine to discover the hour and latitude at once.

About the same time were made proposals for finding the longitude by observations of the moon.—In 1530, Gemma Frisius advised the keeping of the time by means of small clocks or watches, then, as he says, newly invented. He also contrived a new sort of

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*See Mariner’s Compass.*
of cross-staff and an instrument called the nautical quadrant; which last was much praised by William Cunningham, in his Astronomical Glass, printed in the year 1559.

In 1577 Pedro Nuex or Nonius, published a book in the Portuguese language, to explain a difficulty in navigation proposed to him by the commander Don Martin Alphonso de Sua. In this he exposes the errors of the plane chart, and likewise gives the solution of several curious astronomical problems; amongst which is that of determining the latitude from two observations of the sun’s altitude and intermediate azimuth being given. He observed, that though the rhumbs are spiral lines, yet the direct course of a ship will always be in the arch of a great circle, whereby the angle with the meridians will continually change: all that the seaman can here do for the preferring of the original rhumb, is to correct these deviations as soon as they appear sensible. But thus the ship will in reality describe a course without the rhumb-line intended; and therefore his calculations for affigning the latitude, where any rhumb line crosses the several meridians, will be in some measure erroneous. He invented a method of dividing a quadrant by means of concentric circles, which, after being much improved by Dr Halley, is used at present, and is called a nonius.

In 1577, Mr William Bourne published a treatise, in which, by considering the irregularities in the moon’s motion, he shews the errors of the sailors in finding her age by the epact, and also in determining the hour from observing on what point of the compass the sun and moon appeared. He advises, in falling towards the high latitudes, to keep the reckoning by the globe, as the place of the sun chart is most erroneous. He depairs of our ever being able to find the longitude, unless the variation of the compass should be occasioned by some such attractive point, as Cortes had imagined; of which, however, he doubts: but as he had shown how to find the variation at all times, he advises to keep an account of the observations, as useful for finding the place of the ship, which advice was prosecuted at large by Simon Stevin, in a treatise published at Leyden in 1599: the substance of which was the same year printed at London in English by Mr Edward Wright, intituled the Haven finding Art. In this ancient treat also is described the way by which our sailors estimate the rate of a ship in her course, by an instrument called the log. This was so named from the piece of wood or log that floats in the water while the time is reckoned during which the line that is fastened to it is veering out. The author of this contrivance is not known; neither was it taken notice of till 1607, in an East India voyage published by Purchas; but from this time it became famous, and was much taken notice of by almost all writers on navigation in every country: and it still continues to be used as at first, though many attempts have been made to improve it, and contrivances proposed to supply its place; many of which have succeeded in quiet water but proved useless in a stormy sea.

In 1581 Michael Coigne, a native of Antwerp, published a treatise, in which he animadverted on Medina. In this he showed that as the rhumbs are spirals, making endless revolutions about the poles, numerous errors must arise from their being represented by straight lines on the sea-charts; but though he hoped to find a remedy for these errors, he was of opinion that the propositions of Nonius were scarcely practicable, and therefore in a great measure useless. In treating of the sun’s declination, he took notice of the gradual decrease in the obliquity of the ecliptic; he also described the cross-staff with three transverse pieces, as it is at present made, and which he owned to have been then in common use among the sailors. He likewise gave some instruments of his own invention; but all of them are now laid aside, excepting perhaps his nocturnal. He constructed a sea-table to be used by such as sailed beyond the 60th degree of latitude; and at the end of the book is delivered a method of falling on a parallel of latitude by means of a ring dial and a 24 hour-glass. The same year the discovery of the dipping needle was made by Mr Robert Norman * in his publication on that art he maintains in opposition to Cortes, that the variation of the compass was caused by some point on the surface of the earth, and not in the heavens: he also made considerable improvements in the construction of compasses themselves; showing especially the danger of not fixing, on account of the variation, the wire directly under the fleur-de-luce; as compasses made in different countries have it placed differently. To this performance of Norman’s is always prefixed a discourse on the variation of the magnetic needle by Mr William Burrough, in which he shows how to determine the variation in many different ways. He also points out many errors in the practice of navigation at that time, and speaks in very severe terms concerning those who had published upon it.

All this time the Spaniards continued to publish treatises on the art. In 1585 an excellent compendium was published by Roderico Zamorano, which contributed greatly towards the improvement of the art, particularly in the sea charts. Globes of an improved kind, and of a much larger size than those formerly used, were now constructed, and many improvements were made in other instruments; however the plane chart continued still to be followed, though its errors were frequently complained of. Methods of removing these errors had indeed been sought after; and Gerhard Mercator seems to have been the first who found the true method of doing this so as to answer the purposes of seamen. His method was to represent the parallels both of latitude and longitude by parallel straight lines, but gradually to augment the former as they approached the pole. Thus the rhumbs, which otherwise ought to have been curves, were now also extended into straight lines; and thus a straight line drawn between any two places marked upon the chart would make an angle with the meridians, expressing the rhumb leading from the one to the other. But though, in 1569, Mercator published an universal map constructed in this manner, it doth not appear that he was acquainted with the principles on which this proceeded; and it is now generally believed, that the true principles on which the construction of what is called Mercator’s chart depends, were first discovered by an Englishman, Mr Edward Wright.

Mr Wright supposes, but according to the general opinion, without sufficient grounds, that this enlargement of the degrees of latitude was known and mentioned by Ptolemy, and that the same thing had also been spoken of by Cortes. The expressions of Ptolemy...
Imly alluded to, relate indeed to the proportion between the distances of the parallels and meridians; but instead of propoling any gradual enlargement of the parallels of latitude, in a general chart, he speaks only of particular maps; and advises not to confine a system of such maps to one and the fame scale, but to plan them out by a different measure, as occasion might require: only with this precaution, that the degrees of longitude in each should bear some proportion to those of latitude; and this proportion is to be deduced from that which the magnitude of the respective parallels bear to a great circle of the sphere. He adds that in particular maps, if this proportion be observed with regard to the middle parallel, the inconveniences will not be great though the meridians should be straight lines parallel to each other. Here he is laid only to mean, that the maps should in some measure represent the figures of the countries for which they are drawn. In this fefte Mercator, who drew maps for Ptolemy's tables, understood him; thinking it, however, an improvement not to regulate the meridians by one parallel, but by two; one distant from the northern, the other from the southern extremity of the map by a fourth part of the whole depth: by which means, in his maps, though the meridians are straight lines, yet they are generally drawn inclining to each other towards the poles. With regard, to Cortes, he speaks only of the number of degrees of latitude, and not of the extent of them; nay, he gives express directions that they should all be laid down by equal measurement on scale of leagues adapted to the map.

For some time after the appearance of Mercator's map, it was not rightly understood, and it was even thought to be entirely useless, if not detrimental. However, about the year 1592, its utility began to be perceived; and seven years after, Mr Wright printed his famous treatife entitled, The Correftion of certain Errors in Navigation, where he fully explained the reason of extending the length of the parallels of latitude, and the uses of it to navigators. In 1610, a second edition of Mr Wright's book was published with improvements. An excellent method was proposed of determining the magnitude of the earth; at the same time it was judiciously proposed to make our common measures in some proportion to a degree on its surface, that they might not depend on the uncertain length of a barley-corn. Some of his other improvements were, "The Table of latitudes for dividing the meridian computed to minutes;" whereas it had only been divided to every tenth minute. He also published a description of an instrument which he calls the sea-rings; and by which the variation of the compass; altitude of the sun and time of the day, may be determined readily at once in any place, provided the latitude is known. He showed also how to correct the errors arising from the eccentricity of the eye in observing by the cross-feft. He made a total amendment in the table of the declinations and places of the sun and stars from his own observations made with a fix-foot quadrant, in the years 1594, 95, 96, and 97. A sea quadrant to take altitudes by a forward or backward observation; and likewise with a contrivance for the ready finding the latitude by the height of the pole-star, when not upon the meridian. To this edition was subjoined a translation of Zamorano's Compendium above mentioned, in which he corrected some mistakes in the original, adding a large table of the variation of the compass observed in very different parts of the world, to show that it was not occasioned by any magnetic pole. Thefe improvements soon became known abroad. In 1608, a treatife intitled, Hypomnemata Mathematica, was published by Simon Stevin, for the ufe of Prince Maurice. In that part relating to navigation, the author having treated of falling on a great circle, and shewn how to draw the rhumbs on a globe mechanically, sets down Wright's two tables of latitudes and of rhumbs, in order to defcribe these lines more accurately, pretending even to have discovered an error in Wright's table. But all Stevin's objections were fully anfwered by the author himfelf, who showed that they arose from the gross way of calculating made use of by the former. In 1624, the learned Wellebrodus Snellius, professor of mathematics at Leyden, published a treatife of navigation on Wright's plan, but somewhat obscurely; and as he did not particularly mention all the discoveries of Wright, the latter was thought by fome to have taken the hint of all his discoveries from Snellius. But this fuppofition is long ago refuted; and Wright enjoys the honour of those discoveries which is juftly his due.

Mr Wright having shewn how to find the place of the ship on his chart, observed that the fame might be performed more accurately by calculation: but considering, as he says, that the latitudes, and especially, the courses at sea, could not be determined fo precisely, he forbore setting down particular examples; as the mariner may be allowed to solve himself this trouble, and only mark out upon his chart the ship's way, after the manner then usually practifed. However, in 1614, Mr Raile Handfon, among his nautical quaffons subjoined to a translation of Fiducius's trigonometry, solved very difficultly every cafe of navigation by applying arithmetical calculations to Wright's table of latitudes, or of meridional parts, as it was then called. Though the method discovered by Wright for finding the change of longitude by a ship falling on a rhumb is the proper way of performing it, Handfon also proposes two ways of approximation to it without the affiftance of Wright's division of the meridian line. The first was computed by the arithmetical mean between the confines of both latitudes; the other by the fame mean between the secants as an alternative, when Wright's book was not at hand; though this latter is wider from the truth than the first. By the fame calculations also he showed how much each of these compendiums deviates from the truth, and also how widely the computations on the erroneous principles of the plane chart differ from them all. The method, however, commonly ufed by our sailors is commonly called the mid-line-atitude; which, though it errs more than by the arithmetical mean between the two co-lines, is preferred on account of its being less operofe; yet in high latitudes it is more likely to ufe that of the arithmetical mean between the logarithmic co-lines equivalent to the geometrical mean between the co-lines themselves: a method fince proposed by Mr John Baffat. The computation by the middle latitude will always fall short of the true change of longitude; that by the geometrical mean will al-ways
ways exceed; but that by the arithmetical mean falls short in latitudes above 45 degrees, and exceeds in lesser latitudes. However, none of these methods will differ much from the truth when the change of latitude is sufficiently small.

About this time logarithms were invented by John Napier, baron of Merchilton in Scotland, and proved of the utmost service to the art of navigation. From which Mr Edmund Gunter contrived a table of logarithmic lines and tangents to every minute of the quadrant, which he published in 1620. In this work he applied to navigation, and other branches of mathematics, his admirable ruler known by the name of Gunter’s scale; on which are described lines of logarithmic lines, of logarithmic lines and tangents, of meridional parts, &c. He greatly improved the design for the same purposes. He shewed also how to take a back-obseruction by the cross-haft, whereby the error arising from the eccentricity of the eye is avoided. He described likewise another instrument, of his own invention, called the cross bow, for taking altitudes of the sun or stars, with some contrivances for the more ready collecting the latitude from the observation. The discoveries concerning logarithmic lines were carried to France in 1624 by Mr Edmund Wingate, who published two small tracts in that year at Paris. In one of them he taught the use of Gunter’s scale; and in the other, of the tables of artificial lines and tangents, as modelled according to Napier’s last form, erroneously attributed by Wingate to Briggs.

Gunter’s rule was projected into a circular arch by the Reverend Mr William Oughtred in 1623, and its uses fully shown in a pamphlet intituled, The Circum of Navigation, where, in an appendix, are well treated several important points in navigation. It has also been made in the form of a sliding ruler.

The logarithmic tables were first applied to the different cases of sailing by Mr Thomas Addison, in his treatise intituled, Arithmetical navigation, printed in 1625. He also gives two traverse tables, with their uses; the one to quarter points of the compass, the other to degrees. Mr Henry Gellibrand published his discovery of the changes of the variation of the compass, in a small quarto pamphlet, intituled, A discourse mathematical on the variation of the magnetic medal, printed in 1635. This extraordinary phenomenon he found out by comparing the observations made at different times near the same place by Mr Burrough, Mr Gunter, and himself, all persons of great skill and experience in these matters. This discovery was likewise soon known abroad; For Father Athanasius Kircher, in his treatise intituled, Magna, first printed at Rome in 1641, informs us, that he had been told it by Mr John Graves; and then gives a letter of the famous Marinus Merianus, containing a very distinct account of the same.

As altitudes of the sun are taken on shipboard by observing his elevation above the visible horizon, to obtain from thence the sun’s true altitude with corretions, Wright observes it to be necessary that the dip of the visible horizon below the horizontal plane passing through the observer’s eye should be brought into the account, which cannot be calculated without knowing the magnitude of the earth. Hence he was induced to propose different methods for finding this; but complains that the most effectual was out of his power to execute; and therefore contented himself with a rude attempt, in some measure sufficient for his purpose: and the dimensions of the earth deduced by him corresponded very well with the usual divisions of the log-line; however, as he wrote not an express treatise on navigation, but only for the correcting such errors as prevailed in general practice, the log-line did not fall under his notice. Mr Richard Norwood, however, put in execution the method recommended by Mr Wright as the most perfect for measuring the dimensions of the earth, with the true length of the degrees of a great circle upon it; and, in 1635, he actually measured the distance between London and York; from whence, and the summer solstitial altitudes of the sun observed on the meridian at both places, he found a degree on a great circle of the earth to contain 357,156 English feet, equal to 57,300 French fathoms or tortolos: which is very exact, as appears from many measures that have been made since that time. Of all this Mr Norwood gave a full account in his treatise called Th- Seaman’s Practice, published in 1637. He there shews the reason why Snellius had failed in his attempt; he points out also various uses of his discovery, particularly for correcting the gross errors hitherto committed in the divisions of the log-line. But necessary amendments have been little attended to by seamen, whose obstinacy in adhering to established errors has been complained of by the best writers on navigation. This improvement has at length, however, made its way into practice, and few navigators of reputation now make use of the old measure of 42 feet to a knot. In that treatise also Mr Norwood describes his own excellent method of setting down and perfecting a sea-reckoning, by using a traverse table; which method he had followed and taught for many years. He shews also how to rectify the course by the variation of the compass being considered; as also how to discover currents, and to make proper allowance on their account. This treatise, and another on trigonometry, were continually reprinted, as the principal books for learning scientifically the art of navigation. What he had delivered, especially in the latter of them, concerning this subject, was contracted as a manual for sailors, in a very small piece called his Epitome; which useful performance has gone through a great number of editions. No alterations were ever made in the Seaman’s Practice till the 12th edition in 1676, when the following paragraph was inserted in a smaller character: “About the year 1672, Monsieur Picart has published an account in French, concerning the measure of the earth, a breviate whereof may be seen in the Philosophical Transactions, No 112. wherein he concludes one degree to contain 357,184 English feet, nearly agreeing with Mr Norwood’s experiment,” and this advertisement is continued through the subsequent editions as late as the year 1732.

About the year 1645, Mr Bond published in Norwood’s epitome a very great improvement in Wright’s method by a property in his meridian line, whereby its divisions are more scientifically affigned than the author himself was able to effect; which was from this theorem, that these divisions are analogous to the excels of the logarithmic tangents of half the respective latitudes augmented by 45 degrees above the logarithm of the radius.
dius. This he afterwards explained more fully in the
third edition of Gunter's works, printed in 1653; where,
after observing that the logarithmic tangents
from \(45^\circ\) upwards increase in the same manner that
the secants added together do, if every half degree
be accounted as a whole degree of Mercator's meri-
dional line. His rule for computing the meridional
parts belonging to any two latitudes, supposed on
the same side of the equator, is to the following
effect: "Take the logarithmic tangent, rejecting the
radius, of half each latitude, augmented by \(45^\circ\) degrees; di-
vide the difference of those numbers by the logarith-
mic tangent of \(45^\circ\ 30'\), the radius being likewise re-
jected; and the quotient will be the meridional parts
required, expressed in degrees." This rule is the im-
mediate consequence from the general theorem, That
the degrees of latitude bear to one degree (or 60 minutes,
which in Wright's table stands for the meridional
parts of one degree), the same proportion as the loga-
rithmic tangent of half any latitude augmented by \(45^\circ\) degrees,
and the radius neglected, to the like tangent of half a
degree augmented by \(45^\circ\) degrees, with the radius like-
wise rejected. But here was farther wanting the demon-
stration of this general theorem, which was at length
supplied by Mr James Gregory of Aberdeen in his Exer-
citationes Geometricae, printed at London in 1668; and
afterwards more concisely demonstrated, together
with a scientific determination of the divisor, by Dr
Halley in the Philosophical Transactions for 1695,
N° 219, from the consideration of the spirals into
which the rhumbs are transformed in the stereographic
projection of the sphere upon the plane of the equi-
atorial; and which is rendered still more simple by
Mr Roger Cotes, in his Logometria, first published in
the Philosophical Transactions for 1714, N° 488. It
is moreover added in Gunter's book, that if \(\phi\) be the
degree of this division, which does not sensibly differ from
the logarithmic tangent of \(45^\circ\ 1'\ 30''\) (with the radius sub-
tracted from it), be used, the quotient will exhibit the
meridional parts expressed in leagues; and this is the
divisor set down in Norwood's Epitome. After the
same manner the meridional parts will be found in
minutes, if the like logarithmic tangent of \(45^\circ\ 1'\ 30''\),
 diminished by the radius, be taken; that is, the num-er used by others being 12633, when the logarithmic
tables consist of eight places of figures besides the
index.

In an edition of the Seamen's Kalendar, Mr Bond
declared, that he had discovered the longitudes by ha-
olding found out the true theory of the magnetic varia-
tion; and to g in credit to his assertion, he foresaw,
that at London in 1657 there would be no variation of
the compass, and from that time it would gradually
increase the other way; which happened accordingly.

Again, in the Philosophical Transactions for 1668,
N° 40, he published a table of the variation for 40
years to come. Thus he acquired such reputation, that
his treatise, intitled, The Longitude Found, was in 1676
published by the special command of Charles II. and
approved by many celebrated mathematicians. It was
not long, however, before it met with opposition; and
in 1678 another treatise, intitled, The Longitude not
Found, made its appearance; and as Mr Bond's hy-
pebthesis did not in any manner answer his author's fan-
guine expectations, the affair was undertaken by Dr
Halley. The result of his speculation was, that the
magnetic needle is influenced by four poles; but this
wonderful phenomenon seems hitherto to have eluded
all our researches. In 1700, however, Dr Halley pub-
lished a general map, with curve lines expressing the
paths where the magnetic needle had the same varia-
tion; which was received with universal applause. But
as the positions of these curves vary from time to time,
they should frequently be corrected by skillful per sons;
as was done in 1744 and 1756, by Mr William
Mountaine, and Mr James Dodson, F. R. S. In the Phi-
losophical Transactions for 1690, Dr Halley also gave
a dissertation on the monsoons; containing many very
useful observations for such as fall to places subject
to these winds.

After the true principles of the art were settled by
Wright, Bond, and Norwood, the authors on naviga-
tion became so numerous, that it would be impossible
to enumerate them. New improvements were daily
made, and every thing relative to it was furthered with
an accuracy not only unknown to former ages, but
which would have been reckoned utterly impossible.
The earth being found to be a spheroid, and not a
perfect sphere, with the shortest diameter passing thro'
the poles, a tract was published in 1741 by the Rev.
Doctor Patrick Murdoch, wherein he accommodated
Wright's failing to such a figure; and Mr Colin Mac-
laurin, the same year, in the Philosophical Transac-
tions, N° 461, gave a rule for determining the meri-
dional parts of a spheroid; which speculation is farther
treated of in his book of Fluxions, printed at Edin-
burgh in 1742.

Among the later discoveries in navigation, that of
finding the longitude both by lunar observations and
by time keepers is the principal. It is owing chiefly
to the rewards offered by the British parliament that
this has attained the present degree of perfection. We
are indebted to Dr Stukelyne for putting the first
of these methods in practice, and for other important
improvements in navigation. The time keepers,
constructed by Harrison for this express purpose, were
found to answer so well, that he obtained the parlia-
mentary reward.

**The Theory of Navigation.**

The motion of a ship in the water is well known
to depend upon the action of the wind upon its
sails, regulated by the direction of the helm. As the
water is a resisting medium, and the bulk of the ship
very considerable, it thence follows, that there is al-
ways a great resistance on her fore-part; and when
this resistance becomes sufficient to balance the moving
force of the wind upon the sails, the ship attains her
utmost degree of velocity, and her motion is no longer
accelerated. This velocity is different according to
the different strength of the wind; but the stronger
the wind, the greater resistance is made to the ship's
passage through the water: and hence, though the
wind should blow ever so strongly, there is also a limit
to
N A V I G A T I O N.

in the same place. In proportion to the swiftness of
the ship, then the lee-way will be the less: but if the
wind is very strong, the velocity of the ship bears but
a small proportion to that of the current of air; and
the same effects must follow as though the ship moved
slowly, and the wind was gentle; that is, the ship
must make a great deal of lee-way.—The same thing
happens when the sea rife high, whether the wind is
strong or not; for then the whole water of the ocean,
as far as the swell reaches, hath acquired a motion in
a certain direction, and that to a very considerable
depth. The mountainous waves will not fail to carry
the ship very much out of her course; and this devia-
tion will certainly be according to their velocity and
magnitude. In all cases of a rough sea, therefore, a
great deal of lee way is made.—Another circumstance
also makes a variation in the quantity of the lee-way;
namely, the lightness or heaviness of the ship; it being
evident, that when the ship sinks deep in the water, a
much greater quantity of that element is to be put in
motion before she can make any lee-way, than when
she swims on the surface. As therefore it is impossible
to calculate all these things with mathematical exact-
ness, it is plain that the real course of a ship is exceed-
ingly difficult to be found, and frequent errors must
be made, which only can be corrected by celestial ob-
servations.

In many places of the ocean there are currents, or
places where the water, instead of remaining at rest,
rises with a very considerable velocity for a great way
in some particular direction, and which will certainly
carry the ship greatly out of her course. This occa-
sions an error of the same nature with the lee-way;
and therefore, whenever a current is perceived, its
velocity ought to be determined, and the proper al-
lowances made.

Another source of error in reckoning the course of
a ship proceeds from the variation of the compas.
There are a few parts of the world where the needle
points exactly north; and in those where the variation
is known, it is subject to very considerable alterations.
By these means the course of the ship is mistaken; for
as the sailors have no other standard to direct them
than the compass, if the needle, instead of pointing
due north, should point northeast, a pregiuous error
would be occasioned during the course of the voyage,
and the ship would not come near the port to which
she was bound. To avoid errors of this kind the only
method is, to observe the fan's amplitude and azimuth
as frequently as possible, by which the variation of
the compass will be perceived, and the proper allow-
ances can then be made for errors in the course which
this may have occasioned.

Errors will arise in the reckoning of a ship, espe-
cially when she fails in high latitudes, from the sphero-
idal figure of the earth; for as the polar diameter
of our globe is found to be considerably shorter than
the equatorial one, it thence follows, that the further
we remove from the equator, the longer are the degrees
of latitude. Of consequence, if a navigator aligns
any certain number of miles for the length of a degree
of latitude near the equator, he must vary that mea-
ture as he approaches towards the poles, otherwise
he will imagine that he hath not sailed so far as he
actually hath done. It would therefore be necessary

Vol. XII.
NA V I G A T I O N. Practice.

BOOK I. Containing the various Methods of Sailing.

INTRODUCTION.

The art of navigation depends upon astronomical and mathematical principles. The places of the sun and fixed stars are deduced from observation and calculation, and arranged in tables, the use of which is absolutely necessary in reducing observations taken at sea, for the purpose of ascertaining the latitude and longitude of the ship, and the variation of the compass. The problems in the various sailings are resolved either by trigonometrical calculation, or by tables or rules formed by the assistance of trigonometry. By mathematics, the necessary tables are constructed, and rules investigated for performing the more difficult parts of navigation. For these several branches of science, and for logarithmic tables, the reader is referred to the respective articles in this work. A few tables are given at the end of this article; but as the other tables necessary for the practice of navigation are to be found in almost every treatise on that subject, it therefore seems unnecessary to insert them in this place.

CHAP. I. Preliminary Principles.

SECT. I. Of the Latitude and Longitude of a Place.

The situation of a place on the surface of the earth is estimated by its distance from two imaginary lines intersecting each other at right angles: the one of these is called the equator, and the other the first meridian. The situation of the equator is fixed, but that of the first meridian is arbitrary, and therefore different nations assume different first meridians. In Britain, that which passes through the royal observatory at Greenwich is esteemed to be the first meridian.

The equator divides the earth into two equal parts, called the northern and southern hemispheres; and the latitude of a place is its distance from the equator, reckoned on a meridian in degrees and parts of a degree; and is either north or south, according as it is in the northern or southern hemisphere.

The first meridian being commenced round the globe, divides it into two equal parts, called the eastern and western hemispheres; and the longitude of a place is that portion of the equator contained between the first meridian and the meridian of the given place, and is either east or west; according as it is in the eastern or western hemisphere, respectively to the first meridian.

PROB. I. The latitudes of two places being given, to find the difference of latitude.

RULE. Subtract the less latitude from the greater, if the latitudes be of the same name, but add them if of contrary; and the remainder or sum will be the difference of latitude.

EXAMPLE I. Required the difference of Latitude between the Lizard, in latitude 49° 57' N. and Cape St Vincent, in latitude 37° 2' N.

<table>
<thead>
<tr>
<th>Latitude of the Lizard</th>
<th>49° 57' N.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude of Cape St Vincent</td>
<td>37° 2' N.</td>
</tr>
</tbody>
</table>

Difference of latitude 12° 35' = 775 miles.

EXAMPLE II. What is the difference of latitude between Funkal, in latitude 32° 38' N. and the Cape of Good Hope, in latitude 34° 29' S?

Latitude
NAVIGATION

Difference of latitude 67° 7' = 4027 miles.

Example I. A ship from latitude 90° 22' N. failed due north 560 miles—Required the latitude come to?

Example II. A ship from latitude 7° 19' N. failed 854 miles south—Required the latitude come to?

Example III. The longitudes of two places being given, to find their difference of longitude.

Example I. Required the difference of longitude between Edinburgh and New York, their longitude being 3° 14' W. and 74° 10' W. respectively?

Example II. What is the difference of longitude between Mafkelyne's Isles, in longitude 167° 59' E. and Olindo, in longitude 35° 5' W.?

Example III. Required the time of new moon at Saloquine in May 1793?

Example IV. What is the time of the last quarter of the moon at Resolution Bay in October 1793?

Table VII, which applied to the time of high water, indicates the equation answering to this difference.

Find the equation answering to this difference in

Table VII, which applied to the time of high water.
Tides.

Now take the interval between the reduced time of the phase and the approximate time of high water; and the corresponding equation, which applied as before to the nautical time of high water, will give the time of the afternoon high water.

If the time of the morning high water is required, increase the last interval by 12 hours, if the given day falls before the phase, or diminish it by 12 hours when after that phase; and the equation to this time, applied to the nautical time, gives the morning time of high water.

Example I. Required the morning and afternoon times of high water at Leith, 11th December 1793.

Nearest phase to 11th Dec. is 1st quart. 9d 20h 29'.

Longitude of Leith in time = o 0 13

Time at Leith of 1st quarter = 9 20 16

Given day = 11 0 0

Difference = 1 3 44

Time of H. W. at Leith pier on fyz. = 0 2 20

Equat. from Tab. to 1st 3h 44' = +0 6 32

Approximate time of high water = 11 8 52

Reduced time of 1st quarter = 9 20 16

Interval = 1 12 36

Time of high water at Leith = 0 2 20

Equat. from the Tab. to 1st 12h 36' = 0 7 0

Time of high water at Leith = 9 20 P.M.

Time of H. W. at Leith at full & change = 2 20

Equat. to 1st 12h 36' - 12h 1d 0h 36' = 6 22

High water at Leith, Dec. 11th, at 8 42 A.M.
The time of high water found by the common method is about an hour and a half sooner.

Example II. Required the time of high water at Funchal, 15th November 1793.
The nearest phase to 15th November is that of full moon, 17d 8h 46'.
Longitude of Funchal in time = 0 1 8 W.

Time of full moon at Funchal = 17 7 38

Given day, November = 15 0 0

Difference = 2 7 38

Time of high water at Funchal at full and change = 0 12 4

Equation from the Table to 2d 7h 38' before full moon = 0 1 35

Approx. time of high water, Nov. 15 = 0 10 29

Reduced time of full moon = 17 7 38

Interval = 1 11 9

Time of high water at full and change = 0 12 4

Equat. to 1st 11h before full moon = 0 0 56

Time of high water, = 0 11 8 P.M.

Equation to 1st 11h + 12 h. = 1d. 23 h. is 1h, 15'

and 12 h. 4'-1 h. 15'=10 h. 49'=time of high Siph's Run water in the forenoon.

Example III. Required the time of high water at Dufkey Bay, 24th of October 1793.
The nearest phase to the 24th October is the last quarter - 26d 5h 47'.
Longitude of Dufkey Bay in time = 0 1 1 5 E.

Reduced time of first quarter of moon = 26 16 52

Given day = 24 0 0

Difference = 2 16 52

Time of high water at full and change, 1st 6h 7'

Equation to 2d 16h 52' before last quarter, = + 2 52

Approximate time of high water = 1 49

Change of equation to app. time 1h 49' = 3

Time of high water in the afternoon = 1 52

Change of equation to 12 hours, = 20

Time of high water in the morning = 1 32

Sect. III. Of measuring a Ship's Run in a given time.
The method commonly used at sea to find the distance failed in a given time, is by means of a log-line and half-minute-glass. A description of these is given under the articles Log and Log-line, which see.

It has been already observed, that the interval between each knot on the line ought to be 50 feet, in order to adapt it to a glass that runs 30 seconds. But although the line and glass be at any time perfectly adjusted to each other, yet as the line shrinks after being wet, and as the weather has a considerable effect upon the glass, it will therefore be necessary to examine them from time to time; and the distance given by them must be corrected accordingly. The distance may therefore be affected by an error in the glass, or in the line, or in both. The true distance may, however, be found as follows.

Rule. Multiply the distance failed by the log, and the seconds run by the glass, being given, to find the true distance, the line being supposed right.

Example I. The distance failed by the log is 73 miles, and the glass runs out in 35 seconds. Required the true rate of failing?

\[
\frac{35 	imes 270 \text{(7.7 = true rate of failing)}}{30} = \text{true distance.}
\]

Example II. The distance failed by the log is 73 miles, and the glass runs out in 26 seconds. Sought the true distance?

\[
\frac{73 	imes 2190 \text{(84.2 the true distance)}}{30} = \text{true distance.}
\]
Practice.

**Navigation.**

Plane Sailing.

From and come to; and is reckoned either north or south, according as the course is in the northern or southern hemisphere.

The departure is the distance of the ship from the meridian of the place she left, reckoned on a parallel of latitude. In this failing, the departure and difference of longitude are esteemed equal.

In order to illustrate the subject, let A (fig. 1) represent the position of any given place, and AB the meridian passing through that place; also let AC represent the line described by a ship, and C the point arrived at. From C draw CB perpendicular to AB. Now in the triangle ABC, the angle BAC represents the course, the side AC the distance, AB the difference of latitude, and BC the departure.

In constructing a figure relating to a ship's course, let the upper part of what the figure is to be drawn on represent the north, then the lower part will be south, the right-hand side east, and the left-hand side west.

A north and south line is to be drawn to represent the meridian of the place from which the ship failed; and the upper or lower part of this line, according as the course is southerly or northerly, is to be marked as the position of that place. From this point as a centre, with the chord of 60°, an arch is to be described from the meridian towards the right or left, according as the course is easterly or westerly; and the course taken from the line of chords if given in degrees, but from the line of rhumbs, if expressed in points of the compass, is to be laid upon this arch, beginning at the meridian. A line drawn through this point and that from which the ship failed, will represent the distance, which if given must be laid thereon, beginning at the point failed from. A line is to be drawn from the extremity of the distance perpendicular to the meridian; and hence the difference of latitude and departure will be obtained.

If the difference of latitude is given, it is to be laid upon the meridian, beginning at the point representing the place the ship left; and a line drawn from the extremity of the difference of latitude perpendicular to the meridian, till it meets the distance produced, will limit the figure.

If the departure is given, it is to be laid off on a parallel, and a line drawn through its extremity will limit the distance. When either the distance and difference of latitude, distance and departure, or difference of latitude and departure, are given, the measure of each is to be taken from a scale of equal parts, is to be laid off on its respective line, and the extremities connected. Hence the figure will be formed.

**Prob.**

Given the course and distance, to find the difference of latitude and departure.

**Example.** A ship from St Helena, latitude 15° 55' S. failed S. W. by S. 158 miles. Required the latitude come to, and departure?

By Construction.

Draw the meridian AB (fig. 2.), and with the chord of 60° describe the arch m n, and make it equal to the rhumb of 3 points, and through e draw AC equal to 158 miles; from C draw CB perpendicular to AB; then AB applied to the scale from which AC was taken, will be found to measure 151.4 and BC 87.8.

---

**Rule.** Multiply twice the distance failed by the measured length of a knot, point off two figures to the right, and the remainder will be the true distance.

**Example I.** The hourly rate of failing by the log is five knots, and the interval between knot and knot measures 53 feet. Required the true rate of failing?

1. Measured interval = 53
2. Twice hourly rate = 10

3. True rate of failing, = 530

**Example II.** The distance failed is 64 miles, by a log-line which measures 42 feet to a knot. Required the true distance?

1. Twice given distance, = 128
2. Measured interval, = 42

3. True distance, = 53.76

**Prob. III.** Given the length of a knot, the number of seconds run by the glass in half a minute, and the distance failed by the log; to find the true distance.

**Rule.** Multiply the distance failed by the log by six times the measured length of a knot, and divide the product by the seconds run by the glass, the quotient, pointing off one figure to the right, will be the true distance.

**Example.** The distance failed by the log is 159 miles, the measured length of a knot is 42 feet, and the glass runs 33 seconds in half a minute. Required the true distance?

1. Distance by the log, = 159
2. Six times length of a knot, = 42 × 6 = 252

3. Second run by the glass = 3340068 (121.4 =

4. True distance.

---

**Chap. II. Of Plane Sailing.**

Plane sailing is the art of navigating a ship upon principles deduced from the notion of the earth's being an extended plane. On this supposition the meridians are esteemed as parallel right lines. The parallels of latitude are at right angles to the meridians; the lengths of the degrees on the meridians, equator, and parallels of latitude, are every where equal; and the degrees of longitude are reckoned on the parallels of latitude, as well as on the equator. In this sailing four things are principally concerned, namely, the course, distance, difference of latitude, and departure.

The course is the angle contained between the meridian and the line described by the ship, and is usually expressed in points of the compass.

The distance is the number of miles a ship has failed on a direct course in a given time.

The difference of latitude is the portion of a meridian contained between the parallels of latitude failed.
NAVIGATION.

By Gunter’s Scale.

Extend the compasses from 4½ points, the complement of the course to 8 points on fine rhumbs, that extent will reach from the difference of latitude 218 miles to the distance 282 miles in numbers; and the extent from 4 points to the course 3½ points on the line of tangent rhumbs (marked T. R.) will reach from 218 miles to 178.9, the departure on numbers.

PROB. III. Given course and departure, to find the distance and difference of latitude?

EXAMPLE. A ship from Palma, in latitude 28° 37’ N failed NW by W, and made 192 miles of departure; Required the distance, run, and latitude come to?

By Construction.

Make the departure BC (fig. 4.) equal to 192 miles, draw BA perpendicular to BC, and from the centre C, with the chord of 60°, describe the arch m n, which make equal to the rhumb of 3 points, the complement of the course; draw a line through C, which produce till it meets BA in A: then the distance AC being measured, will be equal to 231 m. and the difference of latitude AB will be 128.3 miles.

By Calculation.

To find the distance.

As the line of the course 5 points is to radius 7.91985
so is the departure — 192 — 2.28330

As the tangent of the course 5 points is to radius 10.00000
so is the departure — 192 — 2.28330

As the difference of latitude 8.3 is to radius 18.9
so is the difference of latitude — 218.9 — 2.10819

By Inspection.

Find the departure 192 m. in its proper column above the given course 5 points; and opposite thereto is the distance 231 miles, and difference of latitude 128.3, in their respective columns.

By Gunter’s Scale.

The extent from 5 points to 8 points on the line of fine rhumbs being laid from the departure 192 on numbers, will reach to the distance 231 on the same line; and the extent from 5 points to 4 points on the line of tangent rhumbs will reach from the departure 192 to the difference of latitude 128.3 on numbers.

Latitude of Palma — 28° 37’ N
Difference of latitude — 2.8 N

Latitude come to — 30 45” N

PROB. IV. Given the distance and difference of latitude, to find the course and departure.

EXAMPLE. A ship from a place in latitude 43° 15’ N, fails between the north and east 285 miles; and is then by observation found to be in latitude 45° 31’ N: Required the course and departure?

Latitude failed from — 43° 13’ N
Latitude by observation — 45° 31’ N

Difference of latitude — 3 18 = 198 miles.

By Construction.

Draw the portion of the meridian AB (fig. 5.) equal to 198 miles; from B draw BC perpendicular to
NAVICATI0N

To find the difference of latitude.

As radius

is the course

to the departure

is the difference

to the difference of latitude

By Inspection.

Seek in the traverse table until the nearest to the given departure is found in the same line with the given distance 260. This is found to be in the page marked 47° at the bottom, which is the course; and the corresponding difference of latitude is 177°.

By Gunter's scale.

The extent of the compass, from the distance 260 to the departure 190 on the line of numbers, will reach from 90° to 47°, the course on the line of fives; and the extent from 90° to 43°, the complement of the course on fives, will reach from the distance 260 to the difference of latitude 177° on the line of numbers.

Latitude Fort-Royal

difference of latitude

Latitude in

9 12 N

ProB. VI. Given difference of latitude and departure, found course and distance.

EXAMPLE. A ship from a port in Grenada, latitude 12° 9' N, failed 260 miles between the fourth and fifth, and made 190 miles of departure: Required the course and latitude come to?

By Construction.

Draw BC (fig 6.) perpendicular to AB, and equal to the given departure 190 miles: th. n. from the centre C, with the distance 260 miles, draw an arch intersecting AB in it, and join AC. Now describe an arch from the centre A, with the chord of 60°, and the portion mn of this arch, contained between the distance and difference of latitude, measured on the line of chords, will be 47° the course; and the difference of latitude AB applied to the scale of equal parts, measures 177° miles.

By Calculation.

To find the course.

As the distance

is to the departure

is radius

to the sine of the course

260

190

10.0000

46° 57'
to the departure 132 on the line of numbers, will reach from 45° to 28°, the course on the line of tangents; and the extent from 62°, the complement of the course, to 90° on lines, will reach from the difference of latitude 247 to the distance 280 on numbers.

Chap. III. Of Traverse Sailing.

If a ship falls upon two or more courses in a given time, the irregular track she describes is called a traverse; and to resolve a traverse is the method of reducing these several courses, and the distances run, into a single course and distance. The method chiefly used for this purpose at sea is by inspection, which shall therefore be principally adhered to; and is as follows.

Make a table of a breadth and depth sufficient to contain the several courses, &c. This table is to be divided into six columns; the several courses are to be put in the first, and the corresponding distances in the second column; the third and fourth columns are to contain the differences of latitude, and the two last the departures.

Now, the several courses and their corresponding distances being properly arranged in the table, find the difference of latitude and departure answering to each in the traverse table; remembering that the difference of latitude is to be put in a north or south column, according as the course is in the northern or southern hemisphere; and that the departure is to be put in an east column if the course is easterly, but in a west column if the course is westerly. Observing also, that the departure is less than the difference of latitude when the course is less than 4 points or 45°; otherwise greater.

Add up the columns of northings, southeings, eastings, and westings, and set down the sum of each at its bottom; then the difference between the sums of the north and south columns will be the difference of latitude made good, of the same name with the greater; and the difference between the sums of the east and west columns, is the departure made good, of the same name with the greater sum.

Now seek in the traverse table, till a difference of latitude and departure are found to agree as nearly as possible with those above; then the distance will be found on the same line, and the course at the top or bottom of the page according as the difference of latitude is greater or less than the departure.

In order to resolve a traverse by construction, describe a circle with the chord of 60°, in which draw two diameters at right angles to each other, the one representing the meridian, and the other the parallel of latitude of the place failed from. Take each course from the line of rhumbs, lay it off on the circumference from its proper meridian, and number it in order 1, 2, 3, 4. Upon the first rhumb C₁, lay the first distance from C to A; through it draw the second distance AB parallel to C₂, and equal to 110 miles; through B draw BD equal to 180 miles, and parallel to C₃; and draw DE parallel to C₄, and equal to 68 miles. Now CE being measured, will represent the distance made good; which applied to the scale will measure 281 miles. The arc S₅, which represents the course, being measured on the line of chords, will be found equal to 414°. From E draw EF perpendicular to CS produced; then CF will be the difference of latitude, and FE the departure made good; which applied to the scale will be found to measure 210 and 180 respectively.

As the method by construction is scarcely ever practiced at sea, it therefore seems unnecessary to apply it to the solution of the following examples.
### NAVIGATION

#### II. A ship from latitude 1° 38' S, failed as under.

Required her present latitude, course, and distance made good?

<table>
<thead>
<tr>
<th>Course</th>
<th>Diff. of Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW of N</td>
<td>43</td>
<td>55.8</td>
</tr>
<tr>
<td>NW</td>
<td>78</td>
<td>29.9</td>
</tr>
<tr>
<td>SE</td>
<td>56</td>
<td>31.1</td>
</tr>
<tr>
<td>WSW</td>
<td>62</td>
<td>18.0</td>
</tr>
<tr>
<td>N</td>
<td>87</td>
<td>84.1</td>
</tr>
<tr>
<td>N  44° W</td>
<td>139</td>
<td>100.7</td>
</tr>
</tbody>
</table>

Latitude left: 1° 38' S.
Latitude come to: 0° 38' N.

#### III. Yesterday at noon we were in latitude 13° 12' N, and since then have run as follows: SSE 36 miles, S 12 miles, NW 28 miles, W 30 miles, SW 42 miles, WNW 39 miles, and N 20 miles. Required our present latitude, departure, and direct course and distance?

<table>
<thead>
<tr>
<th>Course</th>
<th>Diff. of Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSE</td>
<td>36</td>
<td>33.3</td>
</tr>
<tr>
<td>S</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>NW</td>
<td>28</td>
<td>17.8</td>
</tr>
<tr>
<td>W</td>
<td>30</td>
<td>0.0</td>
</tr>
<tr>
<td>SW</td>
<td>42</td>
<td>29.7</td>
</tr>
<tr>
<td>WNW</td>
<td>39</td>
<td>7.6</td>
</tr>
<tr>
<td>N</td>
<td>20</td>
<td>20.0</td>
</tr>
<tr>
<td>S 74° W</td>
<td>110</td>
<td>29.6 = 30° 30'</td>
</tr>
</tbody>
</table>

Yesterday's latitude: 13° 12' N.
Present latitude: 12° 42' N.

#### IV. The course per compass from Greighefs to the May is SW 3° S. distance 58 miles; from the May to the Staples SSE 4° E. 44 miles; and from the Staples to Flamborough Head SSE, 110 miles. Required the course per compass, and distance from Greighefs to Flamborough Head?

<table>
<thead>
<tr>
<th>Course</th>
<th>Diff. of Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSE</td>
<td>36</td>
<td>33.3</td>
</tr>
<tr>
<td>S</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>NW</td>
<td>28</td>
<td>17.8</td>
</tr>
<tr>
<td>W</td>
<td>30</td>
<td>0.0</td>
</tr>
<tr>
<td>SW</td>
<td>42</td>
<td>29.7</td>
</tr>
<tr>
<td>WNW</td>
<td>39</td>
<td>7.6</td>
</tr>
<tr>
<td>N</td>
<td>20</td>
<td>20.0</td>
</tr>
<tr>
<td>S 74° W</td>
<td>110</td>
<td>29.6 = 30° 30'</td>
</tr>
</tbody>
</table>

#### CHAP. IV. Of Parallel Sailing.

The figure of the earth is spherical, and the meridians gradually approach each other, and meet at the poles. The difference of longitude between any two places is the angle at the pole contained between the meridians of those places; or it is the arch of the equator intercepted between the meridians of the given places; and the meridian distance between two places in the same parallel, is the arch thereof contained between their meridians. It hence follows, that the meridian distance, answering to the same difference of longitude, will be variable with the latitude of the parallel upon which it is reckoned; and the same meridian distance will not answer to a given meridian distance when reckoned upon different parallels.

Parallel sailing is therefore the method of finding the difference between two places lying in the same parallel whose longitudes are known; or, to find the difference of longitude answering to a given distance, run in an east or west direction. This sailing is particularly useful in making low or small islands.

In order to illustrate the principles of parallel sailing, let CABF (fig. 9.) represent a section of one fourth part of the earth, the arch ABF being part of a meridian; CA the equatorial; and CP the polar semiaxis. Also let B be the situation of any given place on the earth; and join BC, which will be equal to CA or CP (a). The arch AB, or angle ACB, is the measure of the latitude of the place B; and the arch BP, or angle BCP, is that of its complement. If BD be drawn from B perpendicular to CP, it will represent the cofine of latitude to the radius BC or CA.

Now since circles and similar portions of circles are in the direct ratio of their radii; therefore, as radius is to the co-fine of latitude, so is any given portion of the equator to a similar portion of the given parallel.

![Plate CXXVII.]

(a) This is not strictly true, as the figure of the earth is that of an oblate spheroid; and therefore the radius of curvature is variable with the latitude. The difference between CA and CP, according to Sir Isaac Newton's hypothesis, is about 17 miles.
NAVIGATION

But the difference of longitude is an arch of the equator: and the distance between any two places under the same parallel, is a similar portion of that parallel.

Hence $\cos \text{latitude} : \text{Diff. longitude} : \text{Distance}.$

And by inversion,

$\cos \text{latitude} : R : \text{Distance} : \text{Diff. of longitude}.$

Also,

$\text{Diff. of longitude} : \text{Distance} :: R : \cos \text{latitude}.$

**Example I.** Required the number of miles contained in a degree of longitude in latitude $55^\circ$ $58'$.

By Construction.

Draw the indefinite right line $AB$ (fig. 10): make the angle $BAC$ equal to the given latitude, and $AC$ equal to the number of miles contained in a portion of the equator, the angle $BAC$ equal to the given distance $342$ miles, and make the angle $BAC$ equal $45^\circ$ $52'$, the given latitude: from $B$ draw $BC$ perpendicular to $AB$, meeting $AC$ in $C$; then $AC$ applied to the scale will measure 466, the difference of longitude required.

**Calculation.**

As $R$ is to the secant of latitude $45^\circ$ $52'$, so is the distance $342$ to the difference of longitude 466, the difference of longitude required.

The nearest degree to the given latitude is $45^\circ$; under which, and opposite to $171$, half the given distance in a latitude column, is 234 in a distance column, which doubled gives 468, the difference of longitude.

If the proportional part answering to the difference between the given altitude and that used be applied to the above, the same result will with that found by calculation will be obtained.

**By Gunter's Scale.**

The extent from $47^\circ$ $8'$, the complement of latitude to $90^\circ$ on the line of fives, being laid the same way from the distance 342, will reach to the difference of longitude 468 on the line of numbers.

Longitude Cape Finisterre 9° $17'$

Difference of longitude 7 $47'$

Longitude come to 17 $4'$

**Example:** A ship sailed due east 358 miles, and was found by observation to have differed her longitude $8^\circ 42'$. Required the latitude of the parallel.

By Construction.

Make the line $AB$ (fig. 12) equal to the given distance; to which let $BC$ be drawn perpendicular, with an extent equal to 522, the difference of longitude; describe an arch from the centre $A$ cutting $BC$ in $C$; then the angle $BAC$ being measured by means of the line of chords, will be found equal to $45^\circ$, the required latitude.

**Calculation.**

As the distance $358$ is to the difference of longitude $522$, so is radius $2.53288$ to the secant of the latitude $46^\circ$ $42'$. The difference of longitude is 358, 2.53288.

The difference of longitude and distance exceed the limits of the table, let therefore the half of each be taken; these are 261 and 179 respectively. Now, by entering the table with these quantities, the latitude will be found to be between 46 and 47 degrees. Therefore, to latitude $46^\circ$, and distance 261 miles, the corresponding difference of latitude is 181, which exceeds the half of the given distance by 2'. Again, to latitude $47^\circ$, and distance 261, the difference of latitude is 178.5, being 1.0 less than the half of that given: therefore the change of distance answering to a change of $1'$ of latitude is 3'.

Now, as 3' is to 2': 3' is to 1': 42'.

Hence the latitude required is $46^\circ$ 42'.
Practice.

By Gunter's Scale.

The extent from 322 to 358 on the line of numbers, will reach from 90° to about 43°, the complement of which 46° is the latitude required?

Prob. IV. Given the number of miles contained in the portion of a known parallel, to find the length of a similar portion of another known parallel.

Example. From two parts in latitude 33° 58' N, distance 348 miles, two ships fail directly north till they are in latitude 48° 23' N. Required their distance?

By Construction.

Draw the lines CB, CE (fig. 13.), making angles with CP equal to the complements of the given latitudes, namely, 56° 2' and 41° 37' respectively: make BD equal to the given distance 348 miles, and perpendicular to CP; now from the centre C, with the radius CB, describe an arch intersecting CE in E; then EF drawn from the point E, perpendicular to CP, will represent the distance required; and which being applied to the scale, will measure 278 6/10 miles.

By Calculation.

As the cosine of the latitude left 33° 58'

\[ \text{is to the cosine of the latitude } \frac{9.91874}{9.91874} \]

to the distance required \[ \frac{48.23}{348} \]

so is the given distance 348 to the distance required 278 6/10 by Gunter's Scale.

The extent from 34°, and opposite to 174°, half the given distance in a latitude column is 210 in a distance column; being half the difference of longitude answering thereto. Now, find the difference of latitude to distance 210 miles over 48° of latitude, which is 140° 51' from which 1° (the proportional part answering to 22 minutes of latitude) being subtracted, gives 139° 45', which doubled is 278 6/10, the distance required.

By Calculation.

Under 48°, and opposite to 174°, half the given distance in a latitude column is 210 in a distance column; being half the difference of longitude answering thereto. Now, find the difference of latitude to distance 210 miles over 48° of latitude, which is 140° 51' from which 1° (the proportional part answering to 22 minutes of latitude) being subtracted, gives 139° 45', which doubled is 278 6/10, the distance required.

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\[ \text{is to the cosine of the latitude } \frac{9.91874}{9.91874} \]

to the distance required \[ \frac{48.23}{348} \]

so is the given distance 348 to the distance required 278 6/10 by Gunter's Scale.

The extent from 180 to 232 on the line of numbers, being laid in the same direction on the line of fines, from 34°, the complement of the latitude failed from, will reach to 46° 7', the complement of the latitude come to.

Chap. V. Of Middle Latitude Sailing.

The earth is a sphere, and the meridians meet at the poles; and since a rhumb-line makes equal angles with every meridian, the line a ship describes is therefore that kind of a curve called a spiral.

Let AB (fig. 15.) be any given distance sailed upon an oblique rhumb, PBN, PAM the extreme meridians, MN a portion of the equator, and PCK, PEL two meridians intersecting the distance AB in the points CE infinitely near each other. If the arches BS, CD, and AR, be described parallel to the equator, it is hence evident, that AS is the difference of latitude, and the arch MN of the equator the difference of longitude, answering to the given distance AB and course PAB.

Now, since CE represents a very small portion of the distance AB, DE will be the corresponding part of a meridian: hence the triangle EDC may be considered as rectilinear. If the distance be supposed to be divided into an infinite number of parts, each equal to CE, and upon these, triangles be constructed whose sides are portions of a meridian and parallel, it is evident these triangles will be equal and similar; for, besides the right angle, and hypothenuse which is the same in each, the course or angle CED is also the same. Hence, by the 12th of V. Euclid, the sum of all the hypothenuses CE, or the distance AB, is to the sum of all the fides DE, or the difference of latitude AS, as one of the hypothenuses CE is to the corresponding side DE. Now, let the triangle G1H (fig. 16.) be constructed similar to the triangle CDE, having the angle G equal to the course; then as GH: GI: CE: DC:: AB: AS.

Hence, if GH be made equal to the given distance AB, then GI will be the corresponding difference of latitude.

In like manner, the sum of all the hypothenuses CE, or the distance AB, is to the sum of all the fides CD,
NAVIGATION.

Middle
Longitude Isle of May - 2 37 W
Latitude Naze of Norway - 7 27 E
Difference of longitude - 10 7 = 60°

By Construction.

Draw the right line AD (fig. 18.) to represent the meridian of the May, with the chord of 60° describe the arch m n, upon which lay off the chord of 32° 59', the complement of the middle latitude from m to n: from D through n draw the line DC equal to 60°', the difference of longitude, and from C draw CB perpendicular to AC: make BA equal to 98', the difference of latitude, and join AC; which applied to the scale will measure 343 miles, the distance sought: and the angle A being measured by means of the line of chords, will be found equal to 73° 24', the required course.

By Calculation.

To find the course (b).

As the difference of latitude - 98' - 1.99123
is to the difference of longitude 60°' - 2.78104
so is the cosine of middle latitude
- - - - 57° 1' 9.73591

As radius - - - - 10.52572

to the tangent of the cosine 73' 24' 10.54411

As radius - - - - 1.99123

To find the distance.

As the difference of latitude 98' - 1.99123
is to the secant of the course 73° 24' 10.54411
so is the difference of latitude - - - 343 2.53534

By Inversion.

To middle latitude 57°, and 151 one-fourth of the difference of longitude in a distance column, the corresponding difference of latitude is 82°.

Now 24° 5', one-fourth of the difference of latitude, and 82° 2, taken in a departure column, are found to agree nearest on table marked 6i: points at the bottom, which is the cosine; and the corresponding distance 854 multiplied by 4 gives 343 miles, the distance.

By Gunter's Scale.

The extent from 98° the difference of latitude, to 60° the difference of longitude on numbers, being laid the same way from 35°, the complement of the middle latitude on lines, will reach to a certain point beyond the termination of the lines on the scale. Now the extent between this point and 90° on lines, will reach from 45° to 73° 24', the course on the line of tangents. And the extent from 73° 24' the course, to 35° the complement of the middle latitude on the line of lines, being laid the same way from 60° the difference of longitude, will reach to 343 the distance on the line of numbers.

The true course, therefore, from the island of May to the Naze of Norway is N 73° 24 E, or ENE; E nearly; but as the variation at the May is 2° points well.

PROB. I. Given the latitudes and the longitudes of two places, to find the course and distance between them.

EXAMPLE. Required the course and distance from the island of May, in latitude 35° 0' 12 N, and longitude 37° 50', to the Naze of Norway, in latitude 57° 0' 50 N, and longitude 7° 27 E?

Latitude Isle of May - 35° 0' 12 N - 56° 0' 12
Latitude Naze of Norway - 57° 0' 50 N - 57° 50

Difference of latitude 1° 38' 58' - 114. 2
Middle latitude 56° 50' 50' 57° 1
Practice.

Middle

Latitude

Sailing.

NAVIGATION.

well, therefore the course per compass from the May is E; S.

PROB. II. Given one latitude, course, and distance failed, to find the other latitude and difference of longitude.

Example. A ship from Brest, in latitude 48° 23' N. and longitude 4° 30' W. failed SW' W 238 miles. Required the latitude and longitude come to?

By Construction. With the course and distance construct the triangle ABC (fig. 20.), and the difference of latitude AB being measured, will be found equal to 142 miles; hence the latitude come to is 46° 1' N., and the middle latitude 47° 12'. Now make the angle DCB equal to 47° 12'; and DC being measured, will be 281, the difference of longitude: hence the longitude come to is 9° 11' W.

By Calculation.

To find the difference of latitude.

As the cosine of middle latitude 281 on numbers.

So is the difference of long. 10,00000

Hence the latitude come to is 46° 1' N., and middle lat. 47° 12'.

To find the difference of longitude (d).

As the cosine of Mid. Lat. 47° 12' 9.83215

so is the distance, 47 points 9.90489

to the difference of longitude 141.8 2.15161

Latitude of Brest, 48° 23' N. 48° 23' N.

Difference of Lat. 2 22 S. half 1 11 S.

Lat. come to 46° 1' N. Mid. Lat. 47 12'.

To find the difference of longitude (d).

As the cosine of Mid. Lat. 47° 12' 9.83215

so is the distance, 47 points 9.90489

to the difference of longitude 141.8 2.15161

Longitude of Brest - 48° 23' 1.3 49527

Difference of longitude - 4 41 W.

Longitude come to - 9 11 W.

By Inversion.

To the course 47 points, and distance 238 miles, the difference of latitude is 141.8, and the departure 191.1. Hence the latitude come to is 46° 1' N., and middle latitude 47° 12'. Then to middle latitude 47° 12', and departure 191.1 in a latitude column, the corresponding distance is 281', which is the difference of longitude.

By Gunter's Scale.

The extent from 8 points to 32 points, the complement of the course on fine rhumbs, being laid the same way from the distance 238, will reach to the difference of latitude 142 on the line of numbers; and the extent from 42° 48' the complement of the middle latitude, to 53° 26', the course on the line of rhumbs will reach from the distance 238 to the difference of longitude 281 on numbers.

PROB. III. Given both latitudes and course, required the distance and difference of longitude?

Example. A ship from St. Antonio, in latitude 17° 0' N., and longitude 24° 25' W., failed NW', N. till by observation her latitude is found to be 28° 34' N.

Required the distance failed, and longitude come to?

Latitude St. Antonio 17° 0' N. 17° 0' N.

Latitude by observation 28 34 N. 28 34 N.

Difference of lat. 11 34 = 604 m 45 34

Middle lat. 22 47

By Construction.

Construct the triangle triangle ABC (fig. 19), with the given course and difference of latitude, and make the angle BCD equal to the middle latitude. Now the distance AC and difference of longitude DC being measured, will be found equal to 864 and 558 respectively.

By Calculation.

To find the distance. As radius, - 10,00000

Is to the secant of the course 34 points 10,09517

So is the difference of lat. 694 2.84136

To the distance 864 2.93653

To find the difference of longitude.

As the cosine of middle latitude 22° 47' 9.96472

Is to the tangent of the course 34 points 9.87020

So is the difference of latitude 694 2.84136

To the difference of longitude 558.3 2.74664

Longitude of St. Antonio - 24° 25' W.

Difference of longitude, - 9 18 W.

Longitude come to - 33 43 W.

By Inversion.

To course 34 points, and difference of latitude 231,3 one th. of that given, the departure is 171.6, and distance 288, which multiplied by 3 is 864 miles.

Again to the middle latitude 22° 47', or 23°, and departure 171.6 in a latitude column, the distance is 186, which multiplied by 3 is 558, the difference of longitude.

By Gunter's Scale.

The extent from 47 points, the complement of the course, to 8 points on the line of fine rhumbs, will reach from the difference of latitude 694 to the distance 864 on numbers; and the extent from the course 36° 34' to 65° 15', the complement of middle latitude on rhumbs, will reach from the distance 864 to the difference of longitude 558 on numbers.

PROB. IV. Given one latitude, course, and departure, to find the other latitude, distance, and difference of longitude.

Example. A ship from latitude 26° 30' N. and longitude 45° 30' W. failed NE; N. till her departure was 216 miles. Required the distance run, and latitude and longitude come to?

By Construction.

With the course and departure construct the triangle ABC (fig. 20.), and the difference of latitude being measured, will be found equal to 340 and 363 respectively. Hence the latitude come to is 30° 53' and middle latitude 28° 42'. Now make the angle BCD equal to the middle latitude, and the difference of longitude DC applied to the scale will measure 24° 46'.

By

(v) This proportion is obvious, by considering the whole figure as an oblique angled triangle.
NAVIGATION.

By Calculation.

To find the distance.

As the sine of the course is to radius, so is the departure.

To find the difference of latitude.

As the tangent of the course is to radius, so is the departure.

To find the difference of longitude.

As the tangent of the course is to radius, so is the departure.

Difference of latitude.

Latitude come to

39° 53' M Id.lat. 28° 42'

To find the difference of longitude.

As radius is to the second of the middle lat. 28° 42', so is the departure.

To find the difference of longitude.

Longitude left,

45° 30' W.

Difference of longitude

4° 6 E.

Longitude come to

41° 24' W.

By Inspecion.

Under the course 3½ points, and opposite to 108 half the departure, the distance is 170, and difference of latitude 131'; which doubled, give 340 and 263 for the difference of the course and difference of latitude respectively.

Again, to middle latitude 28° 42', and departure 108, the distance is 123; which doubled is 246 the difference of longitude.

By Gunter's Scale.

The extent from the course 3½ points, on fine rhumbs, to the departure 216 on numbers, will reach from 8 points on fine rhumbs to about 340, the difference on numbers; and the same extent will reach from 45 points, the complement of the course, to 263, the difference of latitude on numbers; and the extent from 61° 18' the complement of the middle latitude, to 90° 30' on fines, will reach from the departure 216 to the difference of longitude 246 on numbers.

Prob. V. Given both latitudes and distance; to find the course and difference of longitude.

Example. From Cape Sable, in latitude 43° 34' N., and longitude 65° 39' W., a ship sailed 246 miles on a direct course between the south and east, and is then by observation in latitude 40° 48' N. Required the course and longitude in?

Latitude Cape Sable,

43° 48' N.

Latitude by observation,

40° 48' N.

Difference of latitude,

2° 36' = 156° 24' 12".

Middle latitude 42° 6'

By Construction.

Make AB (fig. 22.) equal to 156 miles; draw BC perpendicular to AB, and make AC equal to 246 miles. Draw CD, making with CB an angle of 42° 6' the middle latitude. Now DC will be found to measure 256, and the course or angle A will measure 50° 39'.

By Calculation.

To find the course.

As the difference of latitude 156 is to the difference of latitude 156, so is the tangent of the course to the tangent of the course.

To find the difference of longitude.

As the difference of longitude 246 is to the difference of longitude 246, so is the tangent of the course to the tangent of the course.

Longitude Cape Sable,

256° 24' 8° 26'

Difference of longitude

5° 39' W.

Longitude come to

61° 23 W.

By Inspecion.

The distance 246, and difference of latitude 156, are found to correspond above 41 points, and the departure is 193.1. Now, to the middle latitude 43° 34', and departure 190.1 in a latitude column, the corresponding distance is 256, which is the difference of longitude required.

By Gunter's scale.

The distance from 246, the difference to 156, the difference of latitude on numbers, will reach from 90° 30' to about 39° 1', the complement of the course on the line of fines; and the extent from 246°, the complement of the middle latitude, to 50° 39', the course on fines, will reach from the distance 246 to the difference of longitude 256 on numbers.

Prob. VI. Given both latitudes and departure; fought the course, distance, and difference of longitude.

Example. A ship from Cape St. Vincent, in latitude 37° 2' N., longitude 9° 2' W., sails between the south and west; the latitude come to is 15° 16', and departure 838 miles. Required the course and distance run, and longitude come to?

Latitude Cape St. Vincent,

37° 2' N.

Latitude come to

18° 16 N.

Difference of latitude

18° 46' 1126

Middle latitude 27° 39'

By Construction.

Make AB (fig. 22.) equal to the difference of latitude 1126 miles, and BC equal to the departure 838, and join AC; draw CD so as to make an angle with CB equal to the middle latitude 27° 39'. Then the course being measured on chords is about 35° 21', and the distance and difference of longitude, measured on the line of equal parts, are found to be 1403 and 945 respectively.

By Calculation.

To find the course.

As the difference of latitude 1126 is to the departure 838, so is the tangent of the course to the tangent of the course.

To the tangent of the course 36° 39'

9.87170

To
NAVIGATION

Practice.

Middle
Sailing.

To find the distance.

As radius - - - 10.00000
is the secant of the course 36° 39'
so is the difference of latitude 1126
- 3.01514

to the distance - 1403
To find the difference of longitude.

As radius - - - 10.00000
is the secant of the mid. lat. 27° 39'
so is the departure - 838
- 2.52324

to the difference of longitude 946
Longitude Cape St Vincent - 9° 2 W.
Difference of longitude - - 15 46 W.

Longitude come to - 24 48 W.

By Inversion.

One-tenth of the difference of latitude 112.6, and of the departure 83.8, are found to agree under 31 points, and the corresponding distance is 140, which multiplied by 10 gives 1400 miles. And to middle latitude 27° 39', and 209.5 one-fourth of the departure in a latitude column, the distance is 236.5; which multiplied by 4 is 946, the difference of longitude.

By Gunter's Scale.

The extent from the difference of latitude 1126 to the departure 838 on numbers, will reach from 45° to 36°; the course on tangents; and the extent from 53° 41', the complement of the course to 90° on lines, will reach from 1126 to 1403 the distance on numbers. Lastly, the extent from 62° 3' the complement of the middle latitude, to 90° on lines, will reach from the departure 838 to the difference of longitude 946 on numbers.

PROB. VII. Given one latitude, distance, and departure, to find the other latitude, course, and difference of longitude.

Example. A ship from Bordeaux in latitude 44° 50' N, and longitude 0° 35' W, failed between the north and west 374 miles, and made 210 miles of sailing.

Required the course and latitude and longitude come to?

By Construction.

With the given distance and departure make the triangle ABC (fig. 23.) Now the course being measured on the line of chords is about 34° 21; and the difference of latitude on the line of numbers is 309 miles: hence the latitude come to, is 49° 55' N, and middle latitude 47° 25'. Then make the angle BCD equal to 47° 25', and DC measured will be 310 miles, the difference of longitude.

By Calculation.

To find the course.

As the distance - 374 - 2.57287
is to the departure - 210 - 2.32222
so is radius - - - 10.00000

to the fine of the course 34° 10' - 9.74935
To find the difference of latitude.

As radius - - - 10.00000
is to the cosine of the course 34° 10'
so is the distance - 374
- 2.57287

to the difference of latitude 309.4 - 2.49599
### NAVIGATION

<table>
<thead>
<tr>
<th>Middle Latitude Sailing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference of latitude</td>
</tr>
<tr>
<td>As the difference of latitude 158</td>
</tr>
<tr>
<td>is to the departure 220</td>
</tr>
<tr>
<td>fo is radius 10.000000</td>
</tr>
<tr>
<td>to the tangent of the course 54° 19' 510.14376</td>
</tr>
<tr>
<td>As radius 10.000000</td>
</tr>
<tr>
<td>is to the secant of the course 54° 19' 10.234106</td>
</tr>
<tr>
<td>fo is the difference of latitude 158 10.219866</td>
</tr>
<tr>
<td>to the distance 270.9 2.43276</td>
</tr>
</tbody>
</table>

### Practice

<table>
<thead>
<tr>
<th>Middle Latitude Sailing</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>To the cosine of the middle latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half difference of latitude 2 42</td>
</tr>
<tr>
<td>Latitude failed from 51 40</td>
</tr>
<tr>
<td>Latitude come to 46 16</td>
</tr>
</tbody>
</table>

**By Infection.**

To the course 3° points, and half the distance 219 miles, the departure is 147°, and difference of latitude 162.2°; which doubled is 324.4°. Again, to half the difference of longitude 224 in a distance column, the difference of latitude is 149.9 above 48°, and 146.9 over 49°.

Now, as 30 : 29 : 60 : 38

Hence the middle latitude is 48° 38'; the latitude failed from is therefore 51° 40', and latitude come to 46° 16'.

**By Gunter's Scale.**

The extent from 8 points to 45 points, the complement of the course on fine rhumbs, will reach from the distance 438 miles to the difference of latitude 3245 on numbers. And the extent from the difference of longitude 448, to the distance 438 on numbers, will reach from the course 42° 11' to the complement of the middle latitude 41° 2' on fine. Hence the latitude left is 51° 40', and that come to 46° 16'.

**Example.** From a port in south latitude a ship sailed SWW, and has made 690 miles of difference of latitude, and 20° 38' of difference of longitude.—Required both latitudes and distance?

**By Construction.**

Construct the triangle ABC (fig. 26.) with the given course and difference of latitude, and make CD equal to 1228 the difference of longitude. Then AC applied to the scale will measure 1088 miles; and the middle latitude BCD will measure 40° 47'. Hence the latitude left is 41° 2', and the latitude come to 54° 32'.

**By Calculation.**

To find the distance.

As radius 10.000000

is to the secant of the course 41 pts. 10.01764
fo is the difference of latitude 690 2.83885

to the distance 1088 3.03649
To find the middle latitude.

As the difference of longitude 1228 3.08920
is to the distance 1088 3.03649
fo is the fine of the course 41 pts. 9.88819

to the cosine of the middle latitude 46° 47' 9.83548
Half difference of latitude 5 45

Latitude failed from 41 2
Latitude come to 52 32

**By Infection.**

To the course 41 points, and one-fourth of the given difference of latitude 172.5 the departure is 210.2
Middle Latitude.

By Gunter's Scale.

The extent from the distance 458 to the difference of latitude 296 on numbers, will reach from 90° to 40° 16 the complement of the course on lines: and the extent from the difference of longitude 437 to the distance 458 on numbers, will reach from the course 49° 44' to the complement of the middle latitude 53° 6 on the line of lines: Hence the latitudes are 34° 20' and 39° 22' respectively.

Prob. XII. Given the distance, middle latitude, and difference of longitude, to find both latitudes and course.

Example. The distance is 384 miles between the south and east, the middle latitude 54° 6', and difference of longitude 6° 36'. Required both latitude and course.

By Construction.

With the middle latitude 54° 6', and difference of longitude 396, construct the triangle BCD (fig. 28.), and make AC equal to the given distance 384 miles. Then the course BAC will be found to measure 37° 12', and the difference of latitude AB 306 miles. Hence the latitude failed from is 56° 39', and that come to 51° 33'.

By Calculation.

To find the course.

As the distance is to the difference of longitude

so is the course of middle latitude

hence the course is 37° 12'.

To find the difference of latitude.

As radius is to the distance

so is the difference of latitude

hence the difference is 384.

Prob. XIII. To determine the difference of longitude made good upon compound courses, by middle latitude failing.

4 T

RUL

Rule
The above method is that always practiced to find the difference of longitude made good in the course of a day's run; and will, no doubt, give the difference of longitude tolerably exact in any probable run a ship may make in that time, especially near the equator. But in a high latitude, when the distances are considerable, this method is not to be depended on.-

To illustrate this, let a ship be supposed to fail from latitude 57° N, as follows: E 240 miles, N 240 miles, W 240 miles, and S 240 miles; then, by the above method, the ship will be come to the same place left. It will, however, appear evident from the following consideration, that this is by no means the case; for let two ships, from latitude 61° N, and distant 240 miles, sail directly south till they are in latitude 57° N; now their distance being computed by Problem IV. of Parallel Sailing, will be 296.6 miles; and, therefore, if the ship failed as above, she will be 29.6 miles west of the place failed from; and the error in longitude will be equal to 296 x secant 61 — secant 57° = 29.6 x secant 57°.

Theorems might be investigated for computing the errors to which the above method is liable. These corrections may, however, be avoided, by using the following method.

Rule II. Complete the traverse table as before, to which annex five columns: the first column is to contain the several latitudes the ship is in at the end of each course and distance; the second, the sums of each following pair of latitude; the third, half the sums, or the difference of the sums of the columns, according to the name of the departure. Then the difference of the sums of the east and west columns will be the difference of longitude made good, of the same name with the greater.

Ex. A ship from Halliford in Iceland, in lat. 64° 30' N, long. 27° 15' W, failed as follows: SSW 46 miles, SW 61 miles, SW 59 miles, SE 86 miles, SE 76 miles. Required the lat. and long. come to?

**Traverse Table.**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Diff.</th>
<th>E</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSW</td>
<td>46</td>
<td>42.5</td>
<td>17.6</td>
</tr>
<tr>
<td>SW</td>
<td>61</td>
<td>43.1</td>
<td>43.0</td>
</tr>
<tr>
<td>S 2 W</td>
<td>59</td>
<td>57.9</td>
<td>11.5</td>
</tr>
<tr>
<td>S E</td>
<td>86</td>
<td>47.8</td>
<td>71.5</td>
</tr>
<tr>
<td>SE 2 E</td>
<td>76</td>
<td>72.7</td>
<td>22.0</td>
</tr>
</tbody>
</table>

264.0 92.5 72.2 72.2

By Rule I. 21.3

<table>
<thead>
<tr>
<th>Latitudes</th>
<th>Successive Sums.</th>
<th>Middle Latitudes</th>
<th>Diff. of Longitude.</th>
</tr>
</thead>
<tbody>
<tr>
<td>64° 30' N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63 48</td>
<td>128° 18'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63 5</td>
<td>125 53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62 7</td>
<td>125 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61 19</td>
<td>121 26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 6</td>
<td>121 25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Difference of Longitude - 34.1

<table>
<thead>
<tr>
<th>Longitude Halliford</th>
<th>27.15 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitude in</td>
<td>26.41 W</td>
</tr>
</tbody>
</table>
Practice.

NAVIGATION.

That is, the difference of longitude is equal to the meridional difference of latitude multiplied by the tangent of the course, and divided by the radius.

This equation answers to a right-angled rectilinear triangle, having an angle equal to the course; the adjacent fide equal to the meridional difference of latitude, and the opposite fide the difference of longitude. This triangle is therefore similar to a triangle constructed, with the course and difference of latitude, according to the principles of plane sailing, and the homologous fides will be proportional. Hence if, in fig. 29, the angle \( A \) represents the course \( AB \) the difference of latitude, and if \( AD \) be made equal to the meridional difference of latitude; then \( DE \), drawn perpendicular to \( AD \), meeting the distance produced to \( E \), will be the difference of longitude.

It is scarce necessary to observe, that the meridional difference of latitude is found by the same rules as the proper difference of latitude; that is, if the given latitudes be of the same name, the difference of the corresponding meridional parts will be the meridional difference of latitude; but if the latitudes are of a contrary denomination, the sum of these parts will be the meridional difference of latitude.

**Example.** Required the course and distance between Cape Finisterre, in latitude 43° 52' N, longitude 9° 17' W, and Port Praya in the island of St Jago, in latitude 14° 54' N, and longitude 23° 29' W.

<table>
<thead>
<tr>
<th>Latitude Port Praya</th>
<th>14° 54' N</th>
<th>Mer. parts</th>
<th>2852</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference of lat.</td>
<td>27° 58'</td>
<td>Mer. diff. lat.</td>
<td>1948</td>
</tr>
<tr>
<td>Longitude Cape Finisterre</td>
<td>9° 17' W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitude Port Praya</td>
<td>23° 29' W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diff. longitude</td>
<td>14° 12'</td>
<td>852</td>
<td></td>
</tr>
</tbody>
</table>

**By Correction.**

Draw the straight line \( AD \) (fig. 29.) to represent the meridian of Cape Finisterre, upon which lay off \( AB \), \( AD \) equal to 1678 and 1948, the proper and meridional differences of latitude; from \( D \) draw \( DE \) perpendicular to \( AD \), and equal to the difference of longitude 852 join \( AE \), and draw \( BC \) parallel to \( DE \); then the distance \( AC \) will measure 1831 miles, and the course \( BAC \) 23° 37'.

**By Calculation.**

To find the course.

As the meridian difference of lat. 1948 3.28959
is to the difference of longitude 852 2.93044
fo is radius - - 10.00000
to the tangent of the course 23° 37' 9.64085
To find the distance.

As radius - - 10.00000
is to the fect of the course 23° 37' 10.03798
fo is the difference of latitude 1678 3.22479
to the distance - 1851 3.26277

Plate CCCCXXXVIII.
NAVIGATION.

By Inspection.

As the meridian difference of latitude and difference of longitude are too large to be found in the tables, let the tenth of each be taken; these are 194.8 and 85.2 respectively. Now these are found to agree nearest under 24°; and to 167.8, one tenth of the proper difference of latitude, the distance is about 183 miles, which multiplied by 10 is 1830 miles.

By Gunter's Scale.

The extent 1948, the meridional difference of latitude, to 852, the difference of longitude, on the line of numbers, will reach from 45° to 23° 37', the course on the line of tangents. And the extent from 66° 25', the complement of the course to 90° on lines, will reach from 1678, the proper difference of latitude, to 1831, the distance on the line of numbers.

PROB. II. Given the course and distance failed from a place whose situation is known, to find the latitude and longitude of the place come to.

Example. A ship from Cape Hinlopen in Virginia, in latitude 38° 47' N, longitude 75° 4' W, failed 267 miles NEbN. Required the ship's present place?

By Conjunction.

With the course and distance failed compute the triangle ABC (fig. 30.); and the difference of latitude AB being measured, is 222 miles; hence the latitude come to is 43° 20' N, and the meridional difference of latitude 293. Make AD equal to 293; and draw DE perpendicular to AD, and meeting AC produced in E; then the difference of longitude DE being applied to the scale of equal parts will measure 196; the longitude come to is therefore 71° 48' W.

By Calculation.

To find the difference of latitude,

As radius

is to the cosine of the course, 3 points

so is the distance

to the difference of latitude 222

Lat. Cape Hinlopen = 38° 47' N. Mer. parts 2528

Difference of lat. 3 42 N.

Latitude come to 42° 29' N. Mer. parts 281

Meridional difference of lat. 293

To find the difference of longitude,

As radius

to the tangent of the course, 3 points

so is the mer. diff. of latitude

to the difference of longitude 195.8

Longitude Cape Hinlopen 75° 4' W

Difference of longitude - 3 16 E

Longitude come to 71° 48 W

By Gunter's Scale.

To the course 3 points, and distance 267 miles, the difference of latitude is 2.22 miles: hence the latitude in, is 43° 20', and the meridional difference of latitude 293. Again, to course 3 points, and 146.6 half the mer. difference of latitude, the departure is 97-9, which doubled is 195.8, the difference of longitude.

By Gunter's Scale.

The extent from 8 points to the complement of the course 5 points on fine rhumbs, will reach from the distance 267 to the difference of latitude 222 on numbers; and the extent from 4 points to 3 points on tangent rhumbs, will reach from the meridional difference of latitude 293 to the difference of longitude 196 on numbers.

PROB. III. Given the latitudes and bearing of two places, to find their distance and difference of longitude.

Example. A ship from Port Canfo in Nova Scotia, in latitude 45° 20' N, longitude 60° 55' W, failed SE 45° 14' N. Required the distance failed, and longitude come to?

Lat. Port Canfo - 45° 20' N. Mer. parts 3058

Lat. in by observation 41° 14 N. Mer. parts 2720

Difference of lat. - 4 6 Mer. diff. lat. 338

By Conjunction.

Make AB (fig. 31.) equal to 246, and AD equal to 338; draw AE, making an angle with AD equal to 32 points, and draw BC, DE perpendicular to AD. Now AC being applied to the scale, will measure 332, and DE 306.

By Calculation.

To find the distance,

As radius

is to the secant of the course, 3 4 points

so is the difference of latitude

to the distance 332

Longitude Port Canfo - 60° 55' W

Difference of longitude - 5 6 E

Longitude in - 55° 49 W

By Inspection.

Under the course 32 points, and opposite to half the difference of latitude, 123 in a latitude column is 166 in a distance column, which doubled is 332 the distance; and opposite to 169, half the meridional difference of latitude in a latitude column, is 153 in a departure column, which doubled is 306, the difference of longitude.

By Gunter's Scale.

The extent from the complement of the course 42 points to 8 points on fine rhumbs, will reach from the difference of latitude 246 m. to the distance 332 on numbers; and the extent from 4 points to 3 points on tangent rhumbs, will reach from the meridional difference of latitude 338 to the difference of longitude 306 on numbers.

PROB. IV. Given the latitude and longitude of the place failed from, the course, and departure; to find the distance, and the latitude and longitude of the place come to.

Example. A ship failed from Sallee in Latitude 35° 58' N, longitude 6° 20' W, the corrected course was NWbW, and departure 420 miles. Required the
Mercator's Practice.

NAVIGATION.

Mercator's the distance run, and the latitude and longitude come Sailing to?

By Construction.

With the course and departure construct the triangle Plate ABC (fig. 32.) now AC and AB being measured, will be found equal to 476 and 224 respectively; hence the radius to is 37° 42' N, and meridional difference of latitude 276. Make AD equal to 276; and draw DE perpendicular thereto, meeting the distance produced in E; then DE applied to the scale will be found to measure 516'. The longitude in therefore is 14° 56' W.

By Calculation.

To find the distance.

As radius - - 10,00000
is to the co-tangent of the course, 51 pts 10,05457
so is the departure - - 420 2,62325

to the distance - - 576.2 2,67782
To find the difference of latitude.

As radius - - 10,00000
is to the co-tangent of the course, 51 pts 9,72796
so is the departure - - 420 2,62325

to the difference of latitude - - 224-5 2,35121

Lat. of Sallee 33° 58' N Mer. parts 2169
Diff. of lat. 8 44 N

Latitude in 37 42 N Mer. parts 2445

Mer. difference of latitude 276
To find the difference of longitude.

As radius - - 10,00000
is to the tangent of the course, 51 pts 10,27204
so is the mer. diff. of latitude 276 2,44901

to the difference of longitude 516.3 2,71295

Longitude of Sallee - - 6° 20' W
Difference of longitude - - 8 36 W

Longitude in - - 14 56 W

By Inspection.

Above 51 points the course, and opposite to 210 half the departure, are 238 and 112; which doubled, we have 476 and 224, the distance and difference of latitude respectively. And to the same course, and opposite to 138, half the meridional difference of latitude, in a latitude column, is 258 in a departure column; which being doubled is 516, the difference of longitude.

By Gunter's Scale.

The extent from 51 points the course, and opposite to 420 on numbers, will reach from 8 points on fine rhumbs to the distance 476 on numbers; and from the complement of the course 21 points on fine rhumbs to the difference of latitude 224 on numbers.

Again, the extent from difference of latitude 224 to the meridional difference of latitude 276 on numbers, will reach from the departure 420 to the difference of longitude 516 on the same line.

PROB. V. Given the latitudes of two places, and their distance, to find the course and difference of longitude.

Example. A ship from St Mary's, in latitude 36° 57' N, longitude 25° 9' W, sailed on a direct course between the north and east 1162 miles, and is then by observation in latitude 49° 57' N. Required the course and longitude come to?

Lat. of St Mary's - 36° 57' N Mer. parts 3470
Lat. come to - 49 57 N Mer. parts 2380

Difference of lat. 13 0 Mer. diff. lat. 1081

By Construction.

Make AB (fig. 33.) equal to 780, and AD equal to 1162; draw BC, DE perpendicular to AD; make AC equal to 1162 m. and through AC draw ACE. Then the course or angle A being measured, will be found equal to 47° 50', and the difference of longitude DE will be 1194.

By Calculation.

To find the course.

As the distance - - 1162 3,06521
is to the difference of latitude, 780 2,89209
so is radius - - - 10,00000

to the cosine of the course - - 47° 50' 9,82688

To find the difference of longitude.

As radius - - - 10,00000
is to the tangent of the course, 47° 50' 10,03022
so is the mer. diff. of latitude 1081 3,0383

to the difference of longitude 1194 3,07685

Longitude of St Mary's - 25° 9' W
Difference of longitude - 19 54 E

Longitude in - - 5 15 W

By Inspection.

Because the distance and difference of latitude exceed the limits of the table, take the tenth of each; there are 116.2 and 78.0. Now these are found to agree nearest above 45 points, which is therefore the course; and to this course, and opposite to 108.1, one tenth of the meridional difference of latitude, in a latitude column, is 119.3 in a departure column, which multiplied by 10 is 1193, the difference of longitude.

By Gunter's Scale.

The extent from the distance 1162 m. to the difference of latitude 780 m. on numbers, will reach from 90° to 42° 10' in the line of lines. And the extent 45°, to the course 47° 50' on the line of tangents, will reach from the meridional difference of latitude 1081 to the difference of longitude 1194 on numbers.

PROB. VI. Given the latitudes of two places, and the departure; to find the course, distance, and difference of longitude.

Example. From Aberdeen, in latitude 57° 9' N, longitude 3° 9' W. a ship sailed between the south and east till her departure is 146 miles, and latitude come to 58° 32'. Required the course and distance run, and longitude come to?

Latitude Aberdeen 57° 0' N mer. parts 4199
Latitude come to 58° 32 N mer. parts 817

Difference of latitude 3 37 mer. diff. of lat. 382,
NAVIGATION.

By Construction.

With the difference of latitude 217', and departure 146', construct the triangle ABC (fig. 34.), make AD equal to 382, draw DE parallel to BC, and produce AC to E: Then the course BAC will measure 33° 56', the distance AC 261', and the difference of longitude DE 257'.

By Calculation.

To find the course.

As the difference of latitude 217, is to the tangent of the course 33° 56' to find the distance. 257.

As the difference of latitude 217, is to the tangent of the course 33° 56', so is radius - to - - - 10,00000.

to the tangent of the course 33° 56', so is radius 9.82789.

As radius - - - 10,00000.

to the tangent of the course 33° 56', so is radius - - - 10,08109.

to the tangent of the course 33° 56', so is radius 2.33646.

Longitudes of Aberdeen Difference of longitude

2° 9' W 4° 17' E

Longitude come to 2° 8' E

By Inspection.

The difference of latitude 217, and departure 146, are found to agree nearest under 34°, and the corresponding distance is 262 miles. To the same course, and opposite to 190°, the nearest to 191 half the meridional difference of latitude is 128.6 in a departure column, which doubled is 257, the difference of longitude.

By Gunter's Scale.

The extent from the difference of latitude 217, to the departure 146 on numbers, will reach from 45° to about 34°, the course on the line of tangents; and the same extent will reach from the meridional difference of latitude 382 to 257, the difference of longitude on numbers.—Again, the extent from the course 34° to 90 on fines, will reach from the departure 146 to the distance 261 on numbers.

Prob. VII. Given one latitude, distance, and departure; to find the other latitude, course, and difference of longitude.

Example. A ship from Naples, in latitude 40° 51' N, longitude 14° 14' E, sailed 252 miles on a direct course between the south and west, and made 173 miles of weighting. Required the course made good, and the latitude and longitude come to?

By Construction.

With the distance and departure make the triangle ABC (fig. 35.) as formerly.—Now the course BAC being measured by means of a line of chords will be found equal to 43° 21', and the difference of latitude applied to the scale of equal parts will measure 183°; hence the latitude come to is 37° 48' N, and meridional difference of latitude 237°—Make AD equal to 237, and complete the figure, and the difference of longitude will measure 224°; hence the longitude in is 10° 30' E.

By Calculation.

As the distance 252, is to the departure 173, so is radius - to - - - 10,00000.

to the sine of the course 43° 21', so is radius 9.82665.

To find the difference of latitude.

As radius - - - 10,00000.

is to the tangent of the course 43° 21', so is the difference of latitude 146° to 9.82664.

is to the mer. diff. of latitude 237, so is the distance 252, to 2.40140.

to the difference of longitude 183.2, so is the distance 2.26304.

Latitude of Naples 40° 51' N. Mer. parts 2690.

Difference of latitude 3° 3'.

Latitude come to 37° 48' N. Mer. parts 2453.

Meridional difference of latitude 237°.

To find the difference of longitude.

As radius - - - 10,00000.

is to the tangent of the course 43° 21', so is the mer. diff. of latitude 237, to 9.82664.

is to the mer. diff. of latitude 237, so is the sine of the course 43° 21', to 10.00000.

is to the mer. diff. of latitude 237, so is the sine of the course 43° 21', to 9.97497.

is to the mer. diff. of latitude 237, so is the sine of the course 43° 21', to 2.34972.

Longitude of Naples 14° 14'. E.

Difference of longitude 3° 44', W.

Longitude in 10° 30' E.

By Inspection.

Under 45° and opposite to the distance 252 m. the departure is 173.8, and under 44°, and opposite to the same distance, the departure is 175.0.

Then as 3.2 : 1.2 :: 60 : 22.

Hence the course is 43° 22'.

Again, under 45° and opposite to 118.5, half the meridional difference of latitude in a latitude column, is 110.5 in a departure column; also under 44°, and opposite to 118.5 is 114.4.

Then as 3.2 : 1.2 :: 3.9 : 1.5.

And 110.5 + 1.5 = 112, which doubled is 224, the difference of longitude.

By Gunter's Scale.

The extent from the distance 252 on numbers to 90 on fines will reach from the departure 173 on numbers to the course 43° on fines; and the same extent that will reach from the complement of the course 46° on fines will reach to the difference of latitude on numbers.—Again, the extent from 45° to 43° on tangents will reach from the meridional difference of latitude 237 to the difference of longitude 224 on numbers.

Prob. VIII. Given one latitude, course and difference of longitude, to find the other latitude and distance.

Example. A ship from Tercera, in latitude 38° 45' N, longitude 27° 6' W, sailed on a direct course, which, when corrected, was N 32° E, and is found by observation to be in longitude 18° 24' W. Required the latitude came to, and distance sailed?

Longitude of Tercera 27° 6' W.

Longitude in 18° 24' W.}

Difference of longitude - - - 8 42 = 522.

By
Mercator's Conformity. By Construction.

Make the right angled triangle ADE (fig. 36) having the angle A equal to the course 32°, and the side DE equal to the difference of longitude 522, then AD will measure 855, which added to the meridional parts of the latitude left, will give the difference of latitude come to 48° 46', hence the difference of latitude is 601: make AB equal thereto, to which let BC be drawn perpendicular; then AC applied to the scale will measure 708 miles.

By Calculation.

To find the meridional difference of latitude.

As radius, is to the co-tangent of the course 32° 0' 10.00000
so is the difference of longitude 5 22 2.71767
to the mer. difference of latitude 835 2.92188
Latitude of Tercera 38° 45' N Mer. parts 2526
Mer. diff. of lat. 835

Latitude come to 48 46 N. Mer. parts. 3361

Difference of latitude 10 1 = 601 miles.

To find the distance.

As radius, is to the secant of the course 32° 0' 10.00000
so is the difference of latitude 601 2.77887
to the distance 707.7 2.85045

By Inspection.

To course 32°, and opposite to 130.5, one fourth of the given difference of latitude in a departure column, the difference of latitude is 208.8, which multiplied by 4 is 835, the meridional difference of latitude; hence the latitude in is 48° 46' N, and difference of latitude 601.

Again, to the same course, and opposite to 200, one third of the difference of latitude, the distance is 236, which multiplied by 3 gives 708 miles.

By Gunter's Scale.

The extent from the course 32° to 45° on tangents will reach from the difference of longitude 522 to the meridional difference of latitude 835 on numbers.—And the extent from the complement of the course 58° to 90° on lines, will reach from the difference of latitude 601 to the distance 708 miles on numbers.

Prob. IX. To find the difference of longitude made good upon compound courses.

Rule. With the several courses and distances, complete the Traverse Table, and find the difference of latitude, departure, and course made good, and the latitude come to as in Traverse Sailing. Find also the meridional difference of latitude.

Now, to the course and meridional difference of latitude in a latitude column, the corresponding departure will be the difference of longitude, which applied to the longitude left will give the ship's present longitude.

Example. A ship from Port St Julian, in latitude 49° 10' S, longitude 68° 44' W, failed as follows, ESE 53 miles, SE by E 74 miles, E by N 68 m. SE by E 47 miles, and E 84 miles. Required the ship's present place?

Although the above method is that usually employed at sea to find the difference of longitude, yet as it has been already observed, it is not to be depended on, especially in high latitudes; in which case the following method becomes necessary.

Rule II. Complete the Traverse Table as before, to which annex five columns. Now with the latitude left, and the several differences of latitude, find the successive latitudes, which are to be placed in the first of the annexed columns; in the second the meridional parts corresponding to each latitude is to be put; and in the third, the meridional differences of latitude.

Then to each course, and corresponding meridional difference of latitude, find the difference of longitude, which place in the fourth or fifth columns, according as the course is easterly or westerly; and the difference between the sums of these columns will be the difference of longitude made good upon the whole of the same name with the greater.

Remarks.

1. When the course is north or south, there is no difference of longitude.

2. When the course is east or west, the difference of longitude cannot be found by Mercator's Sailing; in this case the following rule is to be used.

To the nearest degree to the given latitude taken as a course, find the distance answering to the departure in a latitude column: this distance will be the difference of longitude.
**EXAMPLE II.** A ship from latitude 78° 15' N, longitude 28° 84' E, sailed the following courses and distances. The latitude come to is required, and the longitude, by both methods: the bearing and distance of Hcluit's head-land, in latitude 79° 55' N, longitude 11° 55' E, is also required.

**Traverse Table.**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Diff.</th>
<th>N</th>
<th>S</th>
<th>E</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW</td>
<td>154</td>
<td></td>
<td>58.9</td>
<td></td>
<td>142.3</td>
</tr>
<tr>
<td>W</td>
<td>96</td>
<td></td>
<td>67.9</td>
<td></td>
<td>67.9</td>
</tr>
<tr>
<td>WNW</td>
<td>89</td>
<td></td>
<td>56.4</td>
<td></td>
<td>68.8</td>
</tr>
<tr>
<td>WSE</td>
<td>110</td>
<td></td>
<td>107.9</td>
<td></td>
<td>21.5</td>
</tr>
<tr>
<td>NWSE</td>
<td>56</td>
<td></td>
<td>45.0</td>
<td></td>
<td>33.4</td>
</tr>
<tr>
<td>SWE</td>
<td>78</td>
<td></td>
<td>73.4</td>
<td></td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>268.2</td>
<td></td>
<td>141.3</td>
<td></td>
<td>47.8</td>
</tr>
<tr>
<td></td>
<td>47.8</td>
<td></td>
<td>264.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By Rule 1st.

Latitude left 78° 15' N, Mer. pts = 7817

Diff. of latitude 2 7 N.

Lat. come to 80 22 N, Mer. pts = 8504

Meridional diff. of latitude 687

As difference of lat. 126.9

is to mer. diff. of latit. 2.10346

so is the departure 264.6

so is the diff. of longitude 242256

Latitude left 315606

Longitude left 28° 14' E.

Longitude in 4 22 E.

The error of this method in the present example, is therefore 1° 23'.

**Longitude Table.**

<table>
<thead>
<tr>
<th>Successive Latitudes</th>
<th>Merid. Parts</th>
<th>Merid. Diff. Lat.</th>
<th>Diff. of Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>78° 15'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78 14</td>
<td>8120</td>
<td>303</td>
<td></td>
</tr>
<tr>
<td>78 6</td>
<td>7774</td>
<td>346</td>
<td></td>
</tr>
<tr>
<td>79 2</td>
<td>8056</td>
<td>282</td>
<td></td>
</tr>
<tr>
<td>80 50</td>
<td>8676</td>
<td>620</td>
<td>123.6</td>
</tr>
<tr>
<td>81 35</td>
<td>8970</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>80 22</td>
<td>8504</td>
<td>406</td>
<td>166.7</td>
</tr>
<tr>
<td>290.3</td>
<td>1639.3</td>
<td></td>
<td>1349.0</td>
</tr>
</tbody>
</table>

Longitude left - 28° 14' E.

Difference of longitude - 22 29 W.

Longitude in - 5 45 E.

To find the bearing and distance of Hcluit's head-land.

Lat. H H. = 79° 55' N, M. P. 8347 Long. 11° 55' E.

Lat. ship = 80 22 N, M. P. 8504 Long. 5 45 E.

Diff. lat. 0 27 M. D. L. 157 D. L. 6 10

Now to 78.5 half the meridional difference of latitude, and 185.0 half the difference of longitude, the course 65°, and opposite to the difference of latitude 27, the distance is 69 miles. Hence Hcluit's head-land bears S 67° E, distant 69 miles.
PROBLEMS OF MERCEER'S SAILING.

CHAP. VII. Containing the Method of resolving the several Problems of Mercator's Sailing, by the Assistance of a Table of Logarithmic Tangents.

Prop. The constant quantity 12.633114 (6) is to the difference or sum of the logarithmic tangents of half the co-latitudes of two places, according as those latitudes are of the same, or a contrary denomination; as the tangent of the course is to the difference of longitude.

Demonstr. Let CABP, Plate CCCXXXVIII. fig. 37, be a section of one fourth of the earth in the plane of the meridian; and let AC be the radius of the equator, and B any given place whose latitude is therefore AB. Draw BD perpendicular to AC, and BE parallel to it; and let BB be a very small portion of the meridian, as one minute. — Now put CA = r, DB = x, BE = y, and z = meridional parts answering to Method of resolving the Problems of Mercator's Sailing.

Then, \( \frac{r}{x} = \frac{r}{x} \times \frac{r + y}{x} \times bn \)

but, \( \frac{r}{x} = \frac{r}{x} \times \frac{r + y}{r - y} \times bn \) is correspondent portion of the enlarged meridian. Now these being put into fluxions, we have:

\[ \frac{1}{r} = \frac{r + y}{x} \times \log \left( \frac{r + y}{r - y} \right) \]

Of which the fluent is,

\[ \frac{1}{r} = \frac{2.302585 \times r \times \log \left( \frac{r + y}{r - y} \right)}{2} \]

Now as the meridional parts are expressed in parts of the equator, this equation becomes,

\[ z = \frac{2.302585 \times x \times \log \left( \frac{r + y}{r - y} \right)}{3.15149} \times \text{log.} \frac{r + y}{r - y} \]

But \( \frac{r + y}{r - y} = \text{log.} \frac{r + \text{fine} \ AB}{r - \text{fine} \ AB} = \text{log.} \frac{\tan \left( 45 + \frac{1}{2} \ AB \right)}{\tan \left( 45 - \frac{1}{2} \ AB \right)} \)

And the tang. \( \left( 45 + \frac{1}{2} \ AB \right) = \frac{1}{\text{log. tang.} \left( 45 + \frac{1}{2} \ AB \right)} = \frac{1}{\text{log. tang.} \left( 45 - \frac{1}{2} \ AB \right)} \)

Therefore \( z = \frac{2.302585 \times x \times \log \left( \frac{r + y}{r - y} \right)}{3.15149} \times \text{log.} \frac{r + y}{r - y} \)

Hence the meridional parts answering to any given latitude, is found by dividing the difference between the log. of the radius and the log. tangent of half the complement of latitude, by the constant quantity .001263314, &c.; and the meridional difference of latitude is obtained by dividing the difference or sum of the logarithmic tangents of half the co-latitudes, according as they are of the same or a contrary name, by the above quantity.

And the meridional difference of latitude multiplied

<table>
<thead>
<tr>
<th>Long. Aberdeen,</th>
<th>2° 9' W.</th>
<th>Lat. 57°</th>
<th>9° comp. 32° 5' half 16° 25' tangent 9.46951</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long. Oxtend,</td>
<td>2° 56 E.</td>
<td>Lat. 51°</td>
<td>14° comp. 38° 46 half 19 2 34 tangent 9.54633</td>
</tr>
<tr>
<td>Diff. longitude</td>
<td>5 55=305</td>
<td>Diff. Lat. 5 55=355</td>
<td>Difference 7682</td>
</tr>
</tbody>
</table>

To find the course.

As the difference of the log. tang. 7682 is to the consant logarithm 3.88547, so is the diff. of longitude 305 to the tangent of the course 26° 38' 9.70034.

To find the distance.

As radius 10.00000 is to the secant of the course 26° 38' 10.04871, so is the difference of latitude 355 to the distance 397.1 2.59894.

Vol. XII.

a) In this case the tangent is to consist of five figures besides the index; but if the table extends to 6 or 7 figures, the above number will be 126.33, &c. or 1263.3, &c.
Method of solving the Problems of Mercator's Sailing.

Method of finding the distance.

As radius is to the secant of the course 53°
so is the difference of latitude 188

As the constant logarithm is to the tangent of the course 53°
so is the difference of latitude 188

As the constant logarithm is to the tangent of the course 53°
so is to the secant of the course 27° 28'

As the constant logarithm is to the tangent of the course 27° 28'
so is the difference of latitude 186

Longitude come to 12° 42'

Required the course and longitude come to?

Longitude left 16° 45' E.

Difference of longitude 12° 42'

To find the difference of longitude.

As the constant logarithm is to the tangent of the course 27° 28'
so is the sum of the log. tangents 23899

To the difference of longitude 9834

Longitude left 3° 25' E.

Difference of longitude 12° 42'

To find the difference of longitude.

As the constant logarithm is to the tangent of the course 27° 28'
so is the constant logarithm 11.0151

To the difference of longitude 11.0151

Longitude come to 12° 58 W.

Practice.

To find the difference of longitude.

As the constant logarithm is to the tangent of the course 27° 28'
so is the difference of log. tangents 2957

To the difference of longitude 11.0151

Longitude left 3° 25' E.

Difference of longitude 12° 58 W.

Given one latitude and course, to find the other latitude and difference of longitude.

Example. From Scarborough, in latitude 54° 20' N. longitude 5° 10' W. ship sailed NE 4° E. 210 miles. Required the latitude and longitude come to?

From Scarborough, in latitude 54° 20' N. comp. 33° 40' half 17° 50' tang. 9.9746

Diff. of lat. 3° 18' E.

Lat. right, comp. 60 25' N. comp. 33 35 half 16 47' tang. 9.47964

Difference 2784

To find the difference of longitude.

As the constant logarithm is to the tangent of the course 44° points
so is the difference of log. tangents 23899

To the difference of longitude 9834

Longitude left 10° 05' 18' W.

Difference of longitude 10.05194

To the difference of longitude 10.00000

To find the difference of latitude.

As the constant logarithm is to the tangent of the course 44° points
so is the difference of log. tangents 23899

To the difference of latitude 9834

Longitude left 10° 05' 18' W.

Difference of longitude 10.05194

To the difference of longitude 10.00000

To find the difference of latitude.
Practce.

Method of resolving the Problem of Mercator's Sailing.

Pro. VII. Given one latitude, distance, and departure, to find the other latitude, course, and difference of longitude.

Example. A ship from Cape Voltas, in latitude 28° 55'S. longitude 15° 53'E. sailed 286 miles between the south and west, and made 238 miles of departure. Required the course, the latitude and longitude come to?

To find the course.

As the distance
is to departure
so is radius

to the sine of the course
As radius
is to the cosine of the course
so is the distance

to the difference of latitude 158.6
Lat. Cape Voltas, 28° 55'S. comp. 62° 7½; half 30° 3½; tang. 9.77878
Diff. of Lat. 2° 39.8

Latitude in, 31° 34.6, comp. 58° 26½ half 29° 13; tang. 9.74762

Difference 2° 23.5

To find the difference of longitude.

As the constant logarithm
is to the tangent of the course
so is the difference of longitude

to the difference of longitude 276.1
Long. Cape Voltas, 31° 53'E.
Difference of longitude,

Longitude come to,

Pro. VIII. Given one latitude, course, and difference of longitude, to find the other latitude and distance.

Example. A ship from latitude 16° 54' N. longitude 62° 16' W. sailed upon a NW. by N. course, until her latitude by observation is 68° 10' W. Required the distance run, and latitude come to?

Table A.

<table>
<thead>
<tr>
<th>A.</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°</td>
<td>3'</td>
<td>1'</td>
<td>1'</td>
<td>1'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
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<tr>
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<td>4</td>
<td>2</td>
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<td>1</td>
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<td>3</td>
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<td>16</td>
<td>11</td>
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<td>58</td>
<td>40</td>
<td>28</td>
<td>19</td>
<td>12</td>
<td>6</td>
<td>0</td>
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</tbody>
</table>

Example. From latitude 50° N. a ship sailed 290 miles between the south and west, and differed her longitude 5°. Required the course, and latitude come to?

Distance - 290 ar. co. log. 7.53760
Diff. of longitude 300 log. 2.47712

Latitude - 50° cosine 9.80807

Approximate course 41° 41', fine 9.82279

To lat. 50°, and half diff. long. 150, the 1st

Corr. in a dep. column is 115 + 1 55

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<th>A.</th>
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In
Method of solving the Problem of Mercator's sailing.

In the triangle A to co. course 48° and alt. corr. 1° 55', the second correction is 2; to course 41° and diff. long. 5°, the number is 6, of which \( \frac{1}{9} \) (Tab. B) being taken gives 1.

True course 9. 43 33 W

To find the difference of latitude.

As radius is to the cosine of the course 43° 33' = 9.86020

so is the distance 209, 2.6240

to the difference of latitude 30.6 30.6

Latitude left 70.6 30.6

Difference of latitude 10.0 0.0

Latitude come to 60. 0. 0

It was intended in this place to have given rules, to make allowance for the spheroidal figure of the earth, but as the ratio of the polar to the equatorial semiaxis is not as yet determined with sufficient accuracy, neither is it known if both hemispheres be similar figures; therefore these rules would be grounded on assumption only, and which might probably err more from the truth than those adapted to the spherical hypothesis. This therefore is supposed to be a sufficient apology for not inserting them.

Chap. VIII. Of Oblique Sailing.

Oblique sailing is the application of oblique angled plane triangles to the solution of problems at sea. This failing will be found particularly useful in going along shore, and in surveying coasts and harbours, &c.

Example I. At 11th A. M. the Girdlens bore W NW, and at 2h P. M. it bore NW; and to 15 miles the distance failed. From H draw HF in a NW direction, and the point F will represent the Girdlens. Now the distances CF, HF will measure 19.1 and 26.5 miles respectively.

Calculation.

In the triangle FCH are given the distance CH 15 miles; the angle FCH equal to 9 points, the interval between the SW and WNW points; and the angle CHF equal to 4 points, being the supplement of the angle contained between the SW and WNW points; hence CFH is 3 points; to find the distances CF, FH.

To find the distance CF.

As the fine of CFH 3 points = 9.74474

so is the fine of CH 15 miles = 1.17609

to the distance CF 19.07 = 1.28083

To find the distance FH.

As the fine of CH 15 points = 9.74474

so is the fine of FCH 9 points = 9.99157

Practice.

To the distance FH 26.48 = 1.42292

Example II. The distance between the SE point of the island of Jersey and the island of Brehat is 13 leagues; and the correct bearing and distance of Cape Frehel from the island of Brehat is SE 26°.

It is also known that the SE point of Jersey bears NNE from Cape Frehel; from whence the distance of these two is required, together with the bearing of the said point from the island of Brehat.

By Construction.

Describe a circle, (fig. 39) and draw two diameters at right angles, the extant of which will represent the cardinal points, north being uppermost. Let the centre B represent Brehat, from which draw the SE line BF equal to 26 miles, and the point F will represent Cape Frehel, from which draw the NNE line FI; make BI equal to 39 miles. Then FI applied to the scale will measure 34.1 miles, and the inclination of BI to the meridian will be found equal to 63°.

By Calculation.

In the triangle BIF are given BI and BF equal to 39 miles, and 26 miles respectively; and the angle BFI equal to 7 points to find the sides FI, and angle FBI.

To find the angle BFI.

As the distance BI 39 = 1.59106

is to the distance BF 26 = 1.41407

so is the fine of BFI 78° 45' = 9.99157

to the fine of BFI 40 50 = 9.81548

Sum \( \frac{1}{2} \) = 119 35

Angle FBI = 60 25

---

EBF = 33 45

Difference, or EBI = 26 40

Bearing of Jersey from Brehat N 63° 20 E

To find the distance FI.

As the fine of BFI 78° 45' = 9.99157

is to the fine of EBI 60 25 = 9.33934

so is the distance BI 39 miles = 1.59106

to the distance FI 34.58 = 1.53883

Example III. At noon Dungeness bore per compass NW distance 5 leagues; and having run NW 7 knots an hour, at 5 P. M. we were up with Beachyhead. Required the bearing and distance of Beachyhead from Dungeness.

By Construction.

Describe a circle (fig. 40) to represent the horizon; from the centre C draw the NW line CD equal to 15 miles; and the NW line CB equal to 35 miles; join DB, which applied to the scale will measure about 26.1 miles; and the inclination of DB to the meridian will be found equal to N 79° W.

By Calculation.

In the triangle DBC are given the distances CD, CB equal to 15 and 35 miles respectively; and the angle BCD equal to 4 points; to find the angles B and D, and the distance BD.

To
Practice.

Navigation.

Oblique Sailing.

Distance CB = 45 points of the ast, 16 points
CD = 15 angle C 4

Sum 50 angles B and D 12
Difference 20 half sum 6 pts. = 6° 30' 1.69807
As the sum of the distances is to their difference 50 20 1.30103
so is the tangent of half sum angles 67 30 10.38378
to the tangent of half their differ. 44 0 9.68484
Angle CDB - - 111 30
Supplement - - 68 30
Angle NCD - - 11 15

Magnetic bearing, N 79° 45' W. Or by
Allowing 2° points of weekly variation, the true bearing of
Beauchamp from Dungeness will be W 1° 3 nearly.

To find the distance.
As the sine of CBD = 111° 30' 9.68688
is to the sine of BCD 45° 9.84948
so is the distance BC = 35 1.54407
to the distance BD = 26.6 1.44347

Example IV. Running up Channel E8S per compas at the rate of 5 knots an hour. At 11 A.M.
the Eddystone light-house bore N66°E, and the Star point N68°E; and at 4 P.M. the Eddystone bore
N00°N, and the Star N 14°. Required the distance and bearing of the Eddystone, the variation being 2° points W?

By Construction.

Let the point C (fig. 41.) represent the first station, from which draw the N86°E line CA, the N86°E
line CB, and the E8S line CD, which make equal to 25 miles, the distance run in the elapsed time; then from
D draw the N80° line DA intersecting CA in A, which represents the Eddystone; and from the same
point draw the N81°E line DB cutting CB in B, which therefore represents the Star. Now the distance AB
applied to the scale will measure 22.9, and the bearing per compas BAF will measure 73° 37'

By Calculation.

In the triangle CAD are given CD equal to 25 miles, the angle CAD equal to 45° points, the distance
between N66°E and N00°N; and the angle ADC equal to 4 points, the distance between the N00°N
and W82°; to find the distance CA.

As the sine of CAD = 45° points 9.86979
is to the sine of CDA 4 points 9.84948
so is the distance CD = 25 miles 1.37763
to the distance CA = 23.86 1.37763

In the triangle BCD are given the distance CD 25 miles, the angle CBD 4° points the interval between
N86°E and N81°E; and CDB 71 points, the distance between W82° and N80°E; to find the distance CD.

As the sine of CDB = 4° points 9.88819
is to the sine of CDB 71 points 9.99956
so is the distance CD = 25 miles 1.39794
to the distance CB = 32.3 1.50922

In the triangle CAB, the distances CA, CB, are
given, together with the included angle ACB, equal to
4 points, the distance between N86°E and N81°E; to
find the angle CAB and distance AB.

Distance CB = 32.3 Angle ACB = 45° 0'
Distance CA = 23.86 Sum of CAB and ABC 135°

Sum - 56.16 Half - 67 30
Difference 8.44
As the sum of the distances is to their difference 56.16 8.44 0.92634
so is the tangent of half sum angles 67 30 10.38278
to the tangent of half diff. 19.56 9.55969
Angle CAB - 87.26
Angle CAF - + 4

Bearing per compas = S 73° 22' E or ESE; E; and the variation 2° points being allowed to the left of
E8S ESE gives E3N, the true bearing of the Start from the Eddystone.

To find the distance.
As the sine of CAB = 87° 26' 9.99956
is to the sine of ACB 45° 9.84948
so is the distance CB = 32.3 1.50922
to the distance AB = 22.86 1.35914

Example V. A ship from a port in latitude 57°
9' N, longitude 2° 9' W, sailed 82 miles on a direct
course, and spoke a ship that had run 100 miles from
a port in latitude 56° 21' N, longitude 2° 53' W.—
Required the course of each ship, and the latitude and
longitude come to?

Lat. = 57° 9' N Mer. parts 4199 Lon. 2° 9' W
56° 21' N 4112 2° 50 W

Diff. of lat. 48 Mer. diff. lat. 87 Diff. lon. 41

By Construction.

With the meridional difference of latitude, the differ
ence of longitude, and difference of latitude, con
struct the triangles ADE, ABC (fig. 42.) as in Mer
cator's Sailing; then A will represent the northern
moll, and C the southernmost port. The distance
AC applied to the scale will measure 53 miles, and
the bearing BCA will be 25° 47'. From the points A
and C, with distances equal to 82 and 100 miles re
spectively, describe arches intersecting each other in
M, which will therefore be the place of meeting.
Now the angle ABM, the ship's course from the
southernmost port, will measure N 80° 8' E; and the
other ship's course, or angle BAM, will be 67° 4',
or ESE. From M draw the parallel MNP, and AN
will be the difference of latitude made by the one ship,
and CP that by the other ship; hence either of the
being measured and applied to its correspondent latitude,
will give 50° 38', the latitude in. Make AF
equal to 57, the meridional difference of latitude be
 tween the southernmost port and latitude in: from F
draw FG perpendicular to AF, and produce AM to
G, then FG will be the difference of longitude, which
applied to the scale will measure 159; hence the lon
itude in is 8° 10' E.
NAVIGATION

By Calculation.

In the triangles ADE, ABC, are given AD equal to 87, DE equal to 41, and AB equal to 48; to find the angle BAC and distance AC.

To find the bearing of the ports.
As the meridional diff. of lat. 87, fo is radius 1.93952
is to the diff. of long. - 41, fo is radius 1.61278
fo is the mer. diff. of lat. 57, to the diff. of long. - 1.75587
Windward Sailing.

Longitude left - - 139.8 2.14547
Difference of longitude - - 2° 9' W
Longitude in - - 0 11 E

CHAP. IX. Of Windward Sailing.

WINDWARD failing is, when a ship by reason of a contrary wind is obliged to sail on different tacks in order to gain her intended port; and the object of this failing is to find the proper course and distance to be run on each tack.

Example I. A ship is bound to a port 48 miles directly to the windward, the wind being SSW, which it is intended to reach on two boards; and the ship can lie within 6 points of the wind. Required the course and distance on each tack?

By Construction.

Draw the SSW line CB (fig. 43.) equal to 48 miles. Plate Make the angles ACB, ABC, each equal to 6 points. Hence the first course will be W, and the second SE: also the distance CA, or AB, applied to the scale will measure 62° 7 1.79737 miles, the distance to be sailed on each board.

By Calculation.

From A draw AD perpendicular to BC; then in the triangle ADC are given CD, equal to 24 miles; and the angle ACD, equal to 6 points, to find the distance AC.
As radius - - 10.00000
is to the secant of C - 6 points - 10.41716
fo is CD - 24 miles - 1.38021

EXAMPLE II. The wind at NW, a ship bound to a port 64 miles to the windward, proposes to reach it on three boards; two on the larboard, and one on the portboard tack, and each within 5 points of the wind. Required the course and distance on each tack?

By Construction.

Draw the NW line CA (fig. 44.) equal to 64 miles; from C draw CB W&S, and from A draw AD parallel thereto, and in an opposite direction; bisect AC in E, and draw BED parallel to the NE rhumb, meeting CB, AD in the points B and D: then CB=AD applied to the scale will measure 36° 4 1.38021 miles, and BD=2CB=72° 7 1.79737 miles.

By Calculation.

From B draw BF perpendicular to AC; then in the triangle BCF are given the angle BCF equal to 5 points, and CF equal to one fourth of CA=16 m. to find CB.
As radius - - 10.00000
is to the secant of BCF, - 5 points - 10.25526
fo is CF - 16 m. - 1.20412

EXAMPLE III. A ship which can lie within 5 1.55938 points of the wind, is bound to a port 36 miles to the windward, the wind being NE&N, which it is intended to reach

Longitude left - - 193.0 2.14547
Difference of longitude - - 2° 9' W
Longitude in - - 0 11 E

By Calculation.

From A draw AD perpendicular to BC; then in the triangle ADC are given CD, equal to 24 miles; and the angle ACD, equal to 6 points, to find the distance AC.
As radius - - 10.00000
is to the secant of C - 6 points - 10.41716
fo is CD - 24 miles - 1.38021

EXAMPLE IV. A ship is bound to a port 36 miles directly to the leeward, the wind being NSE, which it is intended to reach...
Practise.

Windward sailing.

Draw the N2E line CA (fig. 46.) equal to 36 miles, and bisection it in B; from C and B draw lines parallel to the E:SE rhumb; and from A and B draw lines parallel to the SSE; E point, meeting the former in the points D and E. Now the distances AD, BD, BE, and CE, are equal; and any one of them applied to the scale will measure 19.1 miles.

By Calculation.

From E draw EF perpendicular to AC; and in the triangle CFE given CF=9 m. and the angle FCE = 51°, to find CE.

As the radius

\[ 10,00000 \]

is to the secant of FCE

\[ 51 \text{ points} \]

so is CF

\[ 9 \text{ miles} \]

\[ 0.95424 \]

to the distance CE

\[ 19.1 \text{ miles} \]

1.28085

Example IV. A ship bound to a port bearing NW distant 40 miles, with the wind at NSE; E intends to reach it on two boards. Required the course and distance on each tack, the ship lying within 5° points of the wind.

By Construction.

Draw the NW line CA (fig. 46.) equal to 40 miles; and because the wind is SSW; E, and the ship can lie within 5° points of the wind, the course on the larboard tack will be EEN, and on the starboard NW. Therefore, from the centre C draw the ESN line CB, and from it draw the NW line AB, meeting CB in B; then CB and AB applied to the scale will measure 26.7 and 45.1 miles respectively.

By Calculation.

In the triangle ACB, given AC = 40 miles, and the angles A, B, and C, equal to 31°, 56°, and 8 points respectively, to find AB and BC.

To find the distance CB.

As the sine of B

\[ 5 \text{ points} \]

is to the sine of A

\[ 3 \text{ points} \]

so is the distance CA

\[ 40 \text{ miles} \]

\[ 1.60206 \]

to the distance CB

\[ 26.73 \]

1.42695

To find the distance AB.

As the sine of B

\[ 5 \text{ points} \]

is to the sine of C

\[ 8 \text{ points} \]

so is the distance CA

\[ 40 \text{ miles} \]

\[ 1.60206 \]

to the distance AB

\[ 48.11 \]

1.08212

Example V. A ship close hailed within 5 points of the wind, and making one point of lee-ways, is bound to a port bearing SSW, distant 54 miles, the wind being SSW; E. It is intended to make the port at three boards, the first of which must be on the larboard tack in order to avoid a reef of rocks. Required the course and distance on each tack.

By Calculation.

Draw the SSW line CA (fig. 47.) equal to 54 m. and as the wind is SSW, and the ship makes her course good within 6 points of the wind, therefore the course on the larboard tack will be SSW, and on the starboard ESE: hence from C draw the SSW line CB, and from A draw AD parallel thereto; bisection CA in E. and draw BED parallel to the ESE line; then will

CB and AD be the distances on the larboard tack, which applied to the scale, each will be found to measure 37.4; and the distance on the starboard tack BD will measure 42.4 miles.

By Calculation.

The triangles CBE, EAD are equal and similar; hence the ratio of these are given CE, equal to 27 miles, half the distance between the ship and port; the angles C, B, and E, equal to 31°, 46°, and 9 points respectively, to find CB and BE.

To find CB, the distance on the larboard tack.

As the fine of B

\[ 4 \text{ points} \]

is to the fine of E

\[ 9 \text{ points} \]

so is the distance CE

\[ 27 \text{ miles} \]

\[ 1.43135 \]

to the distance BC

\[ 37.45 \]

1.57345

To find BE half the distance on the starboard tack.

As the fine of B

\[ 4 \text{ points} \]

is to the fine of C

\[ 3 \text{ points} \]

so is the distance CE

\[ 27 \text{ miles} \]

\[ 1.43135 \]

to the distance BE

\[ 21.21 \]

1.32662

Whole distance AC

\[ 42.42 \]

Example VI. A ship plying to the windward, with the wind at NNE, after sailing 51 miles on each of two tacks, found by observation to have made 36 miles of difference of latitude. How near the wind did she make her way good?

By Construction.

Make CA (fig. 48.) equal to 36 miles; draw AB perpendicular to CA, and draw the NNE line CB, meeting AB in B; make CD, BD each equal to 51 miles; and these being measured, will be found equal to 6 points.

By Calculation.

In the triangles CAB, BCD, are given AB equal to 36m. CD=BD=51, and the angle ACB equal to 2 points, to find the angle BCD.

As the distance CD

\[ 51 \text{ miles} \]

is to the differ. of latitude CA

\[ 18 \text{ miles} \]

so is the secant of ACB

\[ 2 \text{ points} \]

\[ 10,03438 \]

to the cosecant of BCD

\[ 67° 59' \]

9.58208

Example VII. A ship that makes her way good within 6 points of the wind, reaches her port on two boards; first being on the larboard tack 35 miles, and the other on the starboard tack 39 miles; and the difference of latitude 21 miles north. Required the bearing of the port, and direction of the wind?

By Construction.

With the given distances 25 and 38 miles and the included angle equal to 16°-2 x 6° = 3 points, construct the triangle BCD (fig. 49.); hence CB will be known.

Draw CA equal to 21 miles, the given difference of latitude; from A draw AB perpendicular to CA, and make CB equal to what it was before determined; make DE=DC, and draw the line CE, which will represent the direction of the wind, and the angle ACB is the bearing of the port, now ACE will be found equal to 52°; and ACB 18°.

By Calculation.

In the triangle BCD are given BC=25m. BD=38m. and the angle D=3 points, to find the angle BCD, and distance CB.
Chap. X. Of Current Sailing.

The computations in the preceding chapters have been performed upon the assumption that the water has no motion. This may not always answer tolerably well in those places where the ebings and flowings are regular, as then the effect of the tide will be nearly counterbalanced. But in places where there is a constant current or setting of the sea towards the same point, an allowance for the change of the ship's place arising therefrom must be made: And the method of resolving these problems, in which the effect of a current, or heave of the sea, is taken into consideration, is called current sailing.

In a calm, it is evident a ship will be carried in the direction and with the velocity of the current. Hence, if a ship fails in a direction, of the current, her rate will be augmented by the rate of the current; but in failing directly against it, the distance made good will be equal to the difference between the ship's rate as given by the log and that of the current. And the absolute motion of the ship will be a head, if her rate exceeds that of the current; but if less, the ship will make sternway. If the ship's course be oblique to the current, the distance made good in a given time will be represented by the third side of a triangle, whereof the distance given by the log, and the drift of the current in the same time, are the other sides; and the true course will be the angle contained between the meridian and the line actually described by the ship.

Example I. A ship sailed NNE at the rate of 8 knots an hour, during 18 hours, in a current setting 

Example II. A ship from a port in latitude 42° 52' N, sailed SW, W 17 miles in 7 hours, in a current setting between the north and west; and then the same port bore ENE, and the ship's latitude by observation was 42° 42' N. Required the setting and drift of the current?

By Construction.

Draw the SSW line CA (fig. 51) equal to 17 x 8 = 136 miles; and from A draw AB parallel to the NW line, and equal to 18 x 2 = 45 miles: now BC being joined will be the distance, and NBC the course. The drift of this will measure 159 miles, and the second 6° 23'.

By Calculation.

In the triangle ACB, given AC = 144 miles, AB = 45 miles, and the angle CAB = 9 points, to find BAC and BC.

To find the course made good.

Diff. AC 144
Angle BAC = 9 pts = 101° 15'
Diff. AB 45
Sum 189
B + C 78 45
Diff. 99 2

As the sum of the sides is to the difference of the sides, so is the tan. of the half sum angles to the tan. of the half diff. angles.

To find the distance.

As the sine of BCD is to the sine of BDC, so is the distance BD to the distance BC.

To find the angle ACB, the bearing of the port.

Angle ACB = 16° 7'
Angle ACN = 22° 30'

Course made good = N 6° 23' E

To find the distance.

As the sine of ACB = 16° 7' = 0.2766 is to the sine of CAB = 101° 15' = 0.999563, so is the distance AB = 45 to the distance BC = 159.

Example II. A ship from a port in latitude 42° 52' N, sailed SW, W 17 miles in 7 hours, in a current setting between the north and west; and then the same port bore ENE, and the ship's latitude by observation was 42° 42' N. Required the setting and drift of the current?

By Construction.

Draw the SSW line CA (fig. 51) equal to 17 x 8 = 136 miles; and from A draw AB parallel to the NW line, and equal to 18 x 2 = 45 miles: now BC being joined will be the distance, and NBC the course. The drift of this will measure 159 miles, and the second 6° 23'.

By Calculation.

In the triangle CBD, given CB = 10 miles, and the angle cabinet AB = 6 points; to find the distance CD.

As radius = 10,0000 is to the secant of BCD = 6 points = 10.441710, so is the diff. of lat. CB = 10 miles = 1,000000, to the distance CD = 26.13 = 1,41710.

Again, in the triangle ACD are given the distance AC = 17 miles, CD = 26.13, and the angle ACD 47 points; to find the remaining parts.
Now, in the triangle CDB are given the difference of latitude and departure; to find the course and distance.

To find the course.

As the difference of latitude CD = 38° 14' to the tangent of the course 9.94279

To find the distance.

As radius = 10,00000 to the secant of the course 41° 14' = 10,12376

By Calculation.

In the triangle ABC, given BB = 20 m, AC = 22 m, and the included angle A = 3 points; to find the remaining parts.

To find the setting of the current.

Distance AC = 22 m. Included angle = 3 points.

By Calculation.

From A (fig. 53.) draw the SE5S line AB = 20, which will represent the ship's apparent track through the water; draw AC equal to 22 miles south, and C will be the ship's real place; and BC being joined will be the current's drift in four hours; which applied to the scale will measure 12.3; from A draw AD parallel to BC, and the angle CAD will be the direction of the current, and will be found to measure 64° 41'.

To find the drift of the current.

Hence the hourly rate of the current is 20.2 = 2.9 knots.

EXAMPLE III. A ship, from latitude 38° 20' N, sailed 24 hours in a current setting NW/N, and by account is in latitude 38° 42' N, having made 44 miles of sailing; but the latitude by observation is 38° 58' N. Required the course and distance made good, and the drift of the current.

By Calculation.

Make CE (fig. 53.) equal to 22 miles, the difference of latitude by D R, and EA = 44 miles, the departure, and join CA; make CD = 38 miles, the difference of latitude by observation; draw the parallel of latitude DB, and from A draw the NW5S line AB, interferring DB in B, and AB will be the drift of the current in 24 hours; CB being joined, will be the distance made good, and the angle DCB the true course. Now, AB and CB applied to the scale, will measure 19.2 and 50.5 respectively; and the angle DCB will be 41° 14'.

By Calculation.

From B draw BF perpendicular to AE, then in the triangle ABF are given BF = 16 miles, and the angle ABF = 3 points; to find AB and AF.

To find the drift of the current AB.

As radius = 10,00000

is to the secent of ABF = 3 points 10.08015

fo is BF = 16 miles 1.20412

Hence the hourly rate of AB = 19.24 = 0.8.

To find AF.

As radius = 10,00000

is to the tangent of ABF = 3 points 9.82489

fo is BF = 16 1.20412

Hence the hourly rate of AF = 10.69 = 0.8.

By Calculation.

To find the course.

As the difference of latitude CD = 38° 14' = 9.94279

To find the distance.

As radius = 10,00000 to the tangent of the course 41° 14' = 10,12376

EXAMPLE IV. In the Straits of Sunda, at 2 P.M. steering SE5S at the rate of 5 knots an hour, I pulled close by the SE of the small island off Hog point. At 6, not having changed our course, came to anchor on the Java shore. Upon setting the said island from this anchoring place, I find it bears due north, its distance by the chart being 22 miles. It follows from hence, that our course has been affected by a current. Required its velocity and direction?

By Confirmation.

EXAMPLE V. A ship bound from Dover to Calais, lying
NAVIGATION

Plate XXXI.

Plate SDB

Course SDB = 39 14 = SE 8.
In the triangle DBC, given DC = 21 miles, the angle BDC = DFE = 22° 38, and the angle DCB = 63°.
As the hourly rate of failing is to the hourly rate of the current 6 m. : 21 m.
As the distance DBC = DFE = 22° 38, and the distance DB = DB.
As the distance by the log DB = 19.4 m.
Example VI. A ship at sea in the night has sight of Scilly light, bearing NE, distant 4 leagues, it being then flood tide, setting ENE 2 miles an hour. What course and distance must the ship sail to make the Lizard, which bears from Scilly E, distance 17 leagues?

By Construction.
Draw the NE line AS = 12 miles (fig. 55), hence S will represent Scilly; from S draw SL = 51 miles, and parallel to the E S S ; then L will represent the Lizard; draw LC parallel to the ENE, and equal to 2 miles, and make CD = 5 miles; from A draw AB parallel to CD, meeting LC produced in B; then AB will be the distance, and the angle SAB the course: the first of these applied to the scale will measure 41.9 miles, and the course will be S 88° E.

By Calculation.
In the triangle SAL are given the sides AS, SL = 12 and 51 miles respectively, and the angle ASL = 101 points; to find the other parts.

To find the angles.
Distance SL = 51 m. Angle ASL = 101 points.
As = 12 m. SL + SLA = 51
Sum 63 m. SL + SLA = 51
Difference 39 m.
As the sum of the sides is to the difference of the sides 63 : 39.
As the tangent of half the sum of the angles 1.79934 : 1.59106.
As the tangent of half the difference 9.77763.
Angle SAL = 31 17.

Practice.
Instruments to solve Problems in Sailage, Independent of Calculation.

VARIOUS methods, beside those already given, have been proposed to save the trouble of calculation.—One of these methods is by means of an instrument composed of rulers, so disposed as to form a right-angled triangle, having numbers in a regular progression marked on their sides. These instruments are made of different materials, such as paper, wood, brass, &c. and are differently constructed, according to the fancy of the inventor. Among instruments of this kind, that by John Cook, Esq. seems to be the best.

A number of other instruments, very differently constructed, have been proposed for the same purpose; of these, however, we shall only take notice of the rectangular instrument, by And. Mackay, A. M., F. R. S. E.

I. Of Cook's Triangular Instrument.

Description. The block a b c d (fig. 56) is a parallelepiped: The length from a to b is two feet, the breadth from a to d two inches, and the depth is one inch and a half. The block is perforated longitudinally, so as to be capable of containing within it e f, a cylindrical piece of wood one inch diameter; g b is an aperture on the surface of the block about a quarter of an inch wide, which difdoses one-twelfth part.
of the surface of the cylinder contained; the edge $de$ is divided into twelve parts, each of these is subdivided into six parts, and each of these again into ten parts. The surface of the cylinder is divided longitudinally into twelve parts, and on each of them is engraved a portion of a line of meridional degree of 22 feet long, which contains the meridional parts for every minute from the equator as far towards the pole as navigation is practicable; and the smallest division on is not less than $\frac{1}{10}$ th of an inch. By rolling and sliding this cylinder, any part of any line on it may be brought into any position which may be required: the box $i$ is engraved into the edge of the block $a$, so that it may move freely from $a$ to $b$; a limb from this box extends to $k$, which serves to mark that degree of the perpendicular $l$ which is parallel to the centre of the semicircle $m$; $ll$ is two feet long, and graduated on both edges as the block; it is perpendicular to the block, and is fixed in the box $i$, by which it may be moved from $a$ to $b$; $o$ $p$ $n$ is a semicircle of six inches radius, engraved, as appears in the plate, which slides freely from $c$ to $d$ in a groove in the edge of the block $c$ $d$; $m$ $q$ is the index moving on the centre $m$, the edge of which marks the course on the semicircle; it is two feet long, and divided into 72 parts; and there are subdivided in the same manner as those on the block and perpendicular to which they are equal; $p$ is a vernier attached to the index to show minutes; $s$ is a vernier composed of concentric semicircles, which slides along the edge $g$, to the intersection of the perpendicular and index, where it serves as a vernier to both. Below the side of ivory, with a mark on it to point out the degree of the line $d$, which is perpendicular under the centre of the semicircle. Fig. 57, is a view of the back part of the instrument.

_U/s_ - The method of working every cafe which occurs in navigation, is to make the instrument similar to that ideal triangle which is composed of the difference of latitude, departure, and distance; or, to that composed of the meridional difference of latitude, difference of longitude, and enlarged distance; or, to that composed of the difference of longitude, departure, and fine, of the middle Latitude; which is done by means of the data procured from the compass, log-line, and quadrant: whence it follows, from the nature of similar triangles, or from the relation which exists between the sides of triangles and the lines of their opposite angles, that the parts of the instrument become proportional to those which they represent; and will ascertain the length of the lines, or the extent of the angles sought, by its graduations.

In the practice of this instrument, a small square is necessary, in order to bring the centre of the semicircle perpendicularly over the meridional degree corresponding to the latitude.

_Prob. I._ The course and distance failed being given, to find the difference of latitude and departure.

_Example._ A ship from latitude $24^\circ 18'$ failed NW by N 168 miles. Required the latitude come to, and departure?

Set the centre of the semicircle perpendicularly over the given latitude $24^\circ 18'$, and the index to the course 3 points; move the perpendicular until it cut the index at the given distance 168; then at the point of intersection on the perpendicular is 93.3 miles, the departure, and on the base, by the edge of the box, is $2.3^\circ 38'$, the latitude come to.

_Prob. II._ Both latitudes and course given, to find the distance and departure.

_Example._ Let the latitude failed from be $43^\circ 50'$, that come to $47^\circ 8'$ N, and the course NNE. Required the distance and departure?

Move the centre of the semicircle to the latitude left $43^\circ 50'$, and the edge of the box to the latitude come to $47^\circ 8'$; fix the index at the given course 2 points; then at the point of intersection of the index and the departure 214 miles on the index, and the departure 82 miles on the perpendicular.

_Prob. III._ Given the course and departure, to find the distance and difference of latitude.

_Example._ Let the latitude failed from be $32^\circ 30'$ N, the course SW by S, and the departure 200 miles. Required the distance and latitude come to?

Move the centre of the semicircle to the latitude left $32^\circ 30'$, set the index to the given course 3 points, and move the perpendicular till the given departure 200 cuts the index; at this point on the index is 560 miles, and the edge of the box will cut the latitude come to $27^\circ 39'$ N.

_Prob. IV._ Given the difference of latitude and distance, to find the course and departure.

_Example._ Let the latitude left be $17^\circ 10'$ N, the latitude come to $21^\circ 40'$ N, and the distance failed on a direct course between the north and west 300 miles. Required the course and departure?

Move the semicircle and box to the given latitudes, and the index until the distance found thereon meets the perpendicular, then at the point of contact on the perpendicular is $130.8$, the departure, and on the semicircle by the index is $25^\circ 50'$, the course.

_Prob. V._ The distance and departure given, to find the course and difference of latitude.

_Example._ The distance failed is 256 miles between the south and east, the departure is 158 miles, and the latitude left $51^\circ 10'$ N. Required the course and latitude come to?

Set the centre of the semicircle to $51^\circ 10'$, the latitude failed from; find the distance 246 on the index, and the departure 138 on the perpendicular; then move both till these points meet, and the course $34^\circ 10'$ will be found on the semicircle by the index, and the latitude in $47^\circ 47'$ N, by the edge of the box.

_Prob. VI._ Both latitudes and departure given, to find the course and distance.

_Example._ A ship from latitude $43^\circ 10'$ N, failed between the north and west till she is in latitude $47^\circ 14'$ N, and has made 170 miles of departure. Required the course and distance?

Move the centre of the semicircle over $43^\circ 10'$, and the edge of the box to $47^\circ 14'$; find the departure on the perpendicular, and bring the edge of the index thereto; now at the point of intersection is the distance 297.4 miles on the index, and the course $34^\circ 52'$ on the semicircle.

_Traverse Sailing._

_Example._ A ship from latitude $46^\circ 48'$ N failed NW by N 168 miles. Required the latitude come to, and departure?

Set the centre of the semicircle perpendicularly over the given latitude $46^\circ 48'$, and the index to the course 3 points; move the perpendicular until it cut the index at the given distance 168; then at the point of intersection on the perpendicular is 93.3 miles, the departure, and on the base, by the edge of the box, is $2.3^\circ 38'$, the latitude come to.
NAVI GHzATION.

Practice.

Instruments to solve problems in sailing, independent of calculation.

Pro. I. The latitudes and longitudes of two places given, to find the direct course and distance between them.

Example. Required the course and distance between two places whose latitudes and longitudes are 50° 30' N, 19° 0' W, and 54° 30' N, 15° 30' W, respectively.

By Mercator’s Sailing.
To find the course.
Move the centre of the semicircle perpendicularly over the meridional degree answering to latitude 50° 30' N, then move the box until the edge of the perpendicular cuts the meridional parts of the other latitude 54° 30' N, and move the index until it cuts the difference of longitude 3° 30' on the perpendicular, and the index will mark the course 30° 10', or NNE:E nearly, on the semicircle.

To find the distance.
Screw the index to this course, and move the centre of the semicircle to the latitude 50° 30' N, and the edge of the perpendicular to the latitude 54° 30' N, then the perpendicular will cut the distance 534.7 on the index.

By Middle Latitude Sailing.
To find the departure.
Move the centre of the semicircle to the latitude 50° 30' N, and the edge of the index to the complement of the middle latitude 37° 20' on the semicircle; then move the box until the edge of the perpendicular intersects the termination of the difference of longitude 210° miles on the index, which point of intersection will mark the departure 121 on the perpendicular.

To find the course and distance.
Move the edge of the perpendicular to the other latitude 54° 30', and the index until it cuts the departure 128 on the perpendicular; then will the perpendicular mark the index on the perpendicular 254.7 miles, and the index will mark the course on the semicircle 30° 10', or NNE:E nearly.

Pro. II. Both latitudes and course given, to find the distance and difference of longitude.

Example. A ship from latitude 50° 30' N, longitude 19° 0' W, sailed N 30° 10' E, until she is in latitude 54° 30' N. Required the distance and difference of longitude?

By Mercator’s Sailing.
To find the difference of longitude.
Move the box and semicircle as in the former problem to the meridional parts of the given latitudes, then set the index to the course, and it will mark the difference of longitude 3° 30' on the perpendicular; hence the longitude in is 17° 30' W.

To find the distance.
Move the perpendicular and semicircle to the given latitudes, and put the index to the given course; then the perpendicular will cut the distance 254.7 miles on the index.

By Middle Latitude Sailing.
To find the distance and departure.
Move the semicircle and perpendicular to the given latitudes, and the index to the course; then the perpendicular will show the departure 128, and the
the index the distance 254.7 miles at the point of intersection.

To find the difference of longitude.

Set the index to the complement of the middle latitude on the semicircle, and move the box until the termination of the departure on the perpendicular meets the index, which will mark the difference of longitude thereon 210 m. or 3° 30'.

Example. From latitude 5° 30' N, longitude 35° 0' W, a ship sailed 254.7 miles between the north and east, and by observation is in latitude 54° 30' N. Required the course and difference of longitude?

By Mercator's Sailing.
To find the course.
Move the perpendicular and semicircle to the given latitudes, and the index until the distance sailed marked on it meets the perpendicular; then the index will mark the course N. 36° 10' E. on the semicircle.

To find the difference of longitude.
Screw the index to the course, move the perpendicular and semicircle to the meridional parts of the given latitudes, and the space intercepted between the limb of the box and the index will be the difference of longitude 3° 30'.

By Middle Latitude Sailing.
To find the departure and course.
Move the semicircle and perpendicular to the given latitudes, and the index until the distance sailed marked on it is perpendicular; then the perpendicular will show the departure 128 miles, and the semicircle the course N. 36° 10' E.

To find the difference of longitude.
Set the index to 37° 20', the complement of the middle latitude on the semicircle, and move the perpendicular until the termination of the departure on it is perpendicular; then the point of intersection will mark the difference of longitude 210 miles on the index.

Example. Let the latitude and longitude failed from be 56° 40' S, longitude 28° 55' E, the course S 31° 35' E, and distance 328 m. Required the latitude and longitude come to?

By Mercator's Sailing.
To find the latitude come to.
Set the semicircle to the latitude failed from, and the index to the course, and bring the perpendicular to the distance, which at the same time will mark the latitude come to 61° 20' S.

To find the difference of longitude.
Screw the index to the course, and move the semicircle and perpendicular to the meridional parts of both latitudes; then the index will cut the difference of longitude on the perpendicular 5° 35'.

By Middle Latitude Sailing.
The latitude arrived at is found as above.
To find the departure.
The semicircle and perpendicular being set to both latitudes, and the index to the course, it will show the departure 172.7 on the perpendicular.

To find the difference of longitude.
Set the index to 31°, the complement of the middle latitude on the semicircle, and move the perpendicular until the departure marked on it cuts the index, and the division on the index at the point of intersection will be the difference of longitude 335;

Problem. One latitude, course, and distance given, to find the difference, difference of latitude, and difference of longitude.
Example. Let the latitude failed from be 56° 40' S, longitude 28° 55' E, the course N 31° 35' W, and departure 172.7. Required the distance, and the latitude and longitude come to?

By Mercator's Sailing.
To find the distance and latitude come to.
Move the semicircle to the latitude left, and the index to the course; mark the departure on the perpendicular, and move it until the termination thereof meets the index; then the point of intersection will show the distance 329 miles on the index, and the perpendicular will show the latitude arrived at 61° 20' N on the bafe.

To find the difference of longitude.
Screw the index, and move the perpendicular and semicircle to the meridional parts of both latitudes, then the index will cut the difference of longitude 5° 35' on the perpendicular.

By Middle Latitude Sailing.
Find the distance sailed and latitude in as above, and

(a) In southern latitudes, the end of the cylinder where the numbers begin must be turned towards the north, pointed out by the semicircle; and in northern latitudes, it must be reversed.
NA V I G A T I O N.

Instruments to solve problems in Sailing.

and the difference of longitude as in Problem IV. by middle latitude sailing.

PROB. VII. One latitude the distance failed, and departure given, to find the course, difference of latitude, and difference of longitude.

Example. The latitude failed from is 48° 30' N, and longitude 14° 40' W, the distance run is 345 miles between the south and east, and the departure 200 miles. Required the course, and the latitude and longitude come to?

By Mercator's Sailing,

To find the course and latitude come to.

Move the semicircle to the latitude left, mark the distance on the index, and the departure on the perpendicular, move both until these points meet; then will the index show the course 35° 26' E on the semicircle, and the latitude come to 43° 49' on the base.

The difference of longitude is found as in the preceding problem.

By Middle Latitude Sailing,

The course and latitude come to are found as above, and the difference of longitude as in Problem IV. by middle latitude sailing.

II. Of Mackay's Rectangular Instrument.

Description. Fig. 58, is a representation of this instrument, of about one-third of the original size—The length CA is divided into 100 equal parts, and the breadth CB into 70; but in this plate every second division only is marked, in order to avoid confusion; through these divisions parallels are drawn, terminating at the opposite sides of the instrument. Upon the upper and right-hand sides are two scales; the first contains the degrees of the quadrant, and the other the points and quarters of the compass. M is an index movable about the centre C, and divided in the same manner as the sides (1). Fig. 59, is a portion of the enlarged meridian, so constructed that the first degree is equal to three divisions on the instrument, and therefore, in the use of this line, each division on the instrument is to be accounted 20 minutes. The size of the plate would not admit of the continuation of the line.

Use. From a bare inspection of this instrument, it is evident that any triangle whatever may be formed on it. In applying it to nautical problems, the course is to be found at top, or right-hand side, in the column of degrees or points, according as it is expressed; the distance is to be found on the index, the difference of latitude at either side column, and the departure at the head or foot of the instrument. The numbers in these columns may represent miles, leagues, &c.; but when used in conjunction with the enlarged meridional line, then 10 is to be accounted 100 miles, 20 is to be esteemed 200 miles, and so on, each number being increased in a tenfold ratio; and the intermediate numbers are to be reckoned accordingly.

Plane Sailing.

PROB. I. The course and distance failed given, to find the difference of latitude and departure.

Nautical Practice.

Example. Let the course be NE ½ N, distance 44 miles. Required the difference of latitude and departure?

Move the index until the graduated edge is over 34 points, and find the given distance 44 miles on the instrument: this distance will be found to cut the parallel of 34 miles, the difference of latitude in the side column, and that of 28 miles, the departure at the top.

PROB. II. Given the course and difference of latitude, to find the distance and departure.

Example. Required the distance and departure answering to the course 28°, and difference of latitude 60 miles.

Lay the index over the given course 28°; find the difference of latitude 60 miles in the side column; its parallel will cut the index at 68 miles, the distance and the corresponding departure at the top is 32 miles.

PROB. III. The course and departure given, to find the distance and difference of latitude?

Example. Let the course be SSW and the departure 36 miles. Required the distance and difference of latitude?

Lay the index over two points; find the departure at the top, and its parallel will cut the index at 94 miles, the distance and the difference of latitude on the side column is 87 miles.

PROB. IV. Given the distance and difference of latitude, to find the course and departure.

Example. The distance is 33 leagues, and the difference of latitude 30 leagues. Required the course and departure?

Bring 33 leagues on the index to the parallel of 30 leagues in the side; then the departure at the top is 18 leagues and the course by the edge of the index on the line of rhumbs is 23° points.

PROB. V. Given the distance and departure, to find the course and difference of latitude?

Example. Let the distance be 58 miles, and the departure 15 miles. Required the course and difference of latitude?

Move the index until 58 found thereon cuts the parallel of 15 from the top: this will be found to intersect the parallel of 56 miles, the difference of latitude, and the course by the edge of the ruler is 15°.

PROB. VI. The difference of latitude and departure being given, to find the course and distance?

Example. Let the difference of latitude be 30 miles, the departure 28 miles. Required the course and distance?

Bring the index to the intersection of the parallels of 30 and 28; then the distance on the index is 41 miles, and the course by its edge is 43°.

Traverse Sailing.

Find the difference of latitude and departure answering to each course and distance by Problem I. of Plane Sailing, and from thence find the difference of latitude and departure made good; with which find the course and distance by the last problem.

An example is unnecessary.

Parallel

(1) In the original instrument are two slips, divided like the side and end of the instrument. One of these slips is moveable in a direction parallel to the side of the instrument, and the other parallel to the end.
**Practice.**

**Parallel Sailing.**

**PROB. I.** Given the difference of longitude between two places on the same parallel, to find the distance between them.

**Example.** Let the latitude of a parallel be 48°, and the difference of longitude between two places on it 3° 40'. Required their distance?

Put the index to 48°, the given latitude, and find the difference of longitude 320 on the index, and the corresponding parallel from the side will be 147, the distance required.

**PROB. II.** The latitude of a parallel, and the distance between two places on that parallel, being given, to find the difference of longitude between them.

**Example.** The latitude of a parallel is 56°, and the distance between two places on it 200 miles. Required their difference of longitude?

Put the index to the given latitude, and find the distance in the side column, and the intersection of its parallel with the index will give 358, the difference of longitude sought.

**PROB. III.** Given the distance and difference of longitude between two places on the same parallel, to find the latitude of that parallel.

**Example.** The number of miles in a degree of longitude is 46.5. Required the latitude of the parallel?

Bring 60 on the index to cut the parallel of 46.5 from the side, then the edge of the index will give 39° 11', the latitude required.

**Middle Latitude and Mercator's Sailing.**

**PROB. I.** The latitudes and longitudes of two places being given, to find the course and distance between them.

**Example.** Required the course and distance between Genoa, in latitude 44° 25' N, longitude 8° 36'E, and Palermo, in latitude 38° 10' N, longitude 13° 38'E?

**By Mercator's Sailing.**

Take the interval between 38° 10' and 44° 25' on the enlarged meridian, which laid off from C upwards will reach to 500; now find the difference of longitude 302 at the top, and bring the divided edge of the index to the intersection of the corresponding parallels, and the index will show the course 31° 8' on the line of degrees; then find the difference of latitude 375 on the side column, and its parallel will intersect the index at 438, the distance.

**By Middle Latitude Sailing.**

Put the index to 43° 18', the complement of the middle latitude on degrees, and the difference of longitude 302 on the index will intersect the parallel of 227, the departure, in the side column. Now move the index to the intersection of the parallels of 375 and 227, the first being found in the side column, and the other at top or bottom; then the distance answering thereto on the index will be 438, and the course on the scale of degrees is 41° 10'.

**PROB. II.** Given one latitude, course, and distance, to find the other latitude and difference of longitude.

**Example.** Let the latitude and longitude failed from be 39° 22' N and 12° 8' W, respectively, the course NW, and distance 500 miles. Required the latitude and longitude come to?
particular, will intersect the index at 230, the difference of
longitude.

Pro. V. Both latitudes and distance given, to find
the course and difference of longitude.

EXAMPLE. The distance failed is 500 miles between
the north and west; the latitude and longitude left are
N. 40° 18' W., and 9° 20' W. respectively, and the latitude
in is 46° 40 N. Required the course and longitude in?

By Mercator's Sailing.

Bring the distance 500 on the index to intersect
the horizontal parallel of the difference of latitude
46°; then the course 500 is found on the line of
degrees by the edge of the index, and the vertical
parallel of the above point of intersection is that
numbering to 313, the departure.

Take the interval between the latitudes 40° 18', and
46° 40', which lay off from the centre C, and its
horizontal parallel will intersect the vertical parallel of
46°, the difference of longitude, by the edge of the
index, it being in the same position as before. Hence
the longitude in is 16° 31' W.

By Middle Latitude Sailing.

The course and departure are found as formerly,
and the middle latitude is 43° 25', to which bring
the edge of the index, and the horizontal parallel of
313, the departure, will intersect the index at 431,
the difference of longitude.

Pro. VI. Both latitudes and departure given, to
find the course, distance, and difference of longitude.

EXAMPLE. Let the latitude failed from be 42° 54' N.
long. 19° 17' W., the distance 250 miles W, and the
latitude come to 36° 18' N. Required the course and
distance failed, and the longitude come to?

By Mercator's Sailing.

Find the point of intersection of the horizontal
parallel of 36°, the difference of latitude, and the
vertical parallel of 250, the departure; to this point
bring the index, and the corresponding division thereon
will be 467 miles, and the course on the scale of
degrees by the edge of the index will be 32° 24'.

Take the interval between the latitudes on the
enlarged meridian, which being laid off from the centre
will reach to 512: now the horizontal parallel of 512
will intersect the vertical parallel of 325, the difference
of longitude, at the edge of the index. The longitude
come to is therefore 14° 42' W.

By Middle Latitude Sailing.

The course and distance are to be found in the same
manner as above. Then bring the index to 30° 35',
the middle latitude, and the horizontal parallel of 250
will intersect the edge of the index at 324°, the
difference of longitude.

Pro. VII. Given one latitude, distance, and
departure, to find the other latitude, course, and
difference of longitude.

EXAMPLE. A ship from latitude 32° 48' N., longi-
tude 17° 6' W., failed 586 miles between the south and
west, and made 346 miles of departure:—Required
the course, and the latitude and longitude come to?

By Mercator's Sailing.

Move the index till the distance 386 intercepts the
vertical parallel of the departure 316; then the corre-
ponding horizontal parallel will be 580, the difference
of latitude, and the course 35°. Hence the latitude
in is 24° 35' N.

Now take the interval between the latitudes on
the entered meridian, which laid off from the centre
will reach to 547, the horizontal parallel of which
will cut the vertical parallel of 386, the difference
of longitude. The longitude in is therefore 23° 29' W.

By Middle Latitude Sailing.

Find the course and difference of latitude as before,
and hence the middle latitude is 28° 38', to which
bring the index, and the horizontal parallel of 336,
the departure, will intersect the index at 383, the
difference of longitude.

It seems unnecessary to enlarge any further on the
use of this instrument, as the above will make it
sufficiently understood.

CHAPTER XII. Of Great Circle Sailing.

The application of spherical trigonometry to the
solution of triangles formed upon the surface of the
earth is called Great Circle Sailing.

The earth being supposed an exact sphere, the
shortest distance between two places is the arch of a
great circle intercepted between them; and therefore
the distance failed upon a direct course from one place
to another, will always be longer than the arch of a
great circle contained between them, except when the
shortest course coincides with a great circle, which can
only happen when the ship falls on a meridian or on the
equator.

Although it is impossible to make a ship describe
an arch of a great circle, yet she may be kept so near it
as to make the error almost insensible.

The terms that enter into this sailing are, the lati-
tudes of the places, their difference of longitude, and the
angles contained between the distance and the meridians
of the places, called the angles of position.

Pro. I. Given the common latitude of two places
on the same parallel, and their difference of longitude,
to find the distance and angle of position (k).

EXAMPLE. Required the distance between St Ma-
ry's, in latitude 36° 57' N., longitude 25° 9' W., and
Cape Henry, in latitude 36° 57' N., and longitude
76° 27' W.

By Conjunction.

Describe the circle EQR (Fig. 60.) to represent
the meridian of one of the places; draw the equator
Plate DQ, and the earth's axis PS at right angles thereto; CCCXL
make ED, Qs, each equal to the chord of 36° 57'; the

(k) This problem may be expressed thus:—Two places lying on the same parallel, and of these four,
the latitudes, difference of longitude, distance, and angle of position, any two being given to find the other
two.—Now this problem contains four different cases, the most usual of which is given above. The others
serve rather as exercises in spherical trigonometry than of any real utility in navigation, and are therefore
omitted. The same is to be understood of the following problems.
Great Circle
Sailing.

Pr~ice.

Great Circle
Sailing.

The given latitude, and draw the parallel of latitude ABD, the radius of which is the tangent of $53^\circ 3'$, the co-latitude; describe the meridian PBS with the

the meridian of one of the places; make $EA = 32^\circ 35'$, and $A$ will represent Bermuda; make $EA$, $QB$ each equal to $49^\circ 57'$; then with the tangent of the co-latitude $40^\circ 3'$ draw the parallel of latitude of the Lizard, and with the secant of $58^\circ 13'$, the given difference of longitude, draw the oblique circle PBS, intersecting the parallel of latitude in $B$; which will be the position of the Lizard. Draw the diameter $AF$, and through the points $A$, $B$, $F$describe a circle: and the arch $AB$ will be the distance, and the angles $A$ and $B$ the angles of position, which are measured as before.

By Calculation.

In the oblique-angled spherical triangle $APB$ are $AP$, $BP$, the co-latitudes, and the angle $APB$ the difference of longitude; to find the distance $AB$, and the angles of position $PAB$, $PBA$.

1. To find the distance.

Distance $AB$ $40^{28}$

2. To find the angle of position.

As radius $- 10.00000$

is to the sine of $AP$ $53^\circ 3'$ $9.90263$

so is the sine of $APG$ $25^\circ 39'$ $9.63636$

to the sine of $AG$ $20^14'$ $9.53899$

2. To find the angle of position at St. Thomas.

As radius $- 10.00000$

is to the sine of $AE$ $66^\circ 10'$ $9.66046$

so is the cotangent of $EB$ $48^51'$ $9.81185$

to the cotangent of $AE$ $66^610'$ $9.96112$

9.90263

3. To find the angle of position at Port St Julian.

As radius $- 10.00000$

is to the sine $EB$ $48^51'$ $9.87679$

so is the cotangent of $AE$ $66^610'$ $9.64517$

to the cotangent of $ABE$ $71^36'$ $9.52196$

Hence a ship from St Thomas to Port St Julian must first steer $38^638'$ W, and then by constantly altering her course towards the west, so as to arrive at Port St Julian on a course $71^656'$ W, she will have failed the shortest distance between those places.

EXAMPLE. What is the shortest distance between the Lizard, in latitude $49^657'$ N, longitude $5^615'$ W, and Bermuda, in latitude $32^635'$ N, and longitude $63^628'$ W?

By Construction.

Describe the primitive circle (fig. 61.) to represent the meridian of one of the places; make $EA = 32^635'$, and $A$ will represent Bermuda; make $EA$, $QB$ each equal to $49^657'$; then with the tangent of the co-latitude $40^63'$ draw the parallel of latitude of the Lizard, and with the secant of $58^613'$, the given difference of longitude, draw the oblique circle PBS, intersecting the parallel of latitude in $B$; which will be the position of the Lizard. Draw the diameter $AF$, and through the points $A$, $B$, $F$ described a circle; and the arch $AB$ will be the distance, and the angles $A$ and $B$ the angles of position, which are measured as before.

By Calculation.

In the oblique-angled spherical triangle $APB$ are $AP$, $BP$, the co-latitudes, and the angle $APB$ the difference of longitude; to find the distance $AB$, and the angles of position $PAB$, $PBA$.

1. To find the distance.

Difference of long. $58^613'$

Verfed fine $9.67573$

AP $57^57'$

BP $40^3$ fine $9.86082$

Difference $17^22$ nat. v. fine $0459^9$

25661 $9.40928$

Distance $AB$ $45^45$ nat. v. fine $03220^*$. *See MacKay's Circumference of the Longitude, where a complete Table of Nat. Verfed Sines is given.

1. To find the angle of position at the Lizard.

As the line of $AB$ $45^45'$ $9.85106$

is to the sine of $AP$ $57^57'$ $9.92326$

so is the sine of $P$ $58^13'$ $9.92944$

to the sine of $B$ $89^20'$ $9.99997$

3. To find the angle of position at Bermuda.

As the line of $AB$ $45^45'$ $9.85106$

is to the sine of $BP$ $40^3$ $9.86082$

so is the sine of $P$ $58^13'$ $9.92944$

to the sine of $A$ $49^47'$ $9.88786$

The shortest distance between the Lizard and Bermuda is $45^45'$ or $2745$ miles, which is $56$ miles less than

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The triangle APB (Fig. 63,) being described, and the computation made as in Problem I., the distance will be found equal to 40° 6', and the angle of position A or B=73° 9'.—Now the triangle APB being isosceles, the perpendicular PI falls in the middle of AB; and the latitudes, courses, and distances being known in the half BI, those in the half IA will also be known.

Let the points a, b, c, d, &c. be the points arrived at on each alteration of five degrees of longitude; then will the arches Pa, Pb, Pc, Pd, &c. be the respective co-latitudes of those places, and are the hypothenuses of the right-angled spherical triangles PLa, PIB, PIC, PID, &c.

Now in the triangle PIB, given PB=53° 3', the angle PBI=73° 9', to find PI.

Since radius is to the sine of PBI 73° 9' = 9.98094, so is the sine of PB 53° 0' = 0.900235 to the sine of PI 49° 51' = 9.88329.

The angle IPB=63° 27', angle IPa=21° 43', 1° 51', IPb=1° 43', 1', IPc=11° 43', 1', IPd=6° 43', are the several polar angles.

To find the latitude of the point a.

As radius is to the cotangent of PI 49° 51' = 9.93612, so is the cosine first polar angle 21° 43' = 9.96800 to the tangent of 1st latitude 38° 5' = 9.89452.

By continuing the operation with the other polar angles, the successive latitudes from a to I will be 38° 56', 39° 33', 39° 57'.

Now with the several latitudes, and respective differences of longitude, compute the courses and distances. The results are entered in the following Table; the calculations being performed on a piece of waste paper.

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<tbody>
<tr>
<td>IPB=26° 43'</td>
<td>25° 0'</td>
<td>37° 0'</td>
<td>239° 2.6</td>
<td>82.0</td>
<td>74° 45'</td>
<td>246.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPa=21° 43'</td>
<td>28° 0'</td>
<td>38° 5'</td>
<td>2474.6</td>
<td>51</td>
<td>77</td>
<td>240.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPb=16° 43'</td>
<td>33° 0'</td>
<td>38° 55'</td>
<td>2539.8</td>
<td>76.5</td>
<td>80</td>
<td>255.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPc=11° 43'</td>
<td>38° 0'</td>
<td>39° 33'</td>
<td>2576.7</td>
<td>47.8</td>
<td>84</td>
<td>233.9</td>
<td></td>
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<tr>
<td>IPd=6° 43'</td>
<td>43° 0'</td>
<td>39° 57'</td>
<td>2618.8</td>
<td>24.8</td>
<td>84</td>
<td>231.9</td>
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The courses, and the first distance, are found by Mercator's Sailing; but as the other courses are near the parallel, the distances cannot be very exactly found by this method; another method is therefore used. The sum of the distances is 1263.1, which doubled is 2526.2, agreeing with the distance found as before. It may be observed, that the distance found by this method cannot be less than the last distance, or that given by Great Circle Sailing, as some authors have found it.

Example II. A ship from the Lizard, in latitude 49° 57' N., longitude 5° 15' W., bound to a place in latitude 32° 25' N., and longitude 60° 39' W., proceeds to fail on a great circle, and to alter her course at every
NAVIGATION.

To find the polar angle $\Phi_{\text{PI}}$.

As radius

is to the co-tangent of $\Phi_{\text{PI}}$.

so is the tangent of $\Phi_{\text{PA}}$.

to the co-tangent of $\Phi_{\text{PA}}$.

Now the polar angle $\Phi_{\text{PI}}$, or the difference of longitude between the perpendicular and the meridian of the place bound to, $57^\circ 49'$, being taken from $61^\circ 24'$, the whole difference of longitude, leaves $3^\circ 35'$ for the difference of longitude between the Lizard and the perpendicular; $\mu 116^\circ 5^\circ$, the proposed alteration of longitude, being subtracted as often as it can be from $57^\circ 49'$, leaves the several polar angles; with which and the perpendicular $\Phi_{\text{PI}}$ the several latitudes arrived at are found as in the preceding example; then with these latitudes and the differences of longitude between them, find the successive courses and distances. The several results are placed in the following Table; the calculations being performed on a piece of waste paper.

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<tbody>
<tr>
<td>$\Phi_{\text{PA}}=10^\circ 00'$</td>
<td>50° 35'</td>
<td>49° 57'</td>
<td>3 4° 57'</td>
<td>4.7</td>
<td>88° 45'</td>
<td>108.7</td>
<td>138 3</td>
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<td>$\Phi_{\text{PA}}=10^\circ 00'$</td>
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<td>108.7</td>
<td>138 3</td>
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</tbody>
</table>

As the four first courses are near the parallel, the corresponding distances were not found by Mercator's Sailing. The sum of the distances 2874 3 agrees every way with, and is not less than, 47° 54', or 287 4 miles, the shortest distance between the places.

CHAP. XIII. Of Sea-Charts.

The charts usually employed in the practice of navigation are of two kinds, namely, Plane and Mercator's Charts. The first of these is adapted to represent a portion of the earth's surface near the equator; and the last for all portions of the earth's surface. For a particular description of these, reference has already been made from the article Chart, to those of Plane and Mercator; and as these charts are particularly described under the above articles, it is therefore sufficient in this place to describe their use.

Use of the Plane Chart.

PROB. I. To find the latitude of a place on the chart.

Rule. Take the least distance between the given place and the nearest parallel of latitude: now this distance applied the same way on the graduated meridian, from the extremity of the parallel, will give the latitude of the proposed place.

Thus the distance between Bona Vista and the parallel of 15 degrees, being laid from that parallel upon the graduated meridian, will reach to 16° 5', the latitude required.

PROB. II. To find the course and distance between two given places on the chart.

Rule. Lay a ruler over the given places, and take the nearest distance between the centre of any of the compasses on the chart and the edge of the ruler; move this extent along, so as one point of the compass may touch the edge of the rule, and the straight line joining their points may be perpendicular there-to; then will the other point throw the course: The interval between the places, being applied to the scale, will give the required distance.

Thus the course from Palma to St Vincent will be found to be about SSW 4 W. and the distance 13°, or 795 m.

PROB. III. The course and distance failed from a known place being given, to find the ship's place on the chart.

Rule. Lay a ruler over the place failed from, parallel
NAVIGATION.

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RULE. The ruler being laid over the place failed from and in the direction of the given course, take the distance failed from the equator, put the point of the compass at the intersection of any parallel with the ruler, and the other point of the compass will reach to a certain place by the edge of the ruler. Now this point remaining in the same position, draw in the other point of the compass until it just touches the above parallel when swept round: apply this extent to the equator, and it will give the difference of latitude. Hence the latitude in will be known, and the intersection of the corresponding parallel with the edge of the ruler will be the ship's present place.

The other problems of Mercator's sailing may be very easily resolved by this chart; but as they are of less use than those given, they are therefore omitted, and may serve as an exercise to the student.

BOOK II.

Containing the method of finding the Latitude and Longitude of a Ship at Sea, and the Variation of the Compass.

CHAPTER I. Of Hadley's Quadrant.

Hadley's quadrant is the chief instrument in use at present for observing altitudes at sea. The form of this instrument, according to the present mode of construction, is an octagonal sector of a circle, and therefore contains 45 degrees; but because of the double reflection, the limb is divided into 90 degrees.

See ASTRONOMY and QUADRANT. Fig. 65, represents a quadrant of the common construction, of which the following are the principal parts.

1. ABC, the frame of the quadrant.
2. BC, the arch or limb.
3. D, the index; a b, the subdividing scale.
4. E, the index-glass.
5. F, the fore horizon-glass.
6. G, the back horizon-glass.
7. K, the coloured or dark glasses.
8. HI, the vanes or sights.

Of the Frame of the Quadrant.

The frame of the quadrant consists of an arch BC, firmly attached to the two radii AB, AC, which are bound together by the braces LM, in order to strengthen it, and prevent it from warping.

Of the Index D.

The index is a flat bar of brass, and turns on the centre of the quadrant: at the lower end of the index there is an oblong opening; to one side of this opening the vernier scale is fixed, to subdivide the divisions of the arch; at the end of the index there is a piece of brass, which bends under the arch, carrying a spring to make the subdividing scale lie close to the divisions. It is also furnished with a screw to fix the index in any desired position. The bevel instruments have an adjusting screw fitted to the index, that it may be moved more slowly, and with greater regularity and accuracy, than by the hand. It is proper, however, to observe, that the index must be previously fixed, near its right position by the abovementioned screw.
NA VIG AT I ON.

Method of finding the Latitude and Longitude at Sea.

Upon the index, and near its axis of motion, is fixed a plane speculum, or mirror of glass quicksilvered. It is set in a brass frame, and is placed so that its face is perpendicular to the plane of the instrument. This mirror being fixed to the index moves along with it, and has its direction changed by the motion thereof; and the intention of this glass is to receive the image of the sun, or any other object, and reflect it upon either of the two horizon-glasses, according to the nature of the observation.

The brass frame with the glass is fixed to the index by the screw c; the other screw serves to replace it in a perpendicular position, if by any accident it has been deranged.

Of the Horizon Glasses F, G.

On the radius AB of the clock are two small speculums: the surface of the upper one is parallel to the index glas, and that of the lower one perpendicular thereto, when o on the index coincides with o on the limb. These mirrors receive the reflected rays, and transmit them to the observer.

The horizon-glasses are not entirely quicksilvered; the upper one F is only silvered on its lower half, or that next the plane of the quadrant, the other half being left transparent, and the back part of the frame cut away, that nothing may impede the sight through the unfilivered part of the glasses. The edge of the foil of this glass is nearly parallel to the plane of the instrument, and ought to be very sharp, and without a flaw. The other horizon-glass is silvered at both ends. In the middle there is a transparent slit, through which the horizon may be seen.

Each of these glasses is set in a brass frame, to which there is an axis passing through the wood work, and is fitted to a lever on the under side of the quadrant, by which the glasses may be turned a few degrees on its axis, in order to set it parallel to the index-glass. The lever has a contrivance to turn it slowly, and a button to fix it. To set the glasses perpendicular to the plane of the instrument, there are two screw cuts, one before and one behind each glass: these screws pass through the plate on which the frame is fixed into another plate; so that by loosening one and tightening the other of these screws, the direction of the frame with its mirror may be altered, and set perpendicular to the plane of the instrument.

Of the Coloured Glasses K.

There are usually three coloured glasses, two of which are tinged red and the other green. They are used to prevent the solar rays from hurting the eye at the time of observation. These glasses are set in a frame, which turns on a centre, so that they may be used separately or together as the brightness of the sun may require. The green glass is particularly useful in observations of the moon; it may be also used in observations of the sun, if that object be very faint.

In the fore-observations, these glasses are fixed as in fig. 65; but when the back-observation is used, they are removed to N.

Of the two Sight Vanes H, I.

Each of these vanes is a perforated piece of brass, designed to direct the light parallel to the plane of the quadrant. That which is fixed at I is used for the fore, and the other for the back observation. The vanes have two holes, one exactly at the height of the silvered part of the horizon-glass, the other a little higher, to direct the light to the middle of the transparent part of the mirror.

Of the Divisions on the Limb of the Quadrant.

The limb of the quadrant is divided from right to left into 90 primary divisions, which are to be considered as degrees, and each degree is subdivided into three equal parts, which are therefore of 20 minutes each: the intermediate minutes are obtained by means of the scale of divisions at the end of the index.

Of the Vernier or Subdividing Scale.

The dividing scale contains a space equal to 21 divisions of the limb, and is divided into 20 equal parts. Hence the difference between a division on the dividing scale and a division on the limb is one twentieth of a division on the limb, or one minute. The degree and minute pointed out by the dividing scale may be easily found thus.

Observe what minute on the dividing scale coincides with a division on the limb; this division being added to the degree and part of a degree on the limb, immediately preceding the first division on the dividing scale, will be the degree and minute required.

Thus suppose the fourteenth minute on the dividing scale coincided with a division on the limb, and that the preceding division on the limb to o on the vernier was 56° 40'; hence the division flown by the vernier is 56° 54'. A magnifying glass will assist the observer to read off the coinciding divisions with more accuracy.

Adjustments of Hadley's Quadrant.

The adjustments of the quadrant consist in placing the mirrors perpendicular to the plane of the instrument. The fore horizon-glass must be set parallel to the speculum, and the planes of the speculum and back horizon glass must be perfectly perpendicular to each other when the index is at o.

Adjustment I. To set the index-glass perpendicular to the plane of the quadrant.

Method I. Set the index towards the middle of the limb, and hold the quadrant so that its plane may be nearly parallel to the horizon: then look into the index-glass i and if the portion of the limb seen by reflection appears in the same plane with that seen directly, the speculum is perpendicular to the plane of the instrument. If they do not appear in the same plane, the error is to be rectified by altering the position of the screws behind the frame of the glass.

Method II. This is performed by means of the two adjusting tools fig. 66, 67, which are two wooden frames, having two lines on each, exactly at the same distance from the bottom.

Place the quadrant in a horizontal position on a table; put the index about the middle of the arch; turn back the dark glasses; place one of the above-mentioned tools near one end of the arch, and the other at the opposite end, the side with the lines being towards the index-glass; then look into the index-glasses, directing the light parallel to the plane of the instrument, and one of the tools will be seen by direct vision, and the other by reflection. By moving the index a little, they may be brought exactly togethe
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Adjustment II. To set the fore horizon-glass perpendicular to the plane of the instrument.

Set the index to \( \theta \); hold the plane of the quadrant parallel to the horizon; direct the fight to a well-defined part of the horizon; then if the horizon be seen directly and by reflection are apparently in the same straight line, the fore horizon-glass is perpendicular to the plane of the instrument; if not, one of the horizons will appear higher than the other. Now if the horizon be seen by reflection is higher than that seen directly, release the nearest screw in the pedestal of the glas, and screw up that on the farther side, till the direct and reflected horizons appear to make one continuous straight line. But if the reflected horizon is lower than that seen directly, unscrew the farthest screw, and screw up the nearest till the coincidence of the horizons is perfect, observing to leave both screws equally tight, and the fore horizon-glass will be perpendicular to the plane of the quadrant.

Adjustment III. To set the fore horizon-glass parallel to the index-glass, the index being at \( \theta \).

Set \( \theta \) on the index exactly to \( \theta \) on the limb, and fix it in that position by the screw at the under side; hold the plane of the quadrant in a vertical position, and direct the sight to a well-defined part of the horizon; then if the horizon be seen directly and coincide with that seen through the transparent part, the fore horizon-glass is adjusted; but if the horizons do not coincide, unscrew the milled screw in the middle of the lever on the other side of the quadrant, and turn the nut at the end of the lever until both horizons coincide, and fix the lever in this position by tightening the milled screw.

As the position of the glas is liable to be altered by fixing the lever, it will therefore be necessary to re-examine it, and if the horizons do not coincide, it will be necessary either to repeat the adjustment, or rather to find the error of adjustment, or, as it is usually called, the index error; which may be done thus:

Direct the sight to the horizon, and move the index until the reflected horizon coincides with that seen directly; then the difference between \( \theta \) on the limb and \( \theta \) on the vernier is the index error; which is additive when the beginning of the vernier is to the right of \( \theta \) on the limb, otherwise subtractive.

Adjustment IV. To set the back horizon-glass perpendicular to the plane of the instrument.

Put the index to \( \theta \); hold the plane of the quadrant parallel to the horizon, and direct the sight to the horizon through the back vane. Now if the reflected horizon is in the same straight line with that seen through the transparent part, the glas is perpendicular to the plane of the instrument: If the horizons do not unite, turn the funk screws in the pedestal of the glas until they are apparently in the same straight line.

Adjustment V. To set the back horizon-glass perpendicular to the plane of the index-glass produced, the index being at \( \theta \).

Let the index be put as much to the right of \( \theta \) as twice the dip of the horizon amounts to; hold the quadrant in a vertical position, and apply the eye to the back vane; then if the reflected horizon coincides with that seen directly, the glas is adjusted; if they do not coincide, the screw in the middle of the lever on the other side of the quadrant must be released, and the nut at its extremity turned till both horizons coincide. It may be observed, that the reflected horizon will be inverted; that is, the sea will be apparently uppermost and the sky lowermost.

As this method of adjustment is esteemed troublesome, and is often found to be very difficult to perform at sea, various contrivances have therefore been proposed to render this adjustment more simple. Some of these are the following.

1. Mr Dollond's method of adjusting the back horizon-glass.

In this method an index is applied to the back horizon-glass, by which it may be moved so as to be parallel to the index-glass, when \( \theta \) on the vernier coincides with \( \theta \) on the limb. When this is effected, the index of the back horizon-glass is to be moved exactly 90° from its former position, which is known by means of a divided arch for that purpose; and then the plane of the back horizon-glass will be perpendicular to the plane of the index-glass produced.

2. Mr Blair's method of adjusting the back horizon-glass.

All that is required in this method is to polish the lower edge of the index-glass, and expose it to view. The back horizon-glass is adjusted by means of a reflection from this polished edge, in the very same method as the fore horizon-glass is adjusted by the common method.

In order to illustrate this, let R I H E (fig. 68.) represent a pencil of rays emitted from the object \( R \), incident on the index-glass \( I \), from which it is reflected to the fore horizon-glass \( H \), and thence to the eye at \( E \). By this double reflection, an image of the object is formed at \( E \). RHE represents another pencil from the same object \( R \), coming directly through the fore horizon-glass to the eye at \( E \); so that the doubly reflected image \( E \) appears coincident with the object \( R \) itself, seen directly.

When this coincidence is perfect, and the object \( R \) is very distant as to make the angle \( IRH \) incontinent, the position of the speculum \( I \) and \( H \) will differ insensibly from parallelism; that is, the quadrant will be adjusted for the fore-observation. Now it is from the ease and accuracy with which this adjustment can at any time be made, that the fore-observation derives its superiority over the back-observation. But by grinding the edge of the index-glass perpendicular to its reflecting surface, and polishing it, the back-observation is rendered capable of an adjustment equally easy and accurate as the fore-horizon-glass; for by a pencil of rays emitted from the object \( S \), incident on the reflecting edge of the index-glass \( D \), thence reflected to the back horizon-glass \( B \), and from that to the eye at \( E \), an image will be formed at \( E \); which image being made to coincide with the object \( S \) itself, seen directly, ascertains the position of the back horizon-glass relative to the index-glass with the same precision, and in a manner equally direct, as the former operation does that of the fore horizon-glass.

Directions for adjusting the Back Horizon-Glases.

The method of adjusting the quadrant for the back-observation
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observation is this. If it is to be done without making use of the telescope, place the index at a, and applying the eye to the hole in the sight-vane (r), or tube for directing the sight, direct it through the back horizon-glaes to the horizon, if that is the object to be used for adjusting. The two horizons are then to be made to coincide, holding the quadrant first in a vertical and then in an horizontal position; by which means both adjustments will be effected as in the fore-observation.

There will be no difficulty in finding the reflected horizon, if the observer first directs his eye to that part of the horizon-glaes where he observes the image of the polished edge of the index-glaes, which will appear double. When the directed horizon is made to appear in this space, the reflected one will be seen close by it, unless the instrument wants a great adjustment. In this case, a little motion of the back horizon-glaes backwards and forwards will presently bring it in view.

When the horizon, or any obscure terrestrial object, is to be made use of for adjusting by means of the reflecting edge, there is a precaution to be taken, without which the observer will sometimes meet with what will appear an unaccountable difficulty; for if the sky, or other object behind him, should happen to be pretty bright, he will not be able to discern the horizon at all. This arises from the image of the object behind him, which is reflected from the silvered surface of the index-glaes, appearing to coincide with the horizon; in which case, the bright picture of the former, which is formed in the bottom of the eye, prevents the fainter impression of the latter from being perceived. This will be avoided, either by applying a black screen over the silvered surface of the index-glaes, or, without being at this trouble, by standing at a door or window, so that only the dark objects within can be reflected from the index-glaes: but if the observation is to be made in the open air, or in a hat, or any thick dark obstacle, held before the silvered surface of the index-glaes, will very effectually remove this inconvenience.

It may be remarked, that some observers, instead of making the principal adjustment, place the speculum parallel, by moving the index without altering the position of the horizon-glaes: and the difference between or on the verniers and or the limb is the index error, which must be subtracted from all angles measured by the back-observation, when or on the index is to the right of or on the limb; and added when to the left.

3. Mr Wright's method of adjusting the back horizon-glaes of his improved patent quadrant.

Plate CCXI.

Fig. 69. is a representation of the quadrant complete in all its parts for use. A, is the reflecting surface of the index-glaes, which is made of the usual length, and of an inch broad. The bottom part is covered in front by the brass frame; and the reflecting surface is c, on the back. B, the fore horizon-glaes, placed as usual; O, the back horizon-glaes, now placed under the fore-sight vane on the first radius of the quadrant: C, the sight-vane of the fore-horizon-glaes; D, the sight-vane of the back horizon-glaes; E, the coloured glassed in a brass frame, in the proper place for the fore-observation: F, a hole in the frame to receive the coloured glaes when an observation is to be taken with the back horizon-glaes in the common way, by turning the back to the fun: G, a hole in the frame of the farther radius K, to receive the coloured glaes when an observation is to be taken by the new method; which is by looking through the lower hole in the sight-vane of the back horizon-glaes, directed at the fun in the line of sight DN: the horizon from behind will then be reflected from the back of the index-glaes to the horizon-glaes, and from thence to the eye. (See fig. 73.) H, a brass clamp on the upper end of the index, having a milled screw underneath, which fastens the round plate to the index when required. (See fig. 70.) I K, the graduated arch of the quadrant divided into 90 degrees: L, the brass index which moves over the graduated arch: M, the vernier to subdivide the divisions on the arch into single minutes of a degree.

Fig. 70. shows the upper part of the index L on a larger scale, with part of the brass frame that fastens the index-glaes, and the three adjusting screws D to adjust its axis vertical to the plane of the quadrant: B, the centre on which the milled plate O moves over the index: The dotted line BF is the distance it is required to move: K, the adjusting screw to fix it in its proper place for adjusting the back observation-glaes: G, a piece of brass fastened to the index opposite to the clamp H, to keep the plate O always close to the index L.

Fig. 71. represents the parallel position of the index and horizon-glaes after adjustment by the fun: BC, a ray from the sun incident on the index-glaes C, and from thence reflected to the fore horizon glaes D, and again to the eye at E, in the line DE, where the eye sees the fun at A by direct vision, and the image by reflection in one; the parallel lines AE and BC being so near to each other, that no apparent angle can be observed in the planes of the index and horizon-glaes, when adjusted by a distant object.

In fig. 72. the index-glaes is removed 45 degrees from the plane of the fore horizon-glaes, and fixed in its proper place for adjusting the back horizon-glaes parallel to its plane, in the same manner as the fore horizon-glaes is adjusted.

In fig. 73. the index-glaes (after the adjustment of the fore and back horizon-glaes) is carried forward by the index on the arch 90 degrees, and makes an angle of 45° with the plane of the fore horizon-glaes, and is at right angles to the plane of the back horizon-glaes. The eye at E now sees the sun in the horizon at H, reflected by the index and horizon-glaes from the zenith at Z, the image and object being 90 degrees.

(x) Besides the hole in the sight-vane commonly made, there must be another nearer to the horizon-glaes, and so placed that an eye directed through it to the centre of the horizon-glaes shall there perceive the image of the polished edge of the index-glaes. This hole must not be made small like the other, but equal to the ordinary size of the pupil of the eye, there being on some occasions no light to spare.
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The back horizon $K$ is now reflected from the back surface of the index-glass $C$ to the horizon-glasses $M$, and from thence to the eye at $D$, in a right line with the fore horizon $F$. In order to make an exact contact of the fore and back horizons at $F$, the index must be advanced beyond the 90th degree on the arc, by a quantity equal to twice the dip of the horizon.

The quadrant is adjusted for the fore-observation as usual, having previously fixed the index-glass in its proper place by the milled screw at $H$, as represented in fig. 70.

To adjust the Quadrant for the Back-observation.

Turn the index to go $0°$ on the limb; loosen the screw $H$ (fig. 70.), and turn the plate $O$ by the milled edge until the end of the adjusting-screw $K$ touches the edge of the clamp $M$; and by means of a distant object observe if the glasses are then parallel, as at fig. 71.: if they are, fasten the screw $H$; if not, with a screw-driver turn the screw $K$ gently to the right or left to make them perfect, and then fasten the screw. Now remove the index back to $O$ on the limb, and the index-glass will be parallel to the back-horizon-glass $E$, fig. 72.: if not, make them so by turning the adjusting-screw of the glass $E$, the eye being at the upper hole in the right-vane $D$, and the sight directed to the horizon, or any distant object in the direction $DN$ (fig. 69.).

Now the index remaining in this position, the index-glass is to be returned, to drop at the pin $E$, and it will be parallel to the fore-horizon-glass as at first: then the quadrant will be adjusted for both methods of observation.

To observe the Sun's Altitude by the Back-observation.

Remove the coloured glasses to $G$ (fig. 69.), and look through the lower hole in the right-vane $D$, in the line of direction $DN$, directly to the sun, and move the index forward on the arc exactly in the same manner as in the fore-observation: make the contact of the sun's limb and the back-horizon-glass, and the minutes shown by the index on the limb is the sun's zenith distance. It may be observed, that the horizon will be inverted. If the sun's lower limb be observed, the semidiameter is to be subtracted from the zenith distance; but if the upper limb is observed, the semidiameter is to be added.

The observation may be made in the usual manner, by turning the back to the sun. In this case the coloured glasses are to be shifted to $F$, and proceed according to the directions formerly given.

Use of Hadley's Quadrant.

The altitude of any object is determined by the position of the index on the limb, when by reflection that object appears to be in contact with the horizon.

If the object whose altitude is to be observed be the sun, and if so bright that its image may be seen in the transparent part of the fore-horizon-glass, the eye is to be applied to the upper hole in the right-vane; otherwise, to the lower hole: and in this case, the quadrant is to be held so that the sun may be bisected by the line of separation of the silvered and transparent parts of the glass. The moon is to be kept as nearly as possible in the same position; and the image of the star is to be observed in the silvered part of the glass adjacent to the line of separation of the two parts.

There are two different methods of taking observations with the quadrant. In the first of these the face of the observer is directed towards that part of the horizon immediately under the sun, and is therefore called the fore observation. In the other method, the observer's back is to the sun, and it is hence called the back observation. This last method of observation is to be used only when the horizon under the sun is obscured, or rendered indistinct by fog or any other impediment.

In taking the sun's altitude, whether by the fore or back observation, the observer must turn the quadrant about upon the axis of vision, and at the same time turn himself about upon his heel, so as to keep the sun always in that part of the horizon glass which is at the same distance as the eye from the plane of the quadrant.

In this way the reflected sun will describe an arch of a parallel circle round the true sun, whole convex sides will be downwards in the fore-observation and upwards in the back; and consequently, when moving the index, the lowest point of the arch in the fore-observation, or highest in the back, is made to touch the horizon, the quadrant will stand in a vertical plane, and the altitude above the visible horizon will be properly observed. The reason of these operations may be thus explained: The image of the sun being always kept in the axis of vision, the index will always show on the quadrant the distance between the sun and any object seen directly which its image appears to touch, therefore, as long as the index remains unmoved, the image of the sun will describe an arch everywhere equidistant from the sun in the heavens, and consequently a parallel circle about the sun, as a pole. Such a translation of the sun's image can only be produced by the quadrant's being turned about upon a line drawn from the eye to the sun, as an axis. A motion of rotation upon this line may be resolved into two, one upon the axis of vision, and the other upon a line in the quadrant perpendicular to the axis of vision; and consequently a proper combination of these two motions will keep the image of the sun constantly in the axis of vision, and cause both jointly to run over a parallel circle about the sun in the heavens; but when the quadrant is vertical, a line thereon perpendicular to the axis of vision becomes a vertical axis; and as a small motion of the quadrant is all that is wanted, it will never differ much in practice from a vertical axis. The observer is directed to perform two motions rather than the single one equivalent to them on a line drawn from the eye to the sun; because we are not capable, while looking towards the horizon, of judging how to turn the quadrant about upon the elevated line going to the sun as an axis, by any other means than by combining the two motions abovementioned, so as to keep the sun's image always in the proper part of the horizon-glass. When the sun is near the horizon, the line going from the eye to the sun will not be far removed from the axis of vision; and consequently the principal motion of the quadrant will be performed on the axis of vision, and the part of motion made on the vertical axis will be but small. On the contrary, when the sun is near the zenith, the line going to the sun is not far removed from a vertical line, and conseq
quently the principal motion of the quadrant will be performed on a vertical axis, by the observer's turning himself about, and the part of the motion made on the axis of vision will be but small. In intermediate altitudes of the sun, the motions of the quadrant on the axis of vision, and on the vertical axis, will be more equally divided.

Observations taken with the quadrant are liable to errors, arising from the bending and elasticity of the index, and the resistance it meets with in turning round its centre; whence the extremity of the index, or being pushed along the arch, will feebly advance before the index-glass begins to move, and may be seen to recoil when the force acting on it is removed. Mr. Hadley seems to have been apprehensive that his instrument would be liable to errors from this cause; and in order to avoid them, gives particular directions that the index be made broad at the end next the centre, and that the centre, or axis itself, have as easy a motion as is consistent with steadiness; that is, an entire freedom from looseness, or shake, as the workmen term it. By strictly complying with these directions the error question may indeed be greatly diminished; so far, perhaps, as to render it nearly inoffensive, where the index is made strong, and the proper medium between the two extremes of a shake at the centre on one hand, and too much stiffness there on the other, is nicely hit; but it cannot be entirely corrected. For to more or less of bending the index will always be subject; and some degree of fluctuation will remain at the centre, unless the friction there could be totally removed, which is impossible.

Of the reality of the error to which he is liable from this cause, the observer, if he is provided with a quadrant furnished with a screw for moving the index gradually, may thus satisfy himself. After finishing the observation, lay the quadrant on a table, and note the angle; then cautiously loosen the screw which fastens the index, and it will immediately, if the quadrant is not remarkably well constructed, be seen to start from its former situation, more or less according to the perfection of the joint and the strength of the index. This starting, which is owing to the index recoiling after being released from the confined state it was in during the observation will sometimes amount to several minutes; and its direction will be opposite to that in which the index was moved by the screw at the time of finishing the observation. But how far it affects the truth of the observation, depends on the manner in which the index was moved in setting it to $a$, for adjusting the instrument, or in finishing the observations necessary for finding the index error.

The safest and best rule to avoid these errors seems to be this: In all observations made by Hadley's quadrant, let the observer take notice constantly to check his observations, by moving the index in the same direction which was used in setting it to $a$ for adjusting; or in the observations necessary for finding the index error. If this rule is observed, the error arising from the spring of the index will be obviated. For as the index was bent the same way, and in the same degree in adjusting as in observing, the truth of the observations will not be affected by this bending.

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N A V I G A T I O N.

To take Altitudes by the Fore-observation.

I. Of the Sun.

Turn down either of the coloured glasses before the horizon-glasses, according to the brightness of the sun; direct the sight to that part of the horizon which is under the sun, and move the index until the coloured image of the sun appears in the horizon-glasses; then give the quadrant a slow vibratory motion about the axis of vision; move the index until the lower or upper limb of the sun is in contact with the horizon, at the lowest part of the arch described by this motion; and the degrees and minutes shown by the index on the limbs will be the altitude of the sun.

II. Of the Moon.

Put the index to $a$, turn down the green glass, place the eye at the lower hole in the sight-vane, and observe the moon in the silvered part of the horizon-glasses; move the index gradually, and follow the moon's reflected image until the enlightened limb is in contact with the horizon, at the lower part of the arch described by the vibratory motion as before, and the index will show the altitude of the observed limb of the moon. If the observation is made in the daytime, the coloured glass is unnecessary.

III. Of a Star or Planet.

The index being put to $o$, direct the sight to the star through the lower hole in the sight-vane and transparent part of the horizon-glasses; move the plane of the quadrant a very little to the left, and the image of the star will appear in the silvered part of the glafes. Now move the index, and the image of the star will appear to descend; continue moving the index gradually until the star is in contact with the horizon at the lowest part of the arch described; and the degrees and minutes shown by the index on the limbs will be the altitude of the star.

To take Altitudes by the Back-observation.

I. Of the Sun.

Put the stem of the coloured glasses into the perforation between the horizon-glasses, turn down either according to the brightness of the sun, and hold the quadrant vertically; then direct the sight to the hole in the back sight-vane, and the transparent slit in the horizon-glasses so that part of the horizon which is opposite to the sun; now move the index till the sun is in the silvered part of the glafes, and by giving the quadrant a vibratory motion, the axis of which is that of vision, the image of the sun will describe an arch whose convex side is upwards; bring the limb of the sun, when in the upper part of this arch, in contact with the horizon; and the index will show the altitude of the other limb of the sun.

II. Of the Moon.

The altitude of the moon is observed in the same manner as that of the sun, with this difference only, that the use of the coloured glass is unnecessary unless the moon is very bright; and that the enlightened limb,
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III. Of a Star or Planet.

Look directly to the star through the vane and transparent slit in the horizon-glass, move the index until the opposite horizon, with respect to the star, is seen in the silvered part of the glass; and make the contact perfect as formerly. If the altitude of the star is known nearly, the index may be set to that altitude, the sight directed to the opposite horizon, and the observation made as before.

Sect. II. Of finding the Latitude of a Place.

The observation necessary for ascertaining the latitude of a place, is that of the meridional altitude of a known celestial object; or two altitudes when the object is out of the meridian. The latitude is deduced with more certainty and with less trouble from the first of these methods, than from the second; and the fun, for various reasons, is the object most proper for this purpose at sea. It, however, frequently happens, that by the interpolation of clouds, the sun is obscured at noon; and by this means the meridian altitude is lost. In this case, therefore, the method by double altitudes becomes necessary. The latitude may be deduced from three altitudes of an unknown object, or from double altitudes, the apparent times of observation being given.

The altitude of the limb of an object observed at sea, requires four separate corrections in order to obtain the true altitude of its centre: these are for semidiameter, dips, refraction, and parallax. (See Astronomy, and the respective articles). The first and last of these corrections vanish when the observed object is a fixed star.

When the altitude of the lower limb of any object is observed, its semidiameter is to be added thereto in order to obtain the central altitude; but if the upper limb be observed, the semidiameter is to be subtracted. If the altitude be taken by the back-observation, the contrary rule is to be applied. The dip is to be subtracted from, or added to, the observed altitude, according as the fore or back-observation is used. The refraction is always to be subtracted from, and the parallax added to, the observed altitude.

Prob. I. To reduce the sun's declination to any given meridian.

Rule. Find the number in Table IX, answering to the longitude in the table nearest to that given, and to the nearest day of the month. Now, if the longitude is west, and the declination increasing, that is, from the 20th of March to the 22d of June, and from the 22d of September to the 23d of December, the above number is to be added to the declination: during the other part of the year, or while the declination is decreasing, this number is to be subtracted. In east longitude, the contrary rule is to be applied.

Example I. Required the sun's declination at noon 15th April 1793, in longitude 84° W?

Sun's declination at noon at Greenwich 10° 1.8 N

Reduced declination 10° 6.3 N

Example II. Required the sun's declination at noon 22d March 1793, in longitude 15° E?

Sun's declination at noon at Greenwich 0° 56' N

Reduced declination 0° 46' N

Prob. II. Given the sun's meridian altitude, to find the latitude of the place of observation.

Rule. The sun's semidiameter is to be added to, or subtracted from, the observed altitude, according as the lower or upper limb is observed; the dip answering to the time from Table V. is to be subtracted if the fore-observation is used; otherwise, it is to be added; and the refraction answering to the altitude from Table IV. is to be subtracted; hence the true altitude of the sun's centre will be obtained. Call the altitude south or north, according as the sun is south or north at the time of observation; which subtracted from 90°, will give the zenith distance of a contrary denomination.

Reduce the sun's declination to the meridian of the place of observation, by Problem I.; then the sun or difference of the zenith distance and declination, according as they are of the same or of a contrary denomination, will be the latitude of the place of observation, of the same name with the greater quantity.

Example I. October 17th 1793, in longitude 32° E, the meridian altitude of the sun's lower limb was 48° 53' S, height of the eye 18 feet. Required the latitude?

Obs.alt. sun's lower limb, 48° 53' S Sun's decl. 17th Oct. noon 9° 37' S

Semidiameter +0 16

Dip and refraction — 0 5

Reduced declination 9° 35' S

True alt. sun's centre 49° 43' S Zenith distance 40° 36' N

Latitude 31° 11' N

Example II. November 16th 1793, in longitude 15° W, the meridian altitude of the sun's lower limb was 87° 37' N, height of the eye 10 feet. Required the latitude?

Obs.alt. sun's lower limb, 87° 37' N Sun's decl. 16th Nov. noon 18° 57' S

Semidiameter +0 16

Dip and refraction — 0 8

Reduced decl. 19° 5 S

True alt. sun's centre 87° 50' N Zenith distance 2° 10' S

Latitude 31° 15' S

Example III. December 15th 1793, being nearly under the meridian of Greenwich, the altitude of the sun's upper limb at noon was 4° 30' S, height of the eye 20 feet. Required the latitude?

Observed altitude of the sun's upper limb 4° 30' S

Sun's semidiameter — 0 16

Dip and refraction — 0 15

True altitude of the sun's centre — 3° 59' S

Zenith distance — 86° 1 N

Declination — 23° 27' S

Latitude — 62° 34' N

Example.
EXAMPLE IV. August 23rd 1793, in longitude 107° E, the meridian altitude of the sun's lower limb by the back-observation was 61° 8' N, and the height of the eye 14 feet. Required the latitude.

Observed the altitude sun's upper limb
Sun's semidiameter
Dip
Refration
True altitude of the sun's centre
Zenith distance
Reduced declination
Latitude
The dip in Table V. answers to an entirely open and unobstructed horizon. It, however, frequently happens, that the sun is over the land at the time of observation, and the ship nearer to the land than the visible horizon would be if unconfined. In this case, the dip will be different from what it would otherwise have been, and is to be taken from Table VI, in which the height is expressed at the top, and the distance from the land in the side column in nautical miles.—Seamen, in general, can estimate the distance of any object from the ship with sufficient accuracy for this purpose, especially when that distance is not greater than six miles, which is the greatest distance of the visible horizon from an observer on the deck of any ship.

PROB. III. Given the meridian altitude of a fixed star, to find the latitude of the place of observation.

RULE. Correct the altitude of the star by dip and refraction, and find the zenith distance of the star as formerly; take the declination of the star from Table X., and reduce it to the time of observation. Now, the sum or difference of the zenith distance and declination of the star, according as they are of the same or of a contrary name, will be the latitude of the place of observation.

EXAMPLE I. December 18th 1793, the meridian altitude of Sirius was 59° 30' S, height of the eye 14 feet. Required the latitude?

Observed altitude of Sirius
Dip and refraction
True altitude
Zenith distance
Declination
Latitude
EXAMPLE II. February 17th 1797, the meridian altitude of Procyon was 71° 15' N, the height of the eye 10 feet. Required the latitude?

Observed altitude of Procyon
Dip and refraction
True altitude
Zenith distance
Declination
Latitude

EXAMPLE V. Given the meridian altitude of a planet, to find the latitude of a place of observation.

RULE. Compute the true altitude of the planet as directed in last problem (which is sufficiently accurate for altitudes taken at sea); take its declination from the Nautical Almanac, page iv. of the month, and reduce it to the time and meridian of the place of observation; then the sum or difference of the zenith distance and declination of the planet will be the latitude as before.

EXAMPLE I. December 10th 1792, the meridian altitude of Saturn was 68° 42' N, and height of the eye 15 feet. Required the latitude?

Observed altitude of Saturn
Dip and refraction
True altitude
Zenith distance
Declination
Latitude

EXAMPLE II. April 16th 1793, the meridian altitude of Jupiter was 81° 5' S, height of the eye 18 feet. Required the latitude?

Observed altitude of Jupiter
Dip
True altitude
Zenith distance
Declination
Latitude

EXAMPLE I. December 24th 1792, in longitude 30° W, the meridian altitude of the moon's lower limb was 81° 15' N, height of the eye 12 feet. Required the latitude?

Time of paff over mer. of Greenwich = 9h 19'
Equation Table XX.
Time of paff over mer. ship
Longitude in time
Reduced time
Moon's decl. at midnight, Tab. IX.
Eq. time from midnight
Reduced declination
Moon's hor. par.
4 Z 2
Moon's
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**Example I.** July 1st 1793, in longitude 14° W, the altitude of the sun's lower limb at midnight was 8° 58', height of the eye 18 feet. Required the latitude?

*Observed altitude sun's lower limb* | 8° 58' |
| **Semidiameter** | +0 15 |
| **Dip and refraction** | -0 10 |

**True altitude of sun's centre** | 9 4 N |
| **Compl. Declination reduced to time and place** | 66 57 N |

**Latitude** | 76 1 N |

**Example II.** December 1st 1798, the altitude of the pole star below the pole was 52° 20' N, height of the eye 12 feet. Required the latitude?

*Observed altitude, pole star* | 52° 20' N |
| **Dip and refraction** | -0 4 |

**True altitude** | 52 16 N |
| **Complement of Declination** | 1 45 |

**Latitude** | 54 2 N |

**Prob. VI.** Given the latitude by account, the declination and two observed altitudes of the sun, and the interval of time between them, to find the true latitude.

**Rule.** To the log. secant of the latitude by account, add the log. secant of the sun's declination; the sum is the logarithm ratio. To this add the log. of the difference between the natural lines of the two altitudes, and the log. of the half elapsed time from its proper column.

If this sum is column of middle time, and take the time answering thereto; the difference between which and the half elapsed time will be the time from noon when the greater altitude was observed.

Take the log. answering to this time from column of rising, from which subtract the log. ratio, the remainder is the logarithm of a natural number; which being added to the natural line of the greater altitude, the sum is the natural cosine of the meridian zenith distance; from which and the sun's declination the latitude is obtained as formerly.

If the latitude thus found differs considerably from that by account, the operation is to be repeated, using the computed latitude in place of that by account (l).

**Example I.** June 4th 1795, in latitude by account

(1.) This method is only an approximation, and ought to be used under certain restrictions; namely,

The observations must be taken between nine o'clock in the forenoon and three in the afternoon. If both observations be in the forenoon, or both in the afternoon, the interval must not be less than the distance of the time of observation of the greatest altitude from moon. If one observation be in the forenoon and the other in the afternoon, the interval must not exceed four hours and a half; and in all cases, the nearer the greater altitude is to noon the better.

If the sun's meridian zenith distance be less than the latitude, the limitations are still more contracted. If the latitude be double the meridian zenith distance, the observations must be taken between half past nine in the morning and half past two in the afternoon, and the interval must not exceed three hours and a half. The observations must be taken full nearer to noon, if the latitude exceeds the zenith distance in a greater proportion. See Matheny's British Mariner's Guide, and Requisite Tables, 2d Ed.
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The greatest altitude was observed 50° before 12, or at 11h 9'; hence the first altitude was observed at 9h 25'; A. M.

EXAMPLE IV. In latitude 49° 48' N., by account, the sun's declination being 9° 37' S., at oh 32' P. M. per watch, the altitude of the sun's lower limb was 28° 32', and at 2h 41' it was 19° 25', the height of the eye 12 feet. Required the true latitude?

First observed altitude. 28° 32' Second altitude 19° 25'
Semidiameter + 0 16 Semidiameter + 0 16
Dip and refraction — 0 5 Dip and refraction — 0 6

True altitude 28° 43' True altitude 19° 35'

The latitude by computation differs 10° 27' from that by account, the operation must be repeated.

Computed latitude 51° 15' Secant 0.2024
Declination 9° 37' Secant 0.00615

Logarithm ratio - 0.20679
Difference of nat. sines 14530 Log.
Half elapsed time 1h 43' 30" Log.

Middle time
Rising - 0 40 20 Log. 4.92927

Natural number 639
Mer. zenith. diff. 60° 52' C. 48687
Declination 9° 37'

Latitude 51° 15' N.

As the latitude by computation differs 1° 27' from that by account, the operation must be repeated.

Computed latitude 51° 15' Secant 0.2024
Declination 9° 37' Secant 0.00615

Logarithm ratio - 0.20679
Difference of nat. sines 14530 Log.
Half elapsed time 1h 43' 30" Log.

Middle time
Rising - 0 40 20 Log. 4.92927

Natural number 639
Mer. zenith. diff. 60° 52' C. 48687
Declination 9° 37'

Latitude, 51° 15' N.

As this latitude differs only 6' from that used in the computation, it may therefore be depended on as the true latitude.

PROB. VII. Given the latitude by account, the sun's declination, two observed altitudes, the elapsed time, and the course and distance run between the observations; to find the ship's latitude at the time of observation of the greater altitude.

Rule. Find the angle contained between the ship's course and the sun's bearing at the time of observation of the least altitude, with which enter the Traverse Table as a course, and the difference of latitude answering to the distance made good will be the reduction of altitude.

Now, if the least altitude be observed in the forenoon, the reduction of altitude is to be applied thereto by addition or subtraction, according as the angle between
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The difference of longitude in time between the observations is to be applied to the elapsed time by addition or subtraction, according as it is east or west. This is, however, in many cases too inconsiderable to be neglected.

With the corrected altitudes and interval, the latitude by account and sun's declination at the time of observation of the greatest altitude, the computation is to be performed by the last problem.

**EXAMPLE I.** July 6th 1793, in latitude 58° 14' N. by account, and longitude 16° E. at 16h 54' A. M. per watch, the altitude of the sun's lower limb was 53° 17', and at 17h 17' P. M. the altitude was 52° 51', and bearing per compass SW by W; the ship's course during the elapsed time was SW by W, and the hourly rate of falling 8 knots, the height of the eye 16 feet. Required the true latitude at the time of observation of the greater altitude?

Sun's bear. at z.d. ob. SW by W. Interval bet. observ. 2h 23'.

<table>
<thead>
<tr>
<th>Ship's course</th>
<th>SW by W Diff. run = 2h 23' X 8 = 19m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>52° 51' N.</td>
</tr>
<tr>
<td>Difference of natural sines</td>
<td>715 Log. 2.85431</td>
</tr>
<tr>
<td>Half elapsed time</td>
<td>1h 17' 30'' Log. 0.51294</td>
</tr>
<tr>
<td>Middle time</td>
<td>5 20 Log. 5.66859</td>
</tr>
<tr>
<td>Rising</td>
<td>1 6 10 Log. 3.61686</td>
</tr>
<tr>
<td>Logarithm ratio</td>
<td>0 30134</td>
</tr>
<tr>
<td>Natural number</td>
<td>2068 3.31553</td>
</tr>
<tr>
<td>Greatest altitude</td>
<td>53° 29' N. fine 80368</td>
</tr>
<tr>
<td>Mer. zenith. dif.</td>
<td>34 29 N. coine 82436</td>
</tr>
<tr>
<td>Declination</td>
<td>22 40 N.</td>
</tr>
<tr>
<td>Latitude</td>
<td>57° 9 N.</td>
</tr>
</tbody>
</table>

**EXAMPLE II.** Sept. 13th 1793, in latitude 38° 12' N. by account, and longitude 14° 50' E. at 28h 50' A. M. per watch, the altitude of the sun's lower limb was 40° 42', and azimuth per compass SE by E, at 11h 16' A. M. the altitude was 53° 31', the ship's course during the elapsed time was W by N at the rate of 9 knots an hour, and height of the eye 12 feet. Required the ship's true latitude at the time of the second observation?

Sun's bear. at first obs. SE by E. Elapsed time 1h 48'.

<table>
<thead>
<tr>
<th>Ship's course</th>
<th>W by N Diff. run = 1h 48' X 9 = 144m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced angle</td>
<td>111 points; supplement 4° 14'</td>
</tr>
<tr>
<td>True altitude</td>
<td>53° 59' Reduction 15</td>
</tr>
<tr>
<td>Reduced altitude</td>
<td>52° 48</td>
</tr>
<tr>
<td>Time of ob. of gr. alt.</td>
<td>10h 54' A. M. Sun's dec. 22° 39' N.</td>
</tr>
<tr>
<td>Longitude in time</td>
<td>1 4 Eq. to r. t. + 1</td>
</tr>
<tr>
<td>Reduced time</td>
<td>9 50 A. M. Red. decl. 22 40 N.</td>
</tr>
<tr>
<td>Time per watch. Alt. N. Sines. Lat. by acc. 58° 14' Secant. 0.37863</td>
<td></td>
</tr>
<tr>
<td>10h 54'. 53° 29' 80368 Declination 22 40 Secant. 0 03491</td>
<td></td>
</tr>
<tr>
<td>x 17 52 48 79653 Logarithm ratio 0.31354</td>
<td></td>
</tr>
<tr>
<td>2 23 Difference 715 Log. 2.85431</td>
<td></td>
</tr>
<tr>
<td>1 11 30'' Half elapsed time 0.51294</td>
<td></td>
</tr>
<tr>
<td>5 30 Middle time 2 68079</td>
<td></td>
</tr>
<tr>
<td>x 6 0 Rising 3.61686</td>
<td></td>
</tr>
<tr>
<td>Log. ratio 0.31254</td>
<td></td>
</tr>
<tr>
<td>2003 Natural number 53° 29' N. fine 80368</td>
<td></td>
</tr>
<tr>
<td>Mer. zenith. dif. 34 33 N. coine 82436</td>
<td></td>
</tr>
<tr>
<td>Declination 22 40 N.</td>
<td></td>
</tr>
<tr>
<td>Latitude 57° 13' N.</td>
<td></td>
</tr>
</tbody>
</table>

Since the computed latitude differs so much from that by account, it will be necessary to repeat the operation.

**Reduced time** | 10 20 Reduced decl. 4 34 |
| Time per watch. Alt. N. Sines. Lat. by acc. 38° 38' Secant. 0.010566 |
| 9h 28' 40° 43' 65253 Declination 3 34 Secant 0.00084 |
| 28 55 53 23 80264 Logarithm ratio 0.010566 |
| 1 48 Differ. 15035 Log. 4.77770 |
| 0 54 Half elapsed time 0.63182 |
| x 37 Middle time 4.91333 |
| 0 43 Rising 3.44427 |
| Log. ratio 0.30134 |
| 2003 Natural number 3376 3.43877 |
| Mer. Zenith. dif. 23° 16' N. coine 81640 |
| Declination 3 34 Secant 0.00084 |
| Latitude 38° 50' Secant 0.010566 |
| Logarithm ratio 0.010566 |
| Difference of natural sines 15032 Log. 4.17770 |
| Half elapsed time 1h 54' 33' Log. 0.63182 |
| Rising 1 37 50 Log. 4.91855 |
| Log. ratio 0.30134 |
| 0 43 10 Log. 3.26089 |
| Natural number 1418 3.31517 |
| Greatest |
PA6TIC.

Method of finding the Latitude and Longitude at Sea.

Greatest altitude 53° 23' N, fine 80864
Method of finding the Latitude and Longitude at Sea.

Mer. Zen. diff. 35 14 N cosine 81682
Declination 3 34

Latitude - 38 48 N.

This latitude differing only 2 miles from that used in the computation, may therefore be relied on as the true latitude.

Remark. If the sun comes very near the zenith, the fmes of the altitudes will vary so little as to make it uncertain which ought to be taken as that belonging to the natural fine of the meridian altitude. In this case, the following method will be found preferable.

To the log rising of the time from noon as before, add the log. secant of half the sum of the estimated meridian altitude, and greatest observed altitude; from which subtract the log. ratio, its index being increased by 10, and the remainder will be the log. fine of an arch; which added to the greatest altitude will give the sun's meridian altitude.

Example. December 21 st 1793, in latitude 22° 40' S, by account, at 12h 57', the correct altitude of the sun's centre was 89° 10' and at 12h 40', the altitude was 88° 50'. Required the true latitude?

Times per Wat. alt. N. Sines, Lat. by arc. 31° 40' Sec. 0.53491
11th 57' 0" 89° 10' 99989 Declination 23 28 Sec. 0.925749
11 4 40 88 50 99970

Logarithm ratio + 5

9.74240

Arch 0 17' fine 7.70653
Greatest altitude 89 10

Meridian altitude 89 27 zen. diff. 0 33' N
Declination 23 28 S

Latitude 22 55 S

This differing from the assumed latitude, the work must be repeated.

Latitude 22° 55' secant 0.03571
Declination 23 28 secant 0.03749

Logarithm ratio + 5

0.07320

Difference of natural sines

1° log. 1.00000
Half elapsed time 3° 50' 1.77663

Middle time 0 50 2.8498

Rising 3 0 0.93284

C. my. of lat. 67° 5'
Declination 23 28

Sum 9° 33

NA6TIVATION.

Mer. alt. 89 27 492 18', sec. 11.91827
Method of finding the Latitude and Longitude at Sea.

Log. ratio + 5

Arch 0 21 7.77791
Greatest altitude 89 10

Merid. altitude 89 31 zen. diff. 0° 29'
Declination 23 28

If the work be repeated with this last latitude, the latter part only may be altered.

Latitude 22° 59' S
Declination 23 28

Eft. mer. alt. 89 31 log. ratio 0.07341

Greatest altitude 89 10 nr. com. -5 4.92659

Sum 178 41
Half 89 20' secant 1.93973
Rising 0.93284

Arch 0 22 fine 7.79915
Greatest altitude 89 10

Meridian altitude 89 32
Zenith distance 0 28
Declination 23 28

Latitude 23° 0 S

PR0B. VIII. To find the latitude from double altitudes of the sun and the elapsed time: one of these observations being taken near the east or west points, and the other near the meridian.

Rule. With the latitude by account, the sun's declination and least altitude, compute the apparent time of observation by Problem VII. of next chapter. From whence and the interval of time between the observations, the time from noon when the greatest altitude was observed will be known. To the logarithm rising of which, add the logarithmic cosine of the sun's declination and the latitude of the place by account; the sun will be the logarithm of a natural number, which added to the natural sine of the greater altitude, will give the natural cosine of the meridian zenith distance; and hence the latitude is found as formerly.

Or the time from noon being found, the latitude may be computed by the rule given in the preceding remark.

Example. September 18th 1793, in latitude 40° o' N by account, at 6h 5' A. M. per watch, the altitude of the sun's lower limb was 16° 21', and at 11th 41' the altitude was 59° 42'; the height of the eye 18 feet. Required the latitude?

First alt. 16° 21' Second alt. 59° 42'
Sun's sem. dia. +0 16 Sun's sem. dia. +0 16
Dip and refr. -0 7 Dip and refrac. -0 5

True altitude 16 50 True altitude 57 53
Lat.
### NAVIGATION.

<table>
<thead>
<tr>
<th>Prob.</th>
<th>Example I.</th>
<th>Example II.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method of finding the Latitude and Longitude at Sea.</strong></td>
<td><strong>Method of finding the Latitude and Longitude at Sea.</strong></td>
<td><strong>Method of finding the Latitude and Longitude at Sea.</strong></td>
</tr>
<tr>
<td>Lat. by acc.</td>
<td>40° 0 N</td>
<td>57° 9 N</td>
</tr>
<tr>
<td>Declination</td>
<td>8° 3 N</td>
<td>8° 3 N</td>
</tr>
<tr>
<td>Difference</td>
<td>31° 57</td>
<td>31° 57</td>
</tr>
<tr>
<td>Altitude</td>
<td>16° 30</td>
<td>16° 30</td>
</tr>
<tr>
<td>Natural number</td>
<td>31° 57</td>
<td>31° 57</td>
</tr>
<tr>
<td>Greater altitude</td>
<td>57° 53</td>
<td>57° 53</td>
</tr>
<tr>
<td>Merid. zen. diff.</td>
<td>31° 55</td>
<td>31° 55</td>
</tr>
<tr>
<td>Declination</td>
<td>8° 3</td>
<td>8° 3</td>
</tr>
<tr>
<td>Latitude</td>
<td>39° 58</td>
<td>39° 58</td>
</tr>
<tr>
<td>Diff.</td>
<td>5° 49</td>
<td>5° 49</td>
</tr>
<tr>
<td>Time from noon of first obs.</td>
<td>4h 45m</td>
<td>4h 45m</td>
</tr>
<tr>
<td>Interval</td>
<td>1h 34m</td>
<td>1h 34m</td>
</tr>
<tr>
<td>Time from noon of 2d obs.</td>
<td>1h 15m</td>
<td>1h 15m</td>
</tr>
<tr>
<td>Latitude by acc.</td>
<td>40° 0'</td>
<td>40° 0'</td>
</tr>
<tr>
<td>Declination</td>
<td>8° 3'</td>
<td>8° 3'</td>
</tr>
<tr>
<td>Difference</td>
<td>31° 57</td>
<td>31° 57</td>
</tr>
<tr>
<td>Right ascension of Capella</td>
<td>5h 17m</td>
<td>5h 17m</td>
</tr>
<tr>
<td>Right ascension of Sirius</td>
<td>6h 36m</td>
<td>6h 36m</td>
</tr>
<tr>
<td>Capella's declin.</td>
<td>45° 46' N</td>
<td>57° 45' N</td>
</tr>
<tr>
<td>Sirius's declin.</td>
<td>16° 27' S</td>
<td>16° 27' S</td>
</tr>
<tr>
<td>Sum</td>
<td>62 N</td>
<td>62 N</td>
</tr>
</tbody>
</table>

### Practice.

<table>
<thead>
<tr>
<th>Prob.</th>
<th>Example I.</th>
<th>Example II.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method of finding the Latitude and Longitude at Sea.</strong></td>
<td><strong>Method of finding the Latitude and Longitude at Sea.</strong></td>
<td><strong>Method of finding the Latitude and Longitude at Sea.</strong></td>
</tr>
<tr>
<td>Arch first</td>
<td>24° 13' N</td>
<td>57° 9' N</td>
</tr>
<tr>
<td>Arch sec.</td>
<td>1° 11' 28' E.</td>
<td>1° 11' 28' E.</td>
</tr>
<tr>
<td>Arch third</td>
<td>9° 52'</td>
<td>9° 52'</td>
</tr>
<tr>
<td>Arch sec.</td>
<td>1° 19'</td>
<td>1° 19'</td>
</tr>
<tr>
<td>Sum</td>
<td>32° 46' N</td>
<td>54° 55'</td>
</tr>
<tr>
<td>Inter. in f.d. time</td>
<td>18° 0'</td>
<td>18° 0'</td>
</tr>
<tr>
<td>Right asc. of Menkar</td>
<td>2° 52' 31'</td>
<td>4° 44'</td>
</tr>
<tr>
<td>Right asc. of Rigel</td>
<td>5° 44'</td>
<td>0° 36'</td>
</tr>
<tr>
<td>Reduced interval</td>
<td>0° 54' 50'</td>
<td>3° 45' 26'</td>
</tr>
<tr>
<td>Declin. of Menkar</td>
<td>3° 16' N</td>
<td>1° 27'</td>
</tr>
<tr>
<td>Declin. of Rigel</td>
<td>8° 27' S</td>
<td>8° 27' S</td>
</tr>
<tr>
<td>Sum</td>
<td>11° 43' N</td>
<td>11° 43' N</td>
</tr>
<tr>
<td>Arch first</td>
<td>7° 50'</td>
<td>7° 50'</td>
</tr>
<tr>
<td>Declin. of Menkar</td>
<td>3° 16'</td>
<td>3° 16'</td>
</tr>
<tr>
<td>Reduced interval</td>
<td>0° 54' 50' H. E. time</td>
<td>0° 54' 50' H. E. time</td>
</tr>
<tr>
<td>Arch sec.</td>
<td>1° 39'</td>
<td>1° 39'</td>
</tr>
</tbody>
</table>
in order to connect the observations for ascertaining the apparent time at the ship and the longitude with each other.

An observer without any assistants may very easily take all the observations, by first taking the altitudes of the objects, then the distance, and again their altitudes, and reduce the altitudes to the time of observation of the distance; or, by a single observation of the distance, the apparent time being known, the longitude may be determined.

A set of observations of the distance between the moon and a star, and their altitudes, may be taken with accuracy during the time of the evening or morning twilight; and the observer, though not much acquainted with the stars, will not find it difficult to distinguish the star from which the moon's distance is to be observed. For the time of observation nearly, and the ship's longitude by account being known, the ultimate time at Greenwich may be found; and by entering the Nautical Almanac with the reduced time, the distance between the moon and given star will be found nearly. Now set the index of the sextant to this distance, and hold the plane of the instrument so as to be nearly at right angles to the line joining the moon's cusps, direct the light to the moon, and by giving the sextant a slow vibratory motion, the axis of which being that of vision, the star, which is usually one of the brightest in that part of the heavens, will be seen in the silvered part of the horizon-glass.

Sect. II. Of the Sextant.

This instrument is constructed for the express purpose of measuring with accuracy the angular distance between the sun and moon, or between the moon and a fixed star, in order to ascertain the longitude of a place by lunar observations. It is, therefore, made with more care than the quadrant, and has some additional appendages that are wanting in that instrument.

Fig. 74 represents the sextant, so framed as not to be liable to bend (m). The arch AA is divided into 120 degrees, each degree is divided into three parts; each of these parts therefore, contains 20 minutes, which are again subdivided by the vernier into every half minute or 30 seconds. The vernier is numbered at every fifth of the longer divisions, from the right towards the left, with 5, 10, 15, and 20; the first division to the right being the beginning of the scale.

In order to observe with accuracy, and make the images come precisely in contact, an adjusting screw B is added to the index, which may thereby be moved with greater accuracy than it can be by hand; but this screw does not act until the index is fixed by the finger screw C. Care should be taken not to force the adjusting screw when it arrives at either extremity of its adjustment. When the index is to be moved any considerable quantity, the screw C at the back of the sextant must be loosened; but when the index is brought nearly to the division required, this back screw should be tightened, and then the index may be moved gradually by the adjusting screw.

(m) Troughton's patent double-framed sextants are not liable to bend.
There are four tined glasses $D$, each of which is set in a separate frame that turns on a centre. They are used to defend the eye from the brightness of the solar image and the glare of the moon, and may be used separately or together as occasion requires.

There are three more such glasses placed behind the horizon-glasses $E$, to weaken the rays of the sun or moon when they are viewed directly through the horizon-glass. The paler glass is sometimes used in observing altitudes at sea, to take glasses of the telescope and the eye.

The frame of the index-glass $I$, is firmly fixed by a strong cock to the centre plate of the index. The horizon-glass $F$ is fixed in a frame that turns on the axis or pivots, which move in an exterior frame; the holes in which the pivots move may be tightened by four screws in the exterior frame. $G$ is a screw by which the horizon glases may be set perpendicular to the plane of the instrument: should this screw become loose or move too easily, it may be easily tightened by turning the capitation-headed screw $H$, which is on one side of the socket through which the stem of the finger screw passes.

The sextant is furnished with a plain tube (fig. 75.) without any glasses; and to render the objects still more distinct, it has two telescopes, one (fig. 76.) representing the objects erect, or in their natural position; the longer one (fig. 77.) shows them inverted; it has a large field of view and other advantages, and a little ufe will soon accustomed the observer to the inverted position, and the instrument will be as readily managed by it as by the plain tube alone. By a telescope the contact of the images is more perfectly distinguished; and by the place of the images in the field of the telescope, it is easy to perceive whether the sextant is held in the proper place for observation. By folding the tube that contains the eye-glasses in the inside of the other tube, the object is suited to different eyes, and made to appear perfectly distinct and well defined.

The telescopes are to be screwed into a circular ring at $K$, this ring rests on two points against an exterior ring, and is held thereto by two screws; by turning one or other of these screws, and diminishing or increasing the space, the axes of the telescopes may be set parallel to the plane of the sextant. The exterior ring is fixed on a triangular brass plate that slides in a socket, and by means of a screw at the back of the quadrant may be raised or lowered so as to move the centre of the telescope to point to that part of the horizon-glass which shall be judged the most fit for observation.

Fig. 78. is a circular head, with tined glasses to screw on the eye end of either of the telescopes or the plain tube. The glasses are contained in a circular plate which has four holes; three of these are fitted with tined glasses, the fourth is open. By prefing the finger against the projecting edge of this plate and turning it round, the open hole, or any of the tined glasses, may be brought between the eye-glasses of the telescope and the eye.

Fig. 79. is a magnifying glass, to assist the observer to read off the angle with more accuracy; and (fig. 80.) a screw-driver.

Adjustments of the Sextant.

The adjustments of a sextant are, to set the mirrors perpendicular to its plane and parallel to each other when the index is at Zeno, and to set the axis of the telescope parallel to the plane of the instrument. The three first of these adjustments are performed nearly in the same manner as directed in the section on the quadrant: as, however, the sextant is provided with a set of coloured glasses placed behind the horizon-glass, the index-error may be more accurately determined by measuring the sun's diameter twice, with the index placed alternately before and behind the beginning of the divisions; half the difference of these two measures will be the index-error, which must be added to, or subtracted from, all observations, according as the diameter measured with the index to the left of $\theta$ is less or greater than the diameter measured with the index to the right of the beginning of the divisions.

Adjustment IV. To set the axis of the Telescope parallel to the Plane of the Instrument.

Turn the eye end of the telescope until the two wires are parallel to the plane of the instrument and let two distant objects be selected, as two stars of the first magnitude, whose distance is not less than 90° or 100°: make the contact of these objects as perfect as possible at the wire nearest the plane of the instrument; fix the index in this position; move the sextant till the objects are seen at the other wire, and if the same points are in contact, the axis of the telescope is parallel to the plane of the sextant; but if the objects are apparently separated, do partly cover each other, correct half the error by the screws in the circular part of the supporter, one of which is above and the other between the telescope and sextant; turn the adjusting screw at the end of the index till the limbs are in contact; then bring the objects to the wire next the instrument; and if the limbs are in contact, the axis of the telescope is adjusted; if not, proceed as at the other wire, and continue till no error remains.

It is sometimes necessary to know the angular distance between the wires of the telescope; to find which, place the wires perpendicular to the plane of the sextant, hold the instrument vertical, direct the sight to the horizon, and move the sextant in its own plane till the horizon and upper wire coincide; keep the sextant in this position, and move the index till the reflected horizon is covered by the lower wire; and the division shown by the index on the limb, corrected by the index error, will be the angular distance between the wires. Other and better methods will readily occur to the observer at hand.

Use of the Sextant.

When the distance between the moon and the sun or a star is to be observed, the sextant must be held so that its plane may pass through the eye of the observer and both objects; and the reflected image of the most luminous of the two is to be brought in contact with the other seen directly. To effect this, therefore, it is evident, that when the brightest object is to the right of the other, the face of the sextant must be held upwards; but if to the left downwards. When the face of the sextant is held upwards, the instrument should be supported with the right hand, and the index moved with the left hand. But when the face of the sextant is from the observer, it should be held with
PRACTICE.

Of finding the Longitude at Sea by Lunar Observations.

The left hand, and the motion of the index regulated by the right hand.

Sometimes a sitting posture will be found very convenient for the observer, particularly when the reflected object is to the right of the direct one; in this case, the instrument is supported by the right hand, the elbow may rest on the right knee, the right leg at the same time resting on the left Knee.

If the sextant is provided with a ball and socket, and a staff, one of whose ends is attached thereto, and the other rests in a belt fastened round the body of the observer, the greater part of the weight of the instrument will by this means be supported by his body.

To observe the Distance between the Moon and any celestial object.

1. Between the sun and moon.

Put the telescope in its place, and the wires parallel to the plane of the instrument; and if the sun is very bright, raise the plate before the silvered part of the speculum; direct the telescope to the transparent part of the horizon-glass, or to the line of separation of the silvered and transparent parts, according to the brightness of the sun, and turn down one of the coloured glasses, then hold the sextant so that its plane produced may pass through the sun and moon, having its face either upwards or downwards according as the sun is to the right or left of the moon; direct the sight through the telescope to the moon; and move the index till the limb of the sun is nearly in contact with the enlightened limb of the moon; now fasten the index, and by a gentle motion of the instrument make the image of the sun move alternately past the moon, and, when in that position where the limbs are nearest each other, make the coincidence of the limbs perfect by means of the adjusting screw; this being effected, read off the degrees and parts of a degree shown by the index on the limb; using the magnifying glasses; and thus the angular distance between the nearest limbs of the sun and moon is obtained.

2. Between the moon and a star.

Direct the middle of the field of the telescope to the line of separation of the silvered and transparent parts of the horizon-glass; if the moon is very bright turn down the lightest coloured glass, and hold the sextant so that its plane may be parallel to that passing through the eye of the observer and both objects; its face being upwards if the moon is to the right of the star, but if to the left, the face is to be held from the observer; now direct the sight through the telescope to the star, and move the index till the moon appears by reflection to be nearly in contact with the star; fasten the index, and turn the adjusting screw till the coincidence of the star and enlightened limb of the moon is perfect; and the degrees and parts of a degree shown by the index will be the observed distance between the moon’s enlightened limb and the star.

The contact of the limbs must always be observed in the middle between the parallel wires.

It is sometimes difficult for those not much accustomed to observations of this kind, to find the reflected image in the horizon-glass: it will perhaps in this case be found more convenient to look directly to the object, and, by moving the index, to make its image coincide with that seen directly.

Sect. III. Of the Circular Instrument of Reflection.

This instrument was proposed with a view to correct the errors to which the sextant is liable, particularly the error arising from the inaccuracy of the divisions on the limb. It consists of the following parts: a circular ring or limb, two moveable indices, two mirrors, a telescope, coloured glasses, &c.

The limb of this instrument is a complete circle of metal, and is connected with a performed central plate by fixed radii; it is divided into 360 degrees; each degree is divided into three equal parts; and the division is carried to minutes by means of the index foil as usual.

The two indices are moveable about the line axis, which passes exactly through the centre of the instrument—the first index carries the central mirror, and the other the telescope and horizon glass; each index being provided with an adjusting screw for regulating its motion, and a scale for showing the divisions on the limb.

The central mirror is placed on the first index immediately above the centre of the instrument, and its plane makes an angle of about $30^\circ$ with the middle line of the instrument. The four screws at its under end are used for making its plane perpendicular to that of the instrument having square heads, and are therefore easily turned either way by a key for that purpose.

The horizon-glass is placed on the second index near the limb, so that as few as possible may be intercepted of the rays proceeding from the reflected object when to the left. The perpendicular position of this glass is rectified in the same manner as that of the horizon-glass of a sextant, to which it is similar. It has another motion, whereby its plane may be disposed so as to make a proper angle with the axis of the telescope, and a line joining its centre, and that of the central mirror.

The telescope is attached to the other end of the index. It is an achromatic astronomical one, and therefore inverts objects; it has two parallel wires in the common focus of the glasses, whose angular distance is between two and three degrees, and which, at the time of observation, must be placed parallel to the plane of the instrument. This is easily done, by making the mark on the eye-piece coincide with that on the tube. The telescope is moveable by two screws in a vertical direction with regard to the plane of the instrument, but is not capable of receiving a lateral motion.

There are two sets of coloured glasses, each set containing four, and differing in shade from each other. The glasses of the larger set, which belongs to the central mirror, should have each about half the degree of shade with which the correspondent glasses of the set belonging to the horizon mirror are tinged. These glasses are kept tight in their places by small prehending screws, and make an angle of about $85^\circ$ with the plane of the instrument; by which means the image from the coloured glass is not reflected to the telescope. When the angle to be measured is between $5^\circ$ and $34^\circ$, one of the glasses of the largest set is to be placed before the horizon-glass.

The handle is of wood and is screwed to the back of the instrument, immediately under the centre, with which it is to be held at the time of observation.
**NAVIGATION.**

**Practice.**

Of finding the Longitude at Sea by Lunar Observations.

**Plate cccxliii.**

Fig. 81. is a plan of the instrument, wherein the limb is represented by the divided circular plate; A is the central mirror, a a, the places which receive the terms a a of the glass fig. 84; EF, the first or central index, with its scale and adjusting screw; MN, the second or horizon index; GH, the telescope; IK, the screws for moving it forwards or from the plane of the instrument; C, the place of the coloured glass fig. 83; and D, its place in certain observations.

Fig. 82. is a section of the instrument, wherein the several parts are referred to by the same letters as in fig. 81; Fig. 83. represents one of the horizon coloured glaffes; and fig. 84. one of the central coloured glaffes: Fig. 85. is the key for turning the adjusting screws of the mirrors: Fig. 86. is the handle; Fig. 87. a section of one of the radii towards its middle: Fig. 88. is used in some terrestrial observations for diminishing the light of the direct object, whose place at the time of observation is D: Fig. 89 is the tool for adjusting the central mirror, and for rectifying the position of the telescope with regard to the plane of the instrument; there is another tool exactly of the same size. The height of these is nearly equal to that of the middle of the central mirror.

Adjustments of the Circular Instrument.

I. To set the horizon-glass so that none of the rays from the central mirror shall be reflected to the telescope from the horizon mirror, without passing through the coloured glass belonging to this last mirror.—Place the coloured glass before the horizon mirror; direct the telescope to the silvered part of that mirror, and make it nearly parallel to the plane of the instrument; move the first index; and if the rays from the central mirror to the horizon-glass, and from thence to the telescope, have all the same degree of shade with that of the coloured glass used, the horizon-glass is in its proper position; otherwise the pedetal of the glass must be turned until the uncoloured images disappear.

II. Place the two adjusting tools on the limb, about 370° of the instrument distant, one on each side of the division on the left, affixing to the plane of the central mirror produced: then the eye being placed at the upper edge of the nearest tool, move the central index till one half only of the reflected image of this tool is seen in the central mirror towards the left, and move the other tool till its half to the right is hid by the same edge of the mirror; then, if the upper edges of both tools are apparently in the same straight line, the central mirror is perpendicular to the plane of the instrument; if not bring them into this position by the screws in the pedetal of the mirror.

III. To set the horizon mirror perpendicular to the plane of the instrument.—The central mirror being previously adjusted, direct the fight through the telescope to any well defined distant object; then if, by moving the central index, the reflected image passes exactly over the direct object, the mirror is perpendicular; if not, its position must be rectified by means of the screws in the pedetal of the glasses.

A planet, or star of the first magnitude, will be found a very proper object for this purpose.

IV. To make the line of collimation parallel to the plane of the instrument.—Lay the instrument horizontally on a table; place the two adjusting tools on the limb, towards the extremities of one of the diameters of the instrument; and at about 15 or 20 feet distant let a well defined mark be placed so as to be in the same straight line with the tops of the tools; then raise or lower the telescope till the plane passing through its axis and the tops of the tools is parallel to the plane of the instrument, and direct it to the fixed object; turn either or both of the fires of the telescope till the mark is apparently in the middle between the wires; then is the telescope adjusted; and the difference, if any, between the divisions pointed out by the indices of the fires will be the error of the indices. Hence this adjustment may in future be easily made.

In this process the eye tube must be so placed as to obtain distinct vision.

V. To find that division to which the second index being placed the mirrors will be parallel, the central index being at Zero.—Having placed the first index exactly to o, direct the telescope to the horizon mirror, so that its field may be bisected by the line of separation of the silvered and transparent parts of that mirror; hold the instrument vertically, and move the second index until the direct and reflected horizons agree; and the division shown by the index will be the one required.

This adjustment may be performed by measuring the sun's diameter in contrary directions, or by making the reflected and direct images of a star or planet to coincide.

Use of the Circular Instrument.

I. To observe the distance between the sun and moon.

Set a proper coloured glass before the central mirror, if the distance between the objects is less than 20°; but if above that quantity, place a coloured glass before the horizon mirror: make the mirrors parallel, the first index being at o, and hold the instrument so that its plane may be directed to the objects, with its face downwards, or from the observer: direct the sight through the telescope to the moon: move the second index, according to the order of the divisions on the limb, till the nearest limbs of the sun and moon are almost in contact: then set that index, and make the coincidence of the limbs perfect by the adjusting screw belonging thereto: then invert the instrument, and move the central index towards the second by a quantity equal to twice the arch passed over by that index: direct the plane of the instrument to the objects: look directly to the moon, and the sun will be seen in the field of the telescope: move the contact of the same two limbs by means of the adjusting screw: Then half the angle shown by the central index will be the distance between the nearest limbs of the sun and moon.

II. The sun being to the left of the moon.

Hold the instrument with its face upwards, so that its plane may pass through both objects: direct the telescope to the moon, and make its limb coincide with the nearest limb of the sun's reflected image, by moving the second index: now put the instrument in an opposite position: direct its plane to the objects, and the sight to the moon, the central index being previously moved towards the second by a quantity equal to twice the measured distance: and make the same two limbs
Of finding the Longitude at Sea by Lunar Observations.

To observe the angular Distance between the Moon and a Fixed Star or Planet.

I. The star being to the right of the moon.

In this case the star is to be considered as the direct object; and the enlightened limb of the moon's reflected image is to be brought in contact with the star or planet, both by a direct and inverted position of the instrument, exactly in the same manner as described in the last article. If the moon's image is very bright, the lightest tinged glass is to be used.

II. The star being to the left of the moon.

Proceed in the same manner as directed for observing the distance between the sun and moon, using the lightest image is to be brought in the clock or watch, or to which the sun or moon, using the lightest tinged glass if necessary.

Sec. IV. Of the Method of determining the Longitude from Observation.

Prob. I. To convert degrees or parts of a degree into time.

Rule. Multiply the degrees and parts of a degree by 4, beginning at the lowest denomination, and the product will be the corresponding time. Observing that minutes multiplied by 4 produce seconds of time, and degrees multiplied by 4 give minutes.

Example I. Let 26° 45' be reduced to time. 26° 45' = 4

1h 47' 0"=time required.

Example II. Reduce 83° 37' to time. 83° 37' = 4

Corresponding time = 5 34 28.

Prob. II. To convert time into degrees.

Rule. Multiply the given time by 45, beginning to which add the half of the product. The sum will be the corresponding degrees.

Example I. Let 3h 4' 28" be reduced to degrees. 3h 4' 28" = 10

Half = 15 22 20

Corresponding deg. = 46 7 0

Example II. Reduce 8h 42' 36" to degrees. 8h 42' 36" = 10

87 6 0

43 3 0

Answer 130 39 0

Prob. III. Given the time under any known meridian, to find the corresponding time at Greenwich.

Rule. Let the given time be reckoned from the preceding noon, to which the longitude of the place in time is to be applied by addition or subtraction, according as it is east or west; and the sum or difference will be the corresponding time at Greenwich.

Example. What time at Greenwich answers to 6h 15' at a ship in longitude 76° 45' W?

Time at ship = 6h 15'

Longitude in time = 5 7 W.

Time at Greenwich, 11 22

Example II. Required the time at Greenwich answering to 5h 46' 39" of May 1st, at Canton, whose longitude is 113° 2' 15" E?

Time at Canton, May 1st = 5h 46' 39"

Longitude in time = 7 32 9 E.

Time at Greenwich, April 30. 22 14 30

Prob. IV. To reduce the time at Greenwich to that under any given meridian.

Rule. Reckon the given time for the preceding noon, to which add the longitude in time if east, but subtract it if west; and the sum or remainder will be the corresponding time under the given meridian.

Example I. What is the expected time of the beginning of the lunar eclipse of February 25, 1793, at a ship in longitude 109° 48' E?

Beg. of eclipse at Greenwich per Naut Alm. 9h 23' 45" Ship's longitude in time, = - 7 19 12

Time of beginning of eclipse at ship, 16 42 57

Example II. At what time may the immersion of the first satellite of Jupiter be observed at Port St Julian, in longitude 68° 44' W. by the Nautical Almanac happens at Greenwich 24th March 1792, at 17h 53' 1?.

App. time of immersion at Greenwich 17h 53' 1" Longitude of Port St Julian in time, 4 34 56 W.

App. time ofimmer, at Port St Julian, 13 18 5

Prob. V. To find the equation of equal latitudes.

Rule. To the co-secant of half the interval of time in degrees add the tangent of the latitude, and to the cotangent of half the interval add the tangent of the declination. Now if the latitude and declination be of a contrary name, add the corresponding natural numbers; but if of the same name, subtract them. Then to the ar. co-log. of this sum or difference add the proportional logarithm of one-fourth of the interval expressed in time, and the proportional logarithm of the daily variation of declination, the sum will be the proportional logarithm of the equation of equal altitudes in minutes and seconds, which are to be esteemed seconds and thirds.

Example. Let the latitude of the place of observation be 57° 9' N, the interval of time between the observations of the equal altitudes 5h 17', the sun's declination 17° 48' S, and the daily change of declination 16° 19' 3: Required the equation of equal altitudes?

Half the interval = 2h 38' 1" = 39° 37'

½ int. = 39° 37' cos'. 0.19545 cotang. 0.08209

Lat. 57° 9' tan. 0.18997 dec. 17° 48' 32°. 9° 56 32' 0.38 73 24 38 63 38 79 9.58 08 86

Sum - - 2.8167 ar. co. lo. 9.55 03 One-
The document appears to be a page from a navigation or astronomy text, discussing methods for determining the error of a watch by equal altitudes of the sun. It includes practical examples and rules for calculating the error.

### Table

| Rule | In the morning when the sun is more than two hours distant from the meridian, let a set of observations be taken, confessing, for the sake of greater accuracy, of at least three altitudes, which, together with the corresponding times per watch, are to be written regularly, the time of each observation being increased by 12 hours. In the afternoon, observe the time per watch of apparent noon, the difference between which and noon will be the time per watch of apparent time, and the error of the watch. |
| Rule | If the latitude and declination are of different names, let their sun be taken; otherwise, their difference. From the natural cosine of this sun or difference subtract the natural fine of the corrected altitude, and find the logarithm of the remainder; to which add the log. secants of the latitude and declination: the sun will be the log. rising of the horary distance of the object from the meridian, and hence the apparent time will be known. |

### Example I
January 29, 1786, in lat. 57° 9' N, the following equal altitudes of the sun were observed:

- Required the error of the watch?

### Example II
September 15th 1792, in latitude 33° 56' S, and longitude 18° 22' E, the mean of the times per watch was 8h 12° 10' A.M. and that of the altitudes of the sun's lower limb 24° 14' 15; height of the eye 24 feet. Required the error of the watch?
<table>
<thead>
<tr>
<th>Practice.</th>
<th>NAVIGATION.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>of finding Latitude</td>
<td>-</td>
<td>56 40 N.</td>
</tr>
<tr>
<td>Declination</td>
<td>-</td>
<td>16 49.5 N.</td>
</tr>
<tr>
<td>Difference</td>
<td>-</td>
<td>39 14.5</td>
</tr>
<tr>
<td>Sun's altitude</td>
<td>-</td>
<td>25 16.0</td>
</tr>
<tr>
<td>Apparent time</td>
<td>-</td>
<td>4h 38' 12&quot;</td>
</tr>
<tr>
<td>Time per watch</td>
<td>-</td>
<td>4 37 4</td>
</tr>
<tr>
<td>Watch flow</td>
<td>-</td>
<td>1 8</td>
</tr>
</tbody>
</table>

**Prob. VIII.** Given the latitude of a place, the altitude of a known fixed star, and the sun's right ascension, to find the apparent time of observation and error of the watch.

**Rule.** Correct the observed altitude of the star, and reduce its right ascension and declination to the time of observation.

With the latitude of the place, the true altitude and declination of the star, compute its horary distance from meridian by half problem; which being added to or subtracted from its right ascension according as it was observed in the western or eastern hemisphere, the sum or remainder will be the right ascension of the meridian.

From the right ascension of the meridian subtract the sun's right ascension as given in the Nautical Almanac for the moon of the given day, and the remainder will be the approximate time of observation; from which subtract the proportional part of the daily variation of right ascension anfwering thereto, and let the proportional part anfwering to the longitude be added or subtracted according as the longitude is east or west, and the result will be the apparent time of observation; and hence the error of the watch will be known.

**Example I.** December 12th 1792, in latitude 37° 46 N. and longitude 21° 15 E, the altitude of Arcturus east of the meridian was 34° 6.4, the height of the eye 10 feet. Required the apparent time of observation?

- Observed alt. of Arcturus 34° 6.4
- Dip and refraction — 4.4
- True altitude — 34° 2.0
- Latitude — 37° 46.0 N. sec. 0.10209
- Declination — 20° 14.4 N. fec. 0.02778
- Difference — 17° 31.6 N. co. 0.0538
- Altitude of Arcturus 34° 2.0 N. sec. 0.0538
- Difference 39° 30.0 59° 39

Arcturus's merid. dist. 4h 8' 10" rising 4:72526
Right as. 16 4 13
Right as. of merid. 9 58 3
Sun's right as. 17 21 59
Approximate time 16 36 4
Eq. to approx. time — 3 3

**Example.** March 3rd 1792, in latitude 51° 38 N, at 11h 29' 7" P. M. per watch, the altitude of the moon's lower limb was 37° 31', the height of the eye being 10 feet, and the time at Greenwich 13h 45'.

Required the error of the watch?

**Eq. to longitude**

**Ap. time of obs.** 16 83 17

**Example II.** January 29th 1792, in latitude 53° 24 N. and longitude 25° 18 W, by account, at 14h 58' 38", the altitude of Procyon west of the meridian was 19° 58'; height of the eye 20 feet. Required the error of the watch?

- Obs. alt. of Procyon 19° 58
- Dip and refraction 7
- True altitude 19° 51
- Latitude 53° 44 secant 0.22459
- Declination 5° 45 secant 0.00219
- Difference 47° 39 nat. cos. 0.7366
- Altitude of Procyon 19° 51 nat. fine 39956
- Difference 33° 10 4.52388

Procyon's merid. dist. 4h 16' 24" rising 4:75066
Right as. 7 28 24
Right as. of merid. 11 44 48
Sun's right as. 20 47 22
Approximate time 14° 57 26
Eq. to ap. time — 0 2 50
Eq. to long. — 0 0 17

- Apparent time 14° 54 33
- Time per watch 14° 58 38
- Watch falt 0 4 5

**Prob. IX.** Given the altitude of the moon, the latitude of a place, and the apparent time at Greenwich, to find the apparent time at the place of observation.

**Rule.** Correct the altitude of the moon's limb by Problem V. p. 731, and reduce its right ascension and declination, and the sun's right ascension to the Greenwich time of observation. Now with the latitude of the place, the declination and altitude of the moon, compute its meridian distance as before; Which being applied to its right ascension by addition or subtraction, according as it is in the western or eastern hemisphere, will give the right ascension of the meridian. Then the sun's right ascension subtracted from the right ascension of the meridian, will give the apparent time of observation.
### Navigation

**Practice.**

<table>
<thead>
<tr>
<th>Atitude of the moon's lower limb</th>
<th>$37^\circ 15'$</th>
<th>Moon's right ascension at Green. time</th>
<th>$7^h 22^m 54''$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semidiameter</td>
<td>17</td>
<td>declination</td>
<td>$17^h 0^m$ N.</td>
</tr>
<tr>
<td>Dip</td>
<td>3</td>
<td>Sun's right ascension</td>
<td>$23^h 2^m$ o.</td>
</tr>
<tr>
<td>Correction</td>
<td>43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correct altitude of moon's centre</th>
<th>$37 25$</th>
<th>secant</th>
<th>0.20712</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude</td>
<td>$51^o 38'$ N.</td>
<td>secant</td>
<td>0.01940</td>
</tr>
<tr>
<td>Declination</td>
<td>$17^o 0'$ N.</td>
<td>Nat. cofine</td>
<td>82281</td>
</tr>
<tr>
<td>Difference</td>
<td>$34 38$</td>
<td>Difference</td>
<td>20143</td>
</tr>
<tr>
<td>Moon's altitude</td>
<td>$38 25$</td>
<td>rising</td>
<td>4.30412</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Moon's meridian distance</th>
<th>$5^o 14^m 36^s$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right ascension</td>
<td>$7 22 54$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Right ascension of meridian</th>
<th>$10 37 30$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun's right ascension</td>
<td>$23 2 0$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apparent time at ship</th>
<th>$11 35 30$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time per watch</td>
<td>$11 29 7$</td>
</tr>
</tbody>
</table>

| Watch flow                        | $6 23$         |

**Prob. X.** Given the apparent distance between the moon and the sun or a fixed star, to find the true distance.

**Rule.** To the logarithmic difference answering to the moon's apparent altitude and horizontal parallax, add the logarithmic sines of half the sum, and half the difference of the apparent distance and difference of the apparent altitudes; half the sum will be the logarithmic cofine of an arch: now add the logarithmic sines of the sum and difference of this arch, and half the difference of the true altitudes, and half the sum will be the logarithmic cofine of half the true distance.

**Example.** Let the apparent altitude of the moon's centre be $48^\circ 22'$, that of the sun's $27^\circ 43'$, the apparent central distance $81^o 23^m 40^s$, and the moon's horizontal parallax $58^o 45''$. Required the true distance?

<table>
<thead>
<tr>
<th>Apparent altitude fun's centre</th>
<th>$27^o 43^m 0^s$</th>
<th>Apparent altitude moon's centre</th>
<th>$48^o 22^m 0^s$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction</td>
<td>$-1 40'$</td>
<td>Correction</td>
<td>$+38 26$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sun's true altitude</th>
<th>$27 41 20$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun's apparent altitude</td>
<td>$27 43$</td>
</tr>
<tr>
<td>Moon's apparent altitude</td>
<td>$48 22$</td>
</tr>
<tr>
<td>Difference</td>
<td>$20 39$</td>
</tr>
<tr>
<td>Apparent distance</td>
<td>$81 23 40$</td>
</tr>
<tr>
<td>Half</td>
<td>$10 39 33$</td>
</tr>
<tr>
<td>Logarithmic difference</td>
<td>$9.994638$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sum</th>
<th>$102 2 40$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference</td>
<td>$64 44 40$</td>
</tr>
<tr>
<td>Half difference of true altitudes</td>
<td>$10 39 33$</td>
</tr>
<tr>
<td>Arch</td>
<td>$51 27 29$</td>
</tr>
<tr>
<td>Sum</td>
<td>$62 7 2$</td>
</tr>
<tr>
<td>Difference</td>
<td>$40 47 56$</td>
</tr>
<tr>
<td>Half difference of true altitudes</td>
<td>$19.7561600$</td>
</tr>
<tr>
<td>Arch</td>
<td>$51 27 29$</td>
</tr>
<tr>
<td>Sum</td>
<td>$62 7 2$</td>
</tr>
<tr>
<td>Difference</td>
<td>$40 47 56$</td>
</tr>
<tr>
<td>Half difference of true altitudes</td>
<td>$19.7561600$</td>
</tr>
</tbody>
</table>

| True distance                     | $81 4.32$      |

**Prob. XI.** To find the time at Greenwich answering to a given distance between the moon and the sun, or one of the stars, used in the Nautical Almanac.

**Rule.** If the given distance is found in the Nautical Almanac opposite to the given day of the month, or to that which immediately precedes or follows it, the time is found at the top of the page. But if this distance is not found exactly in the ephemeris, subtract the prop. log. of the difference between the distances which immediately precede and follow the given distance; from the prop. log. of the difference between the given and preceding distances, the remainder will be the prop. log. of the excess of the time
corresponding to the given distance, above that answering to the preceding distance: And hence the apparent time at Greenwich is known.

**Example.** September 21, 1792, the true distance between the centres of the sun and moon was 68° 13' 8". Required the apparent time at Greenwich?

<table>
<thead>
<tr>
<th>Given distance</th>
<th>68° 13' 8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff. at six hours</td>
<td>67 53 27</td>
</tr>
<tr>
<td>Diff. at twelve hours</td>
<td>69 30 6</td>
</tr>
<tr>
<td>Excess</td>
<td>0 36 39</td>
</tr>
<tr>
<td>Preceding time</td>
<td>9 0 0</td>
</tr>
<tr>
<td>App. time at Greenwich</td>
<td>9 36 39</td>
</tr>
</tbody>
</table>

**Prob. XII.** The latitude of a place and its longitude by account being given, together with the distance between, and the altitude of the moon and the sun, or one of the stars in the Nautical Almanac; to find the true longitude of the place of observation.

**Rule.** Reduce the estimate time of observation to the meridian of Greenwich by Problem III., and to this time, take from the Nautical Almanac page vii. of finding the longitude at sea by lunar observations, of the month, the moon's horizontal parallax and semidiameter. Increase the semidiameter by the augmentation answering to the moon's altitude.

Find the apparent and true altitudes of each object's centre, and the apparent central distance; with which compute the true distance by Problem X., and find the apparent time at Greenwich answering thereto by the last problem.

If the sun or star be at a proper distance from the meridian at the time of observation of the distance, compute the apparent time at the ship. If not, the error of the watch may be found from observations taken either before or after that of the distance; or the apparent time may be inferred from the moon's altitude taken with the distance, by Problem IX.

The difference between the apparent times of observation at the ship and Greenwich, will be the longitude of the ship in time; which is east or west according as the time at the ship is later or earlier than the Greenwich time.

**Example I.** March 17, 1792, in latitude 34° 23' N, and longitude by account 27° W, about 9h A.M. the distance between the nearest limbs of the sun and moon was 68° 32'; the altitude of the sun's lower limb 33° 18'; that of the moon's upper limb 31° 3'; and the height of the eye 12 feet. Required the true longitude of the ship?

<table>
<thead>
<tr>
<th>Time at ship</th>
<th>9h 0' A.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitude in time</td>
<td>1 48</td>
</tr>
<tr>
<td>Reduced time</td>
<td>10 48 A.M.</td>
</tr>
<tr>
<td>Altitude moon's upper limb</td>
<td>31 3 0</td>
</tr>
<tr>
<td>Aug. semidiameter</td>
<td>- 16 19</td>
</tr>
<tr>
<td>Dip</td>
<td>- 3 18</td>
</tr>
<tr>
<td>Apparent altitude</td>
<td>30 43 23</td>
</tr>
<tr>
<td>Correction</td>
<td>+ 49 26</td>
</tr>
<tr>
<td>Moon's true altitude</td>
<td>31 32 49</td>
</tr>
</tbody>
</table>

**Prob. XI.** To find the apparent and true altitudes of each object's centre, and the apparent central distance; with which compute the true distance by Problem X., and find the apparent time at Greenwich answering thereto by the last problem.

| Sun's apparent altitude | 33° 30' 48" |
| Moon's apparent altitude| 30° 43 23   |
| Difference              | 2 47 25     |
| Apparent distance       | 68 35 40    |
| Sum                      | 71 23 5     |
| Difference               | 65 48 15    |
| Half difference true altitudes | 0 58 20    |
| Arch                     | 55 54 12    |
| Sum                       | 56 52 32    |
| Difference                 | 54 35 52    |
| Half true distance | 34 6 53     |
| True distance             | 68 13 46    |

**Logarithmic difference**

- 9.996336
- 9.765991
- 9.734954

**Cosine**

- 9.497291
- 9.748645
- 9.912998

- 19.839275
- 9.917987

**True**
**NAVIGATION.**

<table>
<thead>
<tr>
<th>True distance</th>
<th>68° 13 46&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference at XXI hours</td>
<td>69 11 20</td>
</tr>
<tr>
<td>Difference at noon</td>
<td>67 32 38</td>
</tr>
<tr>
<td>Proportional part</td>
<td>-</td>
</tr>
<tr>
<td>Preceding time</td>
<td>21 0 0</td>
</tr>
</tbody>
</table>

**Practice.**

**NAVIATION.**

<table>
<thead>
<tr>
<th>True distance</th>
<th>68° 13 46&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference at XXI hours</td>
<td>69 11 20</td>
</tr>
<tr>
<td>Difference at noon</td>
<td>67 32 38</td>
</tr>
<tr>
<td>Proportional part</td>
<td>-</td>
</tr>
<tr>
<td>Preceding time</td>
<td>21 0 0</td>
</tr>
</tbody>
</table>

**Apparent time at Greenwich**

<table>
<thead>
<tr>
<th>Latitude</th>
<th>34° 53 0 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declination</td>
<td>0 57 9 S</td>
</tr>
<tr>
<td>Sun's altitude</td>
<td>33 29 5</td>
</tr>
<tr>
<td>Sun's altitude</td>
<td>33 29 5</td>
</tr>
<tr>
<td>Difference</td>
<td>-</td>
</tr>
<tr>
<td>Time from noon</td>
<td>3h 7 13&quot;</td>
</tr>
</tbody>
</table>

**Longitude in time**

1 52 13 = 28° 34 4 W.

**Example II.** September 2, 1792, in latitude 13° 57' N., and longitude by account 56° E., several observations of the moon and altair were taken; the mean of the times per watch was 1h 18' 59" A.M. that the distance between altair and the moon's nearest limb 58° 45' 26"; the mean of the altitude of the moon's center limb 70° 33'; and that of altair 25° 27.4'. Height of the eye 10 feet. Required the true longitude?

<table>
<thead>
<tr>
<th>Time per watch</th>
<th>1h 18' 59&quot; A.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitude in time</td>
<td>3 44 0</td>
</tr>
<tr>
<td>Reduced time</td>
<td>9 34 59</td>
</tr>
<tr>
<td>Altitude moon</td>
<td>70° 33</td>
</tr>
<tr>
<td>Semidiameter and dip</td>
<td>- 0 13</td>
</tr>
<tr>
<td>Apparent alt. moon</td>
<td>70 20 0</td>
</tr>
<tr>
<td>Correction</td>
<td>+0 19 40</td>
</tr>
<tr>
<td>True altitude moon</td>
<td>70 39 40</td>
</tr>
<tr>
<td>Moon's apparent alt.</td>
<td>70 20 0</td>
</tr>
<tr>
<td>Altair's apparent alt.</td>
<td>25 24 0</td>
</tr>
</tbody>
</table>

**Difference**

<table>
<thead>
<tr>
<th>Difference</th>
<th>44 56</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent distance</td>
<td>59 1 54</td>
</tr>
<tr>
<td>Logarithmic difference</td>
<td>9.993101</td>
</tr>
</tbody>
</table>

**Sum**

<table>
<thead>
<tr>
<th>Sum</th>
<th>103 57 54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference</td>
<td>14 5 54</td>
</tr>
</tbody>
</table>

**Half true distance**

<table>
<thead>
<tr>
<th>Half diff. true alt.</th>
<th>22 38 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch</td>
<td>72 1 57</td>
</tr>
<tr>
<td>Sum</td>
<td>94 40 47</td>
</tr>
<tr>
<td>Difference</td>
<td>49 23 7</td>
</tr>
</tbody>
</table>

| Half true distance | 29 33 48 1/2 |

**True distance**

<table>
<thead>
<tr>
<th>True distance</th>
<th>59 7 37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance at IX hours</td>
<td>58 51 17</td>
</tr>
<tr>
<td>Distance at XII hours</td>
<td>60 24 34</td>
</tr>
<tr>
<td>Proportional part</td>
<td>-</td>
</tr>
<tr>
<td>Preceding time</td>
<td>-</td>
</tr>
</tbody>
</table>

**Apparent time at Greenwich**

| Latitude | 9 31 31 |


Practice.  

**NAVIGATION**

<table>
<thead>
<tr>
<th>Variation of the Compas</th>
<th>Latitude</th>
<th>Declination</th>
<th>Secant</th>
<th>Variation of the Compas</th>
<th>Latitude</th>
<th>Declination</th>
<th>Secant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15° 57' N</td>
<td>8 19.8 N</td>
<td></td>
<td></td>
<td>0.01300</td>
<td>0.00461</td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>5 27.2</td>
<td>Nat. cosine</td>
<td>99519</td>
<td></td>
<td>56678</td>
<td>4.75341</td>
<td></td>
</tr>
<tr>
<td>Altitude attain</td>
<td>25 22.</td>
<td>Nat. sine</td>
<td>42841</td>
<td></td>
<td>289.5</td>
<td>0 0.007</td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>465</td>
<td>4.77102</td>
<td></td>
</tr>
<tr>
<td>Altair's meridian distance</td>
<td>4h 23' 14''</td>
<td>Rising</td>
<td></td>
<td></td>
<td>19 40 40</td>
<td>4.77102</td>
<td></td>
</tr>
<tr>
<td>Right ascension meridian</td>
<td>0 3 54</td>
<td>Sun's right ascension</td>
<td>10 46 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apparent time at ship</td>
<td>13 17 37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apparent time at Greenwich</td>
<td>9 31 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitude in time</td>
<td>346.6 ≡ 56° 31' E.</td>
<td>longitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The variation of the compass is the deviation of the points of the maker's compass from the corresponding points of the horizon; and is denominated east or west variation, according as the north point of the compass is to the east or west of the true north point of the horizon.

A particular account of the variation, and of the several instruments used for determining it from observation, may be seen under the articles Azimuth, Compass, and Variation; and for the method of communicating magnetism to compass needles, see Magnetics.

**Probl. I.** Given the latitude of a place, and the sun's magnetic amplitude, to find the variation of the compass.

**Rule.** To the log, secant of the latitude, add the log, cosine of the sun's declination; the sum will be the log, cosine of the true amplitude; to be reckoned from the north or south according as the declination is north or south.

The difference between the true and observed amplitudes reckoned from the same point, and if of the same name, is the variation; but if of a different name, the sum is the variation.

If the observation be made in the eastern hemisphere, the variation will be east or west according as the observed amplitude is nearer to or more remote from the north than the true amplitude. The contrary rule holds good in observations taken in the western hemisphere.

**Example I.** May 15. 1784, in latitude 33° 10' N., longitude 18° W., about 5½ A. M. the sun was observed to rise E.N. Required the variation?

Sun's dec. 8° 15 at noon 19° 5' N.  
Equation to noon 4  

To the log, cosine of the sun's declination add the log, cosine of the latitude; the sum, added to the observed amplitude, will be the true amplitude; half the sum of the latitudes will be the true amplitude of the sun in latitude 33° 10' N.

To find the sun's true amplitude, subtract the log, cosine of the latitude from the log, cosine of the sun's declination; and if the result is positive, the true amplitude is the sun's declination; if negative, the sun's declination is greater than the true amplitude.

**Example II.** December 20. 1793, in latitude 31° 38' N., longitude 85° W., the sun was observed to set west. Required the variation?

**Solution.**  
Latitude 31° 38' N.  
Dec. 23° 28 Sine 9.60012  
Variation 17° 7' W.; which is east, as the observed amplitude is farther from the north than the true amplitude, the observation being made at sun-setting.

It may be remarked, that the sun's amplitude ought to be observed at the instant the altitude of its lower limb is equal to the sum of 15 minutes and the dip of the horizon. Thus, if an observer be elevated 18 feet above the surface of the sea, the amplitude should be taken at the instant the altitude of the sun's lower limb is 15 minutes.

**Example III.** July 15. 1794, in latitude 33° 10' N., longitude 18° W., 10 A. M. the sun was observed to rise E.N. Required the variation?

Sun's declination 8° 15 at noon 19° 5' N.  
Equation to noon 4  

To the log, cosine of the sun's declination add the log, cosine of the latitude; the sum, added to the observed amplitude, will be the true amplitude; half the sum of the latitudes will be the true amplitude of the sun in latitude 33° 10' N.

To find the sun's true amplitude, subtract the log, cosine of the latitude from the log, cosine of the sun's declination; and if the result is positive, the true amplitude is the sun's declination; if negative, the sun's declination is greater than the true amplitude.

The difference between the true and observed amplitudes will be the variation as formerly.
NAVIGATION.

Example I. November 18, 1793, in latitude 50° 22' N, longitude 25° 30' W, about three quarters past eight A.M. the altitude of the sun's lower limb was 8° 10', and bearing for compass S 25° 18' E; height of the eye 200 feet. Required the variation of the compass?

Sun's declination 18th Nov. at noon 19° 25' S. Observed alt. sun's lower limb - = 8° 10'

Equation to 34th from noon - 2 Semidiameter - - 2 + 16

Dip and refraction - - - - 10

Reduced declination - 19 24 True altitude - - 8 16

Polar distance - 109 24
Altitude - 8 16 Secant - - 0.00454
Latitude - 50 22 Secant - - 0.19527

Sum - 168 2
Half - 84 1 Cosecant - - 9.01803

Difference - 25 23 Cosecant - - 9.95591

Half true azimuth - 22 43 Sine - 19 17 37.5

True azimuth - S. 45° 26' E.
Observed azimuth - S. 23° 18' E.

Variation - 22 8 W.

Example II. January 3, 1794, in latitude 33° 52' N, longitude 53° 15' E, about half past three the altitude of the sun's lower limb 41° 18', and azimuth S. 30° 25' W. the height of the eye being 20 feet.

Required the variation?

Sun's declination at noon 21° 24' S. Observed alt. sun's lower limb - = 41° 18'

Equation to time from noon - 2 Sun's semidiameter - - 4 + 16

Dip and refraction - 2 6

Reduced declination - 21 24 S. True altitude - - 41 28

Polar distance - 111 24
Altitude - 41 28 Secant - - 0.12532
Latitude - 33 52 Secant - - 0.08075

Sum - 186 44
Half - 93 22 Cosecant - - 8.76885

Difference - 18 2 Cosecant - - 9.97558

17 23 Sine - 18.95048

True azimuth - S. 34° 46 W.
Observed azimuth - S. 50° 25' W.

Variation - 15 39 W.

CHAP. IV. Of a Ship's Journal.

A JOURNAL is a regular and exact register of all the various transactions that happen aboard a ship whether at sea or land, and more particularly that which concerns a ship's way, from whence her place at noon or any other time may be justly ascertained.

That part of the account which is kept at sea is called sea-work; and the remarks taken down while the ship is in port are called harbour-work.

At sea, the day begins at noon, and ends at the noon of the following day: the first 12 hours, or those contained between noon and midnight, are denoted by P.M. signifying after mid-day; and the other 12 hours, or those from midnight to noon, are denoted by A.M. signifying before mid-day. A day's work marked Wednesday March 6, began on Tuesday at noon, and ended on Wednesday at noon. The days of the week are usually represented by astronomical characters. Thus O represents Sunday; @ Monday; @ Tuesday; @ Wednesday; @ Thursday; @ Friday; and @ Saturday.

When a ship is bound to a port so situated that she will be out of sight of land, the bearing and distance of the port must be found. This may be done by Mercator's or Middle-latitude Sailing: but the most expeditious method is by a chart. If islands, capes, or headlands intervene, it will be necessary to find the several courses and distances between each successively.
NAVIGATION.

Practically. The true course between the places must be reduced to the course per compass, by allowing the variation to the right or left of the true course, according as it is west or east.

At the time of leaving the land, the bearing of some known place is to be observed, and its distance is usually found by estimation. As perhaps the distance thus found will be liable to some error, particularly in hazy or foggy weather, or when that distance is considerable, it will therefore be proper to use the following method for this purpose.

Let the bearing be observed of the place from which the departure is to be taken; and the ship having run a certain distance on a direct course, the bearing of the same place is to be again observed. Now having one side of a plane triangle, namely the distance sailed and all the angles, the other distances may be found by Prob. I. of Oblique Sailing.

The method of finding the course and distance sailed in a given time is by the compass, the log line, and half-minute-glasses. These have already been described in the royal navy, and in ships in the service of the East India company; the log is hove once every hour; but in most other trading vessels only every two hours.

The several courses and distances sailed in the course of 24 hours, or between noon and noon, and whatever remarks that are thought worthy of notice, are set down with chalk on a board painted black called the log-board, which is usually divided into six columns: the first column on the left hand contains the hours from noon to noon; the second and third the knots and parts of a knot sailed every hour, or every two hours, according as the log is marked; the fourth column contains the courses steered; the fifth the winds; and in the sixth the various remarks and phenomena are written. The log-board is transcriber every day at noon into the log-book, which is ruled and divided after the same manner.

The courses steered must be corrected by the variation of the compass and leeway. If the variation is west, it must be allowed to the left hand of the course steered; but if east, to the right hand in order to obtain the true course. The leeway is to be allowed to the right or left of the course steered according as the ship is on the larboard or starboard tack. The method of finding the variation, which should be determined daily if possible, is given in the preceding chapter; and the leeway may be understood from what follows.

When a ship is close hauled, that part of the wind which acts upon the hull and rigging, together with a considerable part of the force which is exerted on the sails, tends to drive her to the leeward. But since the bow of a ship exposes less surface to the water than her side, the resistance will be less in the fore part than in the second: the velocity in the direction of her head will therefore in most cases be greater than the velocity in the direction of her side; and the ship's real course will between the two directions. The angle formed between the line of her apparent course and the line she really describes through the water is called the angle of leeway, or simply the leeway.

There are many circumstances which prevent the laving down rules for the allowance of leeway. The conduction of different vessels, their trim with regard to the nature and quantity of their cargo, the position and magnitude of the sail set, and the velocity of the ship together with the swell of the sea, are all susceptible of great variation, and very much affect the leeway. The following rules are, however, usually given for this purpose.

1. When a ship is close hauled, has all her sails set, the water smooth, with a little breeze of wind, she is then supposed to make little or no leeway.
2. Allow one point when the top gallant sails are hauled.
3. Allow two points when under close reefsed topsails.
4. Allow two points and a half when one top-sail is hauled.
5. Allow three points and a half when both top-sails are hauled.
6. Allow four points when the fore course is hauled.
7. Allow five points when under the main-sail only.
8. Allow six points when under-balanced mizen.
9. Allow seven points when under bare poles.

These allowances may be of some use to work up the day's works of a journal which has been neglected, but a prudent navigator will never be guilty of this neglect. A very good method of estimating the leeway is to observe the bearing of the ship's wake as frequently as may be judged necessary; which may be conveniently enough done by drawing a small semicircle on the taffarel, with its diameter at right angles to the ship's length, and dividing its circumference into points and quarters. The angle contained between the semidiameter which points right aft and that which points in the direction of the wake is the leeway.

But the best and most rational way of bringing the leeway into the day's log is to have a compass or semicircle on the taffarel, as before described, with a low crutch or swivel in its centre; after heaving the log, the line may be flipped into the crutch just before it is drawn in, and the angle it makes on the limb with the line drawn right aft will show the leeway very accurately: which as a necessary article, ought to be entered into a separate column against the hourly distance on the log-board.

In hard blowing weather, with a contrary wind and a high sea, it is impossible to gain any advantage by failing. In such cases, therefore, the object is to avoid as much as possible being driven back. With this intention it is usual to lie to under no more sail than is sufficient to prevent the violent rolling which the vessel would otherwise acquire, to the endangering her masts, and straining her timbers, &c. When a ship is brought to, the tiller is put close over to the leeward, which brings her head round to the wind. The wind having then very little power on the sails, the ship loses her way through the water; which ceasing to act on the rudder, her head falls off from the wind, the sail which she has set fills, and gives her fresh way through the water; which acting on the rudder brings her head again to the wind. Thus the ship has a kind of vibratory motion, coming up to the wind and falling off from it again alternately. Now the middle point between those upon which she comes up and falls off is

VOL. XII.
It will be proper, however, for the navigator to determine the longitude of the ship from observation as often as possible; and the reckoning is to be carried forward in the usual manner from the last good observation; yet it will perhaps be very satisfactory to keep a separate account of the longitude by dead-reckoning.

General Rules for working a Day's Work.

Correct the several courses for variation and leeway; place them, and the corresponding distances, in a table prepared for that purpose. From whence, by Traverse Sailing, find the difference of latitude and departure made good; hence the corresponding course and distance, and the ship's present latitude, will be known. Find the middle latitude at the top or bottom of the Traverse Table, and the distance answering to the departure found in a latitude column, will be the difference of longitude; or, the departure answering to the course made good, and the meridional difference of latitude in a latitude column, is the difference of longitude. The sum, or difference of which, and the longitude left, according as they are of the same or of a contrary name, will be the ship's present longitude of the same name with the greater.

Compute the difference of latitude between the ship and the intended port, or any other place whose bearing and distance may be required; find also the meridional difference of latitude and the difference of longitude. Now the course answering the meridional difference of latitude found in a latitude column, and the difference of longitude in a departure column, will be the bearing of the place, and the distance answering to the difference of latitude will be the distance of the ship from the proposed place. If these numbers exceed the limits of the Table, it will be necessary to take aliquot parts of them; and the distance is to be multiplied by the number by which the difference of latitude is divided.

It will sometimes be necessary to keep an account of the meridian distance, especially in the Baltic or Mediterranean trade, where charts are used in which the longitude is not marked. The meridian distance on the first day is that day's departure; and any other day it is equal to the sum or difference of the preceding day's meridian distance and the day's departure, according as they are of the same or of a contrary denomination.
## Navigation

**A Journal of a Voyage from London to Funchal in Madeira, in his Majesty's Ship the Resolution, A M Commander, anno 1793.**

<table>
<thead>
<tr>
<th>Day of Month</th>
<th>Winds</th>
<th>Remarks on board his Majesty's ship Resolution, 1793.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Sept. 28.</td>
<td>SW.</td>
<td>Strong gales and heavy rain. At 3 P.M. sent down top-gallant-yards; at 11 A.M. the pilot came on board.</td>
</tr>
<tr>
<td>6 Sept. 29.</td>
<td>SW.</td>
<td>Moderate and cloudy, with rain. At 10 A.M. cast loose from the hulk at Deptford; got up top-gallant yards and made sail down the river. At noon running through Blackwall reach.</td>
</tr>
<tr>
<td>7 Sept. 30.</td>
<td>SW.</td>
<td>The first part moderate, the latter equally with rain. At half past one anchored at the Galleons, and moored ship with near a whole cable each way in 5 fathoms, a quarter of a mile off shore. At 3 A.M. strong gales; got down top-gallant yards. A.M. the people employed working up junk. Bent the sheet cable.</td>
</tr>
<tr>
<td>3 Octob. 1.</td>
<td>SSW.</td>
<td>Fresh gales and equally. P.M. received the remainder of the boatswain's and carpenter's stores on board. The clerk of the cheque mustered the ship's company.</td>
</tr>
<tr>
<td>4 Octob. 2.</td>
<td>NW.</td>
<td>Variable, weather, with rain. At noon weighed and made sail; at 5 anchored in Long-reach in 8 fathoms. Received the powder on board. At 6 A.M. weighed and got down the river. At 10 A.M. past the Nore; brought to and hoisted in the boats; double reefed the topgalls, and made sail for the Downs. At noon running for the flats of Margate.</td>
</tr>
<tr>
<td>5 Octob. 3.</td>
<td>N.</td>
<td>First part stormy weather; latter moderate and clear. At 4 P.M. got through Margate Roads. At 5 run through the Downs; and at 6 anchored in Dover-road, in 10 fathoms muddy ground. Dover Castle bore north, and the south Foreland NEE4E off shore 1½ miles. Discharged the pilot. Employed making points, &amp;c. for the sails. Scaled the guns.</td>
</tr>
<tr>
<td>6 Octob. 4.</td>
<td>N.</td>
<td>Moderate and fair. Employed working up junk. Received from Deal a cutter of 17 feet, with materials. A.M. strong gales and equally, with rain; got down top-gallant yards.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks, 5 October 5, 1793.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>WSW.</td>
<td>NNE.</td>
<td>Fresh gales with rain.</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>WSW.</td>
<td></td>
<td>Hove short.</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>WSW.</td>
<td></td>
<td>Weighed and made sail.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>WNW.</td>
<td>NE.</td>
<td>Shortened sail.—Dungeness light NEE.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Fresh breezes, and cloudy.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Ditto weather.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>Got up top-gallant yards.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Set fudding furls.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>Ditto weather.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>St Alban's Head NNE.</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* A Journal.
NAVIGATION.

A JOURNAL from England towards Madeira.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Ti.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks</th>
<th>Date: October 6, 1793</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td></td>
<td>WNW</td>
<td>NE</td>
<td>A fresh steady gale.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Spoke the Ranger of London, from Carolina.</td>
<td>Took in floating fogs.</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Eddystone light NW.</td>
<td>Do. weather.</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Eddystone light NE.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td></td>
<td>WIS</td>
<td></td>
<td>Do. weather.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Set lower floating fogs.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Fresh breeze and clear weather.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As there is no land in sight this day at noon, and from the course and distance run since the last bearing of the Eddystone light was taken, it is not to be supposed that any part of England will be seen, the departure is therefore taken from the Eddystone; and the distance of the ship from that place is found by resolving an oblique angled plane triangle, in which all the angles are given, and one side, namely, the distance run (16 miles) between the observations. Hence the distance from the Eddystone at the time the last bearing of the light was taken will be found equal to 18 miles; and as the bearing of the Eddystone from the ship at that time was NE, the ship's bearing from the Eddystone was SE. Now the variation 27 points W. being allowed to the left of SW. gives SW1/2 W, the true course. The other courses are in like manner to be corrected, and inserted in the following table, together with their respective distances, beginning at 10 o'clock A.M. the time when the last bearing of the Eddystone was taken. The difference of latitude, departure, course, and distance, made good, are to be found by Traverse Sailing.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Diff. of Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diff. N.</td>
<td>S.</td>
</tr>
<tr>
<td>SSW1/2 W.</td>
<td>18</td>
<td>170</td>
</tr>
<tr>
<td>WSW1/2 S.</td>
<td>22</td>
<td>5.3</td>
</tr>
<tr>
<td>SW1/2 W.</td>
<td>58</td>
<td>34.6</td>
</tr>
<tr>
<td>SSW1/2 W.</td>
<td>93</td>
<td>56.9 = 57m.</td>
</tr>
</tbody>
</table>

Latitude of Eddystone: 50° 8' N.

Latitude by account: 49° 11' N.

Sum: 99° 19' W.

Middle latitude: 49° 10' W.

Now to middle latitude as a course, and the departure 74m. in a latitude column, the difference of longitude is 114° = 19° 54' W.

Longitude of Eddystone: 4° 24' W.

Longitude in by account: 6° 18' W.
The courses being corrected for variation, and the distances summed up, the work will be as under.

<table>
<thead>
<tr>
<th>Course</th>
<th>Diff. of Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 38° W</td>
<td>99</td>
<td>71.7 51'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61.6</td>
</tr>
</tbody>
</table>

It is now necessary to find the bearing and distance of the intended port, namely Funchal; but as that place is on the opposite side of the island with respect to the ship, it is therefore more proper to find the bearing of the east or west end of Madeira; the west end is, however, preferable. But as the small island of Porto Sancho lies a little to the NE of the east end of Madeira, it therefore seems more eligible to find the bearing and distance of that island.

To find the bearing and distance of Porto Sancho.

Latitude of ship 47° 51' N. Mer. parts 3278 North of Porto Sancho 7° 51' W.

Difference of latitude 12° 53' = 893 M.D. lat 118' Difference of long. 8° 34' 514

The course answering to the meridional difference of latitude and difference of longitude is about S 2° 23' W; and the variation, because west being allowed to the right hand, gives SW 2° W nearly, the bearing for compass, and which is the course that ought to be steered.
## Navigation

**A Journal from England towards Madeira.**

**Remarks, 8 October 1793.**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Fa.</th>
<th>Courses.</th>
<th>Winds.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>1</td>
<td>SW.</td>
<td>NW.Variable.</td>
<td>Little wind and cloudy.</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Ship's head to the SW.</td>
<td></td>
<td>Tried the current and found none.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>Ship's head from SW to SSE. WSW.</td>
<td>S.</td>
<td>Calm; a long swell from the SW.</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 61° W.</td>
<td>51</td>
<td>25</td>
<td>45</td>
<td>8° 58'</td>
<td>67° W.</td>
<td>8° 58'</td>
<td>S 21° W.</td>
</tr>
<tr>
<td>51</td>
<td>25</td>
<td>45</td>
<td>8° 58'</td>
<td>67° W.</td>
<td></td>
<td></td>
<td>932</td>
</tr>
</tbody>
</table>

The several courses corrected will be as under.

<table>
<thead>
<tr>
<th>Courses.</th>
<th>Diff. of Latitude</th>
<th>Departure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSW.</td>
<td>3</td>
<td>2.8</td>
</tr>
<tr>
<td>SW.</td>
<td>13</td>
<td>9.2</td>
</tr>
<tr>
<td>WSW.</td>
<td>22</td>
<td>8.4</td>
</tr>
<tr>
<td>WSSW.</td>
<td>15</td>
<td>4.4</td>
</tr>
<tr>
<td>S 61° W.</td>
<td>51</td>
<td>24.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Latitude by account</th>
<th>47° 26'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>77</td>
</tr>
<tr>
<td>Middle latitude</td>
<td>47° 39'</td>
</tr>
</tbody>
</table>

To find the bearing and distance of Porto Sânto.

- **Latitude of ship**: 47° 28' N.
- **Mer. parts**: 3244
- **Longitude**: 8° 58' W.
- **Latitude of Porto Sânto**: 32° 58' N.
- **Mer. parts**: 2097
- **Longitude**: 16° 25' W.

**Difference of latitude**: 14° 30' = 87° M. D. lat. 1147

Hence the bearing of Porto Sânto is S. 21° W., and distance 932 miles. The course per compass is therefore S. W. nearly.
### NAVIGATION

*A Journal from England to Madeira.*

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Fa.</th>
<th>Courses.</th>
<th>Winds.</th>
<th>Remarks, 9 October 1793</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td></td>
<td>W&amp;N.</td>
<td>SW&amp;S.</td>
<td>Squirally with rain.</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td>Handed top-gallant fails.</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td>In 1st reef topfails.</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>SE&amp;S.</td>
<td></td>
<td>Dark gloomy weather. Tacked ship.</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>In 2d reef topfails, and down top-gallant yards.</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Stormy weather; in fore and mizen topfails and 3rd reef maintop fail. Handed the maintop fail, bent the main-top fail, and brought to with it and the mizen; reefed the mainfail, at 10, wore and lay to under the mainfail, got down top-gallant masts; at 12 fet the foresail, and balanced the mizen.</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>3</td>
<td>up SE&amp;S. off ESE.</td>
<td></td>
<td>The sea froze in several half ports.</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td></td>
<td>up WSW off WNW.</td>
<td></td>
<td>The swell abates a little.</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td>The swell abates fast.</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td></td>
<td>W&amp;N.</td>
<td>SW&amp;S.</td>
<td>Up top-gallant masts.</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>Set the topfails.</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Clear weather; good observation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course.</th>
<th>Diff.</th>
<th>N. Latitude by</th>
<th>W. Long. by</th>
<th>Port of land (\text{Obs.})</th>
</tr>
</thead>
<tbody>
<tr>
<td>W&amp;N.</td>
<td>43</td>
<td>12</td>
<td>41</td>
<td>W. Long. 61° 59'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course.</th>
<th>Diff.</th>
<th>N. Latitude by</th>
<th>W. Long. by</th>
<th>Port of land (\text{Obs.})</th>
</tr>
</thead>
<tbody>
<tr>
<td>W&amp;N.</td>
<td>43</td>
<td>12</td>
<td>41</td>
<td>W. Long. 61° 59'</td>
</tr>
</tbody>
</table>

There is no leeway allowed until 2 o'clock P. M. when the top-gallant fails are taken in; from 2 to 3 one point is allowed; from 3 to 6, one and a half points are allowed; from 6 to 8 one and three-fourth points are allowed: from 8 to 9, three points; from nine to 10 four and an half points; from 10 to 12, five points; from 12 to 10 A. M. three and an half points; and from thence to noon two points leeway are allowed. Now the several courses being corrected by variation and leeway will be as under; but as the corrected courses from 2 to 3 P. M. and from 10 to 12 A. M. are the same, namely, west; this, therefore, is inferred in the table, together with the sum of the distances, as a single course and distance. In like manner, the courses from 12 to 2, and from 5 to 8 being the same, are inferred as a single course and distance.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W&amp;N.</td>
<td>43</td>
<td>1</td>
<td>41.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lat. by account 47° 30' N.</th>
</tr>
</thead>
<tbody>
<tr>
<td>To middle latitude 47° 34' and departure 41.5 the difference of longitude is (61° = 1° 1' W.)</td>
</tr>
<tr>
<td>Yesterday's longitude (8 58 W.)</td>
</tr>
<tr>
<td>Longitude in by account (9 59 W.)</td>
</tr>
</tbody>
</table>
Two points leeway are allowed on the first course, one on the second; and as the ship is 7 points from the wind on the third course, there is no leeway allowed on it. The opposite point to NW, that from which the swell set, with the variation allowed upon it, is the last course in the Traverse Table.

To find the bearing and distance of Porto Sancto.

\[
\begin{align*}
\text{To middle latitude } & \quad 47 \text{ } 24, \quad \text{departure } 103.6, \quad \text{the difference of longitude is } 153^\circ = 2^\circ 33 W. \\
\text{Yesterdays longitude} & \quad - \quad 9 \text{ } 59 W. \\
\text{Longitude in} & \quad - \quad 12 \text{ } 32 W.
\end{align*}
\]

Hence the bearing of Porto Sancto is S 12° W. and distance 870 miles; the course per compass is therefore about SWW.
### Ship's Journal

**A Journal from England towards Madeira.**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Fa.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks, 9 October 11, 1793</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td></td>
<td>SW&lt;sub&gt;W&lt;/sub&gt;S.</td>
<td>ESE.</td>
<td>Moderate wind and fair weather.</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>Shortened fail and set up the topmast rigging.</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>Variation per amplitude 21° W.</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td>A fine steady breeze.</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>By an observation of the moon's distance from Pegasi, the ship's longitude at half past 8 was 12° 28' W.</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td>Clear weather.</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td>Set flooding fails, &amp;c.</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td>One fail in sight.</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td>7</td>
<td></td>
<td></td>
<td>Do. weather, good observation.</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9</td>
<td>7</td>
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<tr>
<td>10</td>
<td>7</td>
<td></td>
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<tr>
<td>11</td>
<td>8</td>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Course.**

<table>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 12° 45' W.</td>
<td>128</td>
<td>125</td>
<td>28</td>
<td>45° 4'</td>
<td>44° 59'</td>
<td>41° W.</td>
<td>13° 13'</td>
<td>12° 59'</td>
<td>21°</td>
<td>S 12° W.</td>
</tr>
</tbody>
</table>

The observed variation S 21° being allowed to the left of SW<sub>W</sub>S. gives 12° 45' W, the corrected course and the distance summed up is 127,9, or 128 miles. Hence the difference of latitude is +124.8, and the departure 28.2. The latitude by account is therefore 45° 4' N, and the middle latitude 46° 6', to which, and the departure 28.2; in a latitude column, the difference of longitude in a distance column is 41° W; which being added to 12° 32' W, the yesterday's longitude, gives 13° 13' W, the longitude in by account. But the longitude by observation was 12° 28' W. at half past 8 P. M.; since that time the ship has run 96 miles; hence the departure in that interval is 21.2 m. Now half the difference of latitude 47 m. added to 44° 59', the latitude by observation at noon, the sun 45° 46' is the middle latitude; with which and the departure 21.2, the difference of longitude is found to be 31° W; which therefore added to 12° 28', the longitude observed, the sun is 12° 59' W, the longitude by observation reduced to noon.

To find the bearing and distance of Porto Santo:

**Latitude ship** 44° 59' N. **Mer. parts** 3028 **Longitude** 12° 59' W.

**Lat. of Porto Santo** 32° 58' N. **Mer. parts** 2097 **Longitude** 16° 25' W.

Difference latitude 12° 1 = 721 M. D. lat. 931 D. longitude 3° 26=205.

Hence the bearing of Porto Santo is S. 12° W, and distance 737 miles. The course to be steered is therefore 833° W, or SW<sub>W</sub>W.nearly.

---

**Vol. XII.**
### NAVIGATION. Practice.

**A Journal from England towards Madeira.**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Fa.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks, 1 October 12, 1793.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>5</td>
<td>SW8.</td>
<td>E6N.</td>
<td>Fresh gales, and cloudy.</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>Hauled down fludding-fails.</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>5</td>
<td></td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
<td>A steady gale and fine weather.</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>6</td>
<td>LNE.</td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Out fluddingfails allow and aloft.</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>Variation per azimuth 20° 14' W.</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td>A fall in the SW. quarter.</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td>Sailmaker altering a lower fludding-fail.</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td>Fine weather, and cloudy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 13° 31' W.</td>
<td>183</td>
<td>178</td>
<td>43</td>
<td>42° 1'</td>
<td>59 W.</td>
<td>14° 12' 13° 58'</td>
<td>20° 14' 15° 27'</td>
<td>S 12° W.</td>
<td>555 m.</td>
<td></td>
</tr>
</tbody>
</table>

The course corrected by variation is S 13° 31' W, and the distance run is 113 miles: hence the difference of latitude is 177.9, and the departure 42.8.

Yesterday’s latitude by observation - 44° 59' N. Mer. parts - - - 3028

Difference of latitude - - 2 58 S.

Latitude in by account - - 42 1 N. Mer. parts - - 2783

Meridional difference of latitude - - 245

Now to course 13° 2', and meridional difference of latitude 245 in a latitude column, the difference of longitude in a departure column is 59 W: hence the yesterday’s longitudes by account and observation, reduced to the noon of this day, will be 14° 12' W. and 13° 58' respективly.

To find the bearing and distance of Porto Santo.

Latitude ship - 42° 1' N. Mer. parts - 2783 Longitude - 13° 58' W.

Lat. Porto Santo 32° 58 N. Mer. parts - 2097 Longitude - 16° 25 W.

Difference of latitude 9 3°=545 M. D. latitude - 686 D. longitude 2 27=147.

The meridional difference of latitude and difference of longitude will be found to agree nearest under 12°, the correct bearing of Porto Santo; and the variation being allowed to the right hand of S. 12° W, gives 832° W, the bearing per compass; and the distance answering to the difference of latitude 545, under 12 degrees, is 555 miles.
N A V I G A T I O N.

A Journal from England towards Madeira.

<table>
<thead>
<tr>
<th>Hours</th>
<th>K.</th>
<th>Fa.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks, 0 October 13, 1793.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>8</td>
<td>SWsS.</td>
<td>ENE.</td>
<td>A steady gale, and fine weather.</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>5</td>
<td></td>
<td></td>
<td>At 34 minutes past three, the distance between the nearest limbs of the sun and moon, together with the altitude of each, were observed; from whence the ship's longitude at that time is 14° 1' W.</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>Hafted in the lower fludding-fails.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td>At 9h 22', by an observation of the moon's distance from a Pegasi, the longitude was 14° 20' W.</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>4</td>
<td></td>
<td></td>
<td>Freth gales, and clear.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Do. weather.</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>5</td>
<td>ESE.</td>
<td></td>
<td>Variation per amplitude 10° 51' W.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Do. per azimuth 19° 28' W. Set fludding-fails.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Carried away a fore-top-mast fludding fail boom, set up another.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Freth gales. Took in fludding-fails.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SWsW.</td>
<td>184</td>
<td>178</td>
<td>45</td>
<td>39° 3'</td>
<td>59° W.</td>
<td>15° 11'</td>
<td>14° 52'</td>
<td>1 4 pts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td>Mer. parts</td>
<td></td>
</tr>
</tbody>
</table>

The mean of the variations is about 14 points W; hence the course corrected is SSWW; with which and the distance run 184 miles, the difference of latitude is 178.5, and the departure 44.7.

Yesterday's latitude 42° 1' N. Mer. parts | 2783

Difference of latitude - 2 58 S.

Latitude in by account - 39 3 N. Mer. parts | 2549

Meridional difference of latitude

Now, to course 14 points, and meridional difference of latitude is 234, the difference of longitude is about 59 m.; which, added to the yesterday's longitude by account 14° 12' W, the sum 15° 11' W, is the longitude in by account noon. The longitudes by observation are reduced to noon as follows:

The distance run between noon and 3h 34 P. M. is 29 miles; to which, and the course 14 points, the difference of latitude is 28°.

Yesterday's latitude at noon - 42° 1 N.

Latitude at time of observation - 41° 33 N. Mer. parts | 2746

Latitude at noon - 39° 3 N. Mer. parts | 2549

Meridional difference of latitude

Then, to course 14 points, and meridional difference of latitude 197 in a latitude column, the difference of longitude in a departure column is 49 W.; which added to 14° 1' W, the longitude by observation, the sum 14° 50' W, is the longitude reduced to noon.

Again, the distance run between the preceding noon and 9h 22' P. M. is 75 miles; hence the corresponding difference of latitude is 72.8, or 73 miles; the ship's latitude at that time is therefore 40° 48' N.

Latitude at time of observation - 40° 48 N. Mer. parts | 2686

Latitude at noon - 39° 3 N. Mer. parts | 2549

Meridional difference of latitude

Now with the corrected course, and meridional difference of latitude the difference of longitude is 34 W.; which added to 14° 20' W, the sum is 14° 54' W, the reduced longitude. The mean of which and the former reduced longitude is 14° 52' W, the correct longitude.
### Journal from England towards Madeira

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>W.</th>
<th>Course(s)</th>
<th>Winds</th>
<th>Remarks, Oct 14, 1793</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>N.</td>
<td>SWbS.</td>
<td>ENE.</td>
<td>Fresh gales and hazy, single reefed top-sails.</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>E.</td>
<td>SSW.</td>
<td></td>
<td>Got down top-gallant yards. Do. weather, and a confused swell running.</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>N.</td>
<td></td>
<td></td>
<td>More moderate.</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>E.</td>
<td></td>
<td></td>
<td>Do. with lightning all round the compass.</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>N.</td>
<td></td>
<td></td>
<td>Squally with rain.</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>E.</td>
<td></td>
<td></td>
<td>Moderate weather; out reefs, and up top-gallant yards.</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>N.</td>
<td></td>
<td></td>
<td>At 11h 10 A.M. the latitude from double altitudes of the sun was 37° 10'. Clear weather.</td>
</tr>
</tbody>
</table>

#### Table of Observations

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 16° W</td>
<td>116</td>
<td>32</td>
<td>37° 12'</td>
<td>37° 8'</td>
<td>41° W.</td>
<td>15° 52' 15° 33'</td>
<td>1½ points</td>
<td>S 10° W.</td>
<td>254 m.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As the ship is close hauled from 2 o'clock A.M. 1½ points leeway are allowed upon that course, and 1 point on the two following courses.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Diff. of Latitude</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>S16°W</td>
<td>30</td>
<td>29.1</td>
</tr>
<tr>
<td>S5°W</td>
<td>54</td>
<td>53.9</td>
</tr>
<tr>
<td>SSW16°W</td>
<td>19</td>
<td>16.8</td>
</tr>
<tr>
<td>SW5°S</td>
<td>8.5</td>
<td>6.8</td>
</tr>
<tr>
<td>SSWW5°W</td>
<td>9.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Yesterdays latitude</td>
<td>39° 37'</td>
<td>M. lat. 38° 7'</td>
</tr>
<tr>
<td>Latitude in by account</td>
<td>37° 12'</td>
<td></td>
</tr>
<tr>
<td>To middle latitude 38°, and departure 32.2 in a latitude column, the difference of longitude in a distance column, is 41 W.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yesterdays longitude by account</td>
<td>15° 11' W.</td>
<td></td>
</tr>
<tr>
<td>Difference of longitude</td>
<td>41 W.</td>
<td>41 W.</td>
</tr>
<tr>
<td>Longitude in</td>
<td>15</td>
<td>22</td>
</tr>
</tbody>
</table>

The latitude by observation at 11h 10 A.M. is 37° 10', and from that time till noon the ship has run about 4 miles. Hence the corresponding difference of latitude is 2 miles, which subtracted from the latitude observed, gives 37° 8', the latitude reduced to noon.

To find the bearing and distance of Porto Santo.
- Latitude of ship 37° 8' N. Mer. parts 4203
- Lat. of Porto Santo 52 58 N. Mer. parts 2097
- Difference of latitude 4° 10' = 250 M. D. Lat. 306

Hence the bearing of Porto Santo is S 10° W, or SSWW5°W nearly, per compass, and the distance is 254 n.miles.

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**A Journal**
Practice.

A Journal from England towards Madeira.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>WbS.</td>
<td>SbW.</td>
<td>Moderate and clear weather.</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>WbN.</td>
<td>SWbS.</td>
<td>Employed working points and rope-bands. Do. weather.</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>WbS.</td>
<td>SbW.</td>
<td>Fine clear weather.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>W.</td>
<td>Variable.</td>
<td>Do. weather.</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 68° W</td>
<td>56</td>
<td>56</td>
<td>36° 47' W.</td>
<td>16° 57'</td>
<td>18° S. E</td>
<td>229 m.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Half a point of leeway is allowed on each course; but as the variation is expressed in degrees, it will be more convenient and accurate to reduce the several courses into one, leeway only being allowed upon them. The course thus found is then to be corrected for variation, with which and the distance made good the difference of latitude and departure are to be found.

To find the bearing and distance of Porto Santo.

Latitude ship 36° 47' N. Mer. parts 2376 Longitude 16° 38' W.
Lat. Porto Santo 32° 58' N. Mer. parts 2097 Longitude 16° 25' W.

Difference of latitude 3' 49'' = 229' M. D. latitude 279' D. longitude 013'

Hence the course is S 4° E, distance 229 miles; and the course per compass is SbWbW, nearly.
A Journal from England towards Madeira.

**Ship's Journal.**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Fa.</th>
<th>Courses.</th>
<th>Winds.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>4</td>
<td>SIE.</td>
<td>SWW.</td>
<td>Fresh gales.</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>4</td>
<td>S</td>
<td>W.</td>
<td>Do. and cloudy.</td>
</tr>
<tr>
<td>3-6</td>
<td>7</td>
<td>7</td>
<td>S</td>
<td>NW.</td>
<td>A steady fresh gale.</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>4</td>
<td>SIE</td>
<td>NW.</td>
<td>Do. weather.</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td></td>
<td>SIE</td>
<td>NW.</td>
<td>Do. weather.</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>7</td>
<td>SIE</td>
<td>NW.</td>
<td>Do. weather.</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>7</td>
<td>SIE</td>
<td>NW.</td>
<td>Variation per amplitude 1° points W.</td>
</tr>
<tr>
<td>11</td>
<td>8</td>
<td>7</td>
<td>SIE</td>
<td>NW.</td>
<td>People employed occasionally.</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>6</td>
<td>SIE</td>
<td>NW.</td>
<td>Do. weather.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 8° E.</td>
<td>186</td>
<td>31</td>
<td>16° 26</td>
<td>16° 7</td>
<td>50 m.</td>
</tr>
</tbody>
</table>

Half a point of lee way is allowed on the first course; which and the others, are corrected for variation as usual.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Diff.</th>
<th>Diff. of Latitude.</th>
<th>Departure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEES.</td>
<td>12.4</td>
<td>10.3</td>
<td>6.9</td>
</tr>
<tr>
<td>S8'E.</td>
<td>43.</td>
<td>41.2</td>
<td>12.5</td>
</tr>
<tr>
<td>SE.</td>
<td>65.</td>
<td>64.7</td>
<td>6.4</td>
</tr>
<tr>
<td>S.</td>
<td>68.5</td>
<td>68.5</td>
<td>0</td>
</tr>
<tr>
<td>S 8° E.</td>
<td>186</td>
<td>184.7</td>
<td>25.8</td>
</tr>
</tbody>
</table>

Yesterdays's latitude 36° 47' N.
Latitude by account 33° 42' N.
Sun 7° 29' 
Middle latitude 35° 15'

To middle latitude and departure the difference of longitude in a distance column is 31' E.

Yesterdays's longitude by acc. 16° 57' W. by obs. 16° 38' W.
Difference of longitude 0 31' E. 31' E.

Longitude in 16° 26' W. 31' E.

To find the bearing and distance of Porto Santo.

<table>
<thead>
<tr>
<th>Latitude ship</th>
<th>33° 46' N.</th>
<th>Mer. parts</th>
<th>2155</th>
<th>Longitude</th>
<th>16° 7' W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lat. of Porto Santo</td>
<td>32° 58' N.</td>
<td>Mer. parts</td>
<td>2097</td>
<td>Longitude</td>
<td>16° 25' W.</td>
</tr>
</tbody>
</table>

Difference of latitude 48' Mer. Diff. lat. 58' Diff. long. 0 18' 

Hence the bearing of Porto Santo is S. 17° W, and distance 50 miles.
This journal is performed by inspection agreeable to the precepts given. Other methods might have been used for the same purpose; for which the two instruments already described and explained seem well adapted. We cannot, however, omit recommending the sliding gunter, which will be found very expeditious, not only in performing a day’s work, but also in resolving most other nautical problems. See Sliding-Gunter.

It will be found very satisfactory to lay down the ship's place on a chart at the noon of each day, and her situation with respect to the place bound to, and the nearest land will be obvious. The bearing and distance of the intended or any other port, and other requisites may be easily found by the chart as already explained; and indeed, every day’s work may be performed on the chart; and thus the use of tables is superfluous.

EXPLANATION OF THE TABLES.

Table I. To reduce points of the compass to degrees, and conversely.

The two first and two last columns of this table contain the several points and quarter-points of the compass; the third column contains the corresponding number of points and quarters; and the fourth, the degrees, &c. answering thereto. The manner of using this table is obvious.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Kn.</th>
<th>Fa.</th>
<th>Courses</th>
<th>Winds</th>
<th>Remarks, 2 October 17, 1793</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td></td>
<td>SSW.</td>
<td>NEAE.</td>
<td>Moderate wind and clear.</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td></td>
<td>S.</td>
<td></td>
<td>Saw the island of Porto Santo, SW5S.</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Hauled up round the east end of Porto Santo. Bent the cables.</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td></td>
<td>SW8S.</td>
<td></td>
<td>Squally weather. Porto Santo W8S.</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td></td>
<td>SW8W.</td>
<td></td>
<td>Do. with rain. Porto Santo NE. The Deferters SW5S.</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td></td>
<td>SW.</td>
<td></td>
<td>Hauled up round the east end of the Deferters.</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td></td>
<td>Various.</td>
<td></td>
<td>Violent squalls; clewed up all at times.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>NNW.</td>
<td></td>
<td>Running into Funchal Roads.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>NW5N.</td>
<td></td>
<td>Anchored in Funchal Road, with the best bower in 30 fathom black sand and mud. Brazen head E5S; S, Loo Rock NW, the Great Church NNE, and the southernmost Deferters E5S; off shore two-thirds of a mile. Saluted the fort with 13 guns; returned by ditto. Found here his majesty’s ship Venus, and 7 English merchant ships.</td>
</tr>
</tbody>
</table>

Table II. The miles and parts of a mile in a degree of longitude at every degree of latitude.

The first column contains degrees of latitude, and the second the corresponding miles in a degree of longitude; the other columns are a continuation of the first and second. If the given latitude consists of degrees and minutes, a proportional part of the difference between the miles answering to the given and following degrees of latitude is to be subtracted from the miles answering to the given degree.

Example. Required the number of miles in a degree of longitude in latitude 57° 9’.

The difference between the miles answering to the latitudes of 57° and 58° is 0.89.

Then as 60° : 0.89 : 0.89

Miles answering to 57° 32.68

Miles answering to 57° 9’ 32.55

This Table may be used in parallel and Middle Latitude Sailing.

Table III. Of the Sun’s Semidiameter.

This table contains the angle subtended by the sun’s semidiameter at the earth, for every sixth day of the year. The months and days are contained in the first column, and the semidiameter expressed in minutes and seconds in the second column. It is useful in correcting...
The refraction is necessary for correcting altitudes and distances observed at sea; it is always to be subtracted from the observed altitude, or added to the zenith distance. This table is adapted to a mean state of the atmosphere in Britain, namely to 29.6 inches of mercury. If the height of the barometer, and of the thermometer. If the height of the mercury in the atmosphere in Britain, namely to 29.6 inches, is over the land, and the distance is nearer the ship than the visible horizon when unconfined: in this case, the sun's limb is to be brought in contact with the line of separation of the sea and land: the distance of that place from the ship is to be found by estimation or otherwise; and the ship answering thereto, and the height of the eye, is to be taken from Table VI.

The first of these tables contains the dip answering to the sun's limb and the moon. The numbers therein, as well as in the other table, are to be subtracted from the observed altitude, when the fore-obseration is used; but added, in the back-observation.

When the sun is over the land, and the ship nearer it than the visible horizon when unconfined; in this case, the sun's limb is to be brought in contact with the line of separation of the sea and land: the distance of that place from the ship is to be found by estimation or otherwise; and the ship answering thereto, and the height of the eye, is to be taken from Table VI.

This table contains the dip answering thereto, and the height of the mean, a correction is necessary to reduce the tabular to the true refraction. See Refraction.

Table IV. Of the Refraction in Altitude.

The refraction is necessary for correcting altitudes and distances observed at sea; it is always to be subtracted from the observed altitude, or added to the zenith distance. This table is adapted to a mean state of the atmosphere in Britain, namely to 29.6 inches of the barometer, and of the thermometer. If the height of the mercury in the atmosphere in Britain, namely to 29.6 inches, is over the land, and the distance is nearer the ship than the visible horizon when unconfined: in this case, the sun's limb is to be brought in contact with the line of separation of the sea and land: the distance of that place from the ship is to be found by estimation or otherwise; and the ship answering thereto, and the height of the eye, is to be taken from Table VI.

The first of these tables contains the dip answering to the sun's limb and the moon. The numbers therein, as well as in the other table, are to be subtracted from the observed altitude, when the fore-obseration is used; but added, in the back-observation.

TABLE IV. Of the Refraction in Altitude.

The refraction is necessary for correcting altitudes and distances observed at sea; it is always to be subtracted from the observed altitude, or added to the zenith distance. This table is adapted to a mean state of the atmosphere in Britain, namely to 29.6 inches of the barometer, and of the thermometer. If the height of the mercury in the atmosphere in Britain, namely to 29.6 inches, is over the land, and the distance is nearer the ship than the visible horizon when unconfined: in this case, the sun's limb is to be brought in contact with the line of separation of the sea and land: the distance of that place from the ship is to be found by estimation or otherwise; and the ship answering thereto, and the height of the eye, is to be taken from Table VI.

The first of these tables contains the dip answering to the sun's limb and the moon. The numbers therein, as well as in the other table, are to be subtracted from the observed altitude, when the fore-obseration is used; but added, in the back-observation.

TABLE V. VI. Of the Dip of the Horizon.

The first of these tables contains the dip answering to the sun's limb and the moon. The numbers therein, as well as in the other table, are to be subtracted from the observed altitude, when the fore-obseration is used; but added, in the back-observation.

TABLE VII. Of the Correction to be applied to the time of high water at full and change of the moon, to find the time of high water on any other day of the moon.

The first of these tables contains the dip answering to the sun's limb and the moon. The numbers therein, as well as in the other table, are to be subtracted from the observed altitude, when the fore-obseration is used; but added, in the back-observation.

TABLE VIII. IX. X. Of the Sun's declination, &c.

The first of these tables contains the dip answering to the sun's limb and the moon. The numbers therein, as well as in the other table, are to be subtracted from the observed altitude, when the fore-obseration is used; but added, in the back-observation.

TABLE XI. Of the Right Ascentions and Declinations of Fixed Stars.

This table contains the right ascensions and declinations of 60 principal fixed stars, adapted to the beginning of the year 1793. Columns fourth and fifth contain the annual variation arising from the precession of the equinoxes, and the proper motion of the stars; which serves to reduce the place of a star to a period a few years after the epoch of the table with sufficient accuracy. When the place of a star is wanted, after the beginning of 1793, the variation in right ascension is additive; and that in declination is to be applied according to its sign. The contrary rule is to be used when the given time is before 1793.

EXAMPLE. Required the right ascension and declination of Bellatrix, May 1. 1798?

Right ascension January 1. 1793 = 5h 14 3°
Variation = 3° 21 x 5° y.
Right ascension, May 1. 1798 = 5h 14 20°
Declination = 6° 8' 53° N
Variation = 4° x 5° y.
Declination, May 1. 1798 = 6° 9' 14° N

The various other tables necessary in the practice of navigation are to be found in most treatises on that subject. Those used in this article are in Mackay's Treatises on the Longitude and Navigation.
## Table I. To reduce Points of the Compass to Degrees, and converse.

<table>
<thead>
<tr>
<th>North-east Quadrant</th>
<th>South-east Quadrant</th>
<th>Points</th>
<th>N.</th>
<th>E.</th>
<th>South-west Quadrant</th>
<th>North-west Quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>North.</td>
<td>South.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>South.</td>
</tr>
<tr>
<td>N1E</td>
<td>S1E</td>
<td>0 1/2</td>
<td>2</td>
<td>48</td>
<td>45</td>
<td>S1W</td>
</tr>
<tr>
<td>N1E</td>
<td>S1E</td>
<td>0 1/2</td>
<td>5</td>
<td>37</td>
<td>30</td>
<td>S1W</td>
</tr>
<tr>
<td>N1E</td>
<td>S1E</td>
<td>0 1/2</td>
<td>8</td>
<td>26</td>
<td>15</td>
<td>S1W</td>
</tr>
<tr>
<td>NNE</td>
<td>SSE</td>
<td>1 0</td>
<td>11</td>
<td>15</td>
<td>0</td>
<td>S/W</td>
</tr>
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<td>NNE</td>
<td>SSE</td>
<td>1 1/2</td>
<td>14</td>
<td>3</td>
<td>45</td>
<td>S/W</td>
</tr>
<tr>
<td>NNE</td>
<td>SSE</td>
<td>1 1/2</td>
<td>16</td>
<td>52</td>
<td>30</td>
<td>S/W</td>
</tr>
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<td>19</td>
<td>41</td>
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<td>SSE</td>
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<td>SSE</td>
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<td>25</td>
<td>18</td>
<td>45</td>
<td>SSE</td>
</tr>
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<td>7</td>
<td>30</td>
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</tr>
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<td>N/W</td>
</tr>
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<td>47</td>
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</tr>
<tr>
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<td>37</td>
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</tr>
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<td>15</td>
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<td>52</td>
<td>30</td>
<td>N/W</td>
</tr>
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</tr>
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<td>70</td>
<td>18</td>
<td>45</td>
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</tr>
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<td>ESE</td>
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<td>73</td>
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</tr>
<tr>
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<td>ESE</td>
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</tr>
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</tr>
<tr>
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<td>ESE</td>
<td>7</td>
<td>87</td>
<td>11</td>
<td>15</td>
<td>W/S/W</td>
</tr>
<tr>
<td>East.</td>
<td>East.</td>
<td>8</td>
<td>90</td>
<td>0</td>
<td>0</td>
<td>West.</td>
</tr>
</tbody>
</table>

## Table II. The Miles and Parts of a Mile in a Degree of Longitude at every Degree of Latitude.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
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<td>1</td>
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<td>16</td>
<td>57.87</td>
<td>31</td>
<td>51.43</td>
<td>46</td>
<td>41.68</td>
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<td>76</td>
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<td>81</td>
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<td>42</td>
<td>44.61</td>
<td>57</td>
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<td>18.54</td>
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<td>15.52</td>
<td>90</td>
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</table>
### Table IV.

<table>
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<th>Refraction in Altitude.</th>
<th>Refraction at the Sea.</th>
<th>Refraction above the Sea.</th>
</tr>
</thead>
<tbody>
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<td>D. M.</td>
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<td>M. S.</td>
</tr>
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<td>3 0</td>
<td>5 0</td>
</tr>
<tr>
<td>0 5 10</td>
<td>3 0</td>
<td>5 0</td>
</tr>
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<tr>
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<td>5 0</td>
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<td>3 0</td>
<td>5 0</td>
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<td>3 0</td>
<td>5 0</td>
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<tr>
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<td>3 0</td>
<td>5 0</td>
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<td>3 0</td>
<td>5 0</td>
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<tr>
<td>0 40 130</td>
<td>3 0</td>
<td>5 0</td>
</tr>
<tr>
<td>0 45 150</td>
<td>3 0</td>
<td>5 0</td>
</tr>
</tbody>
</table>

### Table V.

<table>
<thead>
<tr>
<th>Dip of the Horizon.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet. M. S.</td>
</tr>
<tr>
<td>1 0 0 7 11 15 21 27 33 39 45</td>
</tr>
<tr>
<td>2 0 2 12 18 24 30 36 42 48 54</td>
</tr>
<tr>
<td>3 0 3 18 24 30 36 42 48 54 60</td>
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<tr>
<td>4 0 4 28 34 40 46 52 58 64 70</td>
</tr>
</tbody>
</table>

### Table VI.

<table>
<thead>
<tr>
<th>Dip of the Sea at different distances from the Observer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of the eye above the sea in feet.</td>
</tr>
<tr>
<td>Height of the eye at the horizon in feet.</td>
</tr>
<tr>
<td>Height of the eye at the horizon in degrees.</td>
</tr>
</tbody>
</table>

### Table VII.

The correction to be applied to the Time of High-water at Full and Change of the Moon, to find the time of High-water on any other day.

<table>
<thead>
<tr>
<th>Interval of Time.</th>
<th>After New or Full Moon.</th>
<th>Before 1st or 2nd Quarter.</th>
<th>After 1st or 2nd Quarter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. H.</td>
<td>M. M.</td>
<td>M. M.</td>
<td>M. M.</td>
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<tr>
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<td>5 6</td>
<td>5 6</td>
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<td>0 0 1</td>
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<td>5 16</td>
<td>5 16</td>
</tr>
<tr>
<td>0 0 2</td>
<td>0 0 2</td>
<td>5 32</td>
<td>5 32</td>
</tr>
<tr>
<td>0 0 3</td>
<td>0 0 3</td>
<td>5 48</td>
<td>5 48</td>
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<tr>
<td>0 0 4</td>
<td>0 0 4</td>
<td>6 64</td>
<td>6 64</td>
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<td>6 80</td>
<td>6 80</td>
</tr>
<tr>
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<td>0 0 6</td>
<td>6 96</td>
<td>6 96</td>
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<tr>
<td>0 0 7</td>
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<td>7 12</td>
</tr>
<tr>
<td>0 0 8</td>
<td>0 0 8</td>
<td>7 28</td>
<td>7 28</td>
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<td>0 0 9</td>
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<td>7 44</td>
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<td>7 60</td>
<td>7 60</td>
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<td>0 0 11</td>
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<td>7 92</td>
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<td>8 08</td>
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<td>10 00</td>
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</table>

### Practice.

The correction to be applied to the Time of High-water at Full and Change of the Moon, to find the time of High-water on any other day.
<table>
<thead>
<tr>
<th>Days</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22 May 715</td>
<td>1652784</td>
<td>7°17'08&quot;</td>
<td>4°49'07&quot;</td>
<td>15°17'08&quot;</td>
<td>22°77'07&quot;</td>
<td>23°6'48&quot;</td>
<td>17°53'08&quot;</td>
<td>8°50'30&quot;</td>
<td>3°27'7&quot;</td>
<td>11°45'15&quot;</td>
<td>21°56'58&quot;</td>
</tr>
</tbody>
</table>

Table VIII. Sun's Declination for 1793, being the first leap year.

<table>
<thead>
<tr>
<th>Days</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22 May 715</td>
<td>1652784</td>
<td>7°17'08&quot;</td>
<td>4°49'07&quot;</td>
<td>15°17'08&quot;</td>
<td>22°77'07&quot;</td>
<td>23°6'48&quot;</td>
<td>17°53'08&quot;</td>
<td>8°50'30&quot;</td>
<td>3°27'7&quot;</td>
<td>11°45'15&quot;</td>
<td>21°56'58&quot;</td>
</tr>
</tbody>
</table>

Table VIII. Sun's Declination for 1793, being the second leap year.

<table>
<thead>
<tr>
<th>Days</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22 May 715</td>
<td>1652784</td>
<td>7°17'08&quot;</td>
<td>4°49'07&quot;</td>
<td>15°17'08&quot;</td>
<td>22°77'07&quot;</td>
<td>23°6'48&quot;</td>
<td>17°53'08&quot;</td>
<td>8°50'30&quot;</td>
<td>3°27'7&quot;</td>
<td>11°45'15&quot;</td>
<td>21°56'58&quot;</td>
</tr>
</tbody>
</table>
### Table VIII. Sun's Declination for 1895, being the third leap year

<table>
<thead>
<tr>
<th>Months</th>
<th>Days January</th>
<th>Months</th>
<th>Days January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>1  2  3  4  5</td>
<td>May</td>
<td>1  2  3  4  5</td>
</tr>
<tr>
<td>Apr.</td>
<td>1  2  3  4  5</td>
<td>July</td>
<td>1  2  3  4  5</td>
</tr>
<tr>
<td>June</td>
<td>1  2  3  4  5</td>
<td>Sept.</td>
<td>1  2  3  4  5</td>
</tr>
<tr>
<td>July</td>
<td>1  2  3  4  5</td>
<td>Oct.</td>
<td>1  2  3  4  5</td>
</tr>
<tr>
<td>Aug.</td>
<td>1  2  3  4  5</td>
<td>Nov.</td>
<td>1  2  3  4  5</td>
</tr>
<tr>
<td>Sept.</td>
<td>1  2  3  4  5</td>
<td>Dec.</td>
<td>1  2  3  4  5</td>
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</tbody>
</table>

#### Days January

<table>
<thead>
<tr>
<th>Days January</th>
<th>Months</th>
<th>Days January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>1  2  3  4  5</td>
<td>May</td>
</tr>
<tr>
<td>May</td>
<td>1  2  3  4  5</td>
<td>July</td>
</tr>
<tr>
<td>July</td>
<td>1  2  3  4  5</td>
<td>Sept.</td>
</tr>
<tr>
<td>Sept.</td>
<td>1  2  3  4  5</td>
<td>Oct.</td>
</tr>
<tr>
<td>Oct.</td>
<td>1  2  3  4  5</td>
<td>Nov.</td>
</tr>
<tr>
<td>Nov.</td>
<td>1  2  3  4  5</td>
<td>Dec.</td>
</tr>
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</table>

#### Table VIII. Sun's Declination for 1895, being the third leap year

<table>
<thead>
<tr>
<th>Days January</th>
<th>Months</th>
<th>Days January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>1  2  3  4  5</td>
<td>May</td>
</tr>
<tr>
<td>May</td>
<td>1  2  3  4  5</td>
<td>July</td>
</tr>
<tr>
<td>July</td>
<td>1  2  3  4  5</td>
<td>Sept.</td>
</tr>
<tr>
<td>Sept.</td>
<td>1  2  3  4  5</td>
<td>Oct.</td>
</tr>
<tr>
<td>Oct.</td>
<td>1  2  3  4  5</td>
<td>Nov.</td>
</tr>
<tr>
<td>Nov.</td>
<td>1  2  3  4  5</td>
<td>Dec.</td>
</tr>
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### Table IX. To reduce the Sun's Declination to any other Meridian, and to any given Time under that Meridian.

<table>
<thead>
<tr>
<th>Latitude</th>
<th>10°</th>
<th>20°</th>
<th>30°</th>
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<th>50°</th>
<th>60°</th>
<th>70°</th>
<th>80°</th>
<th>90°</th>
<th>100°</th>
<th>110°</th>
<th>120°</th>
<th>130°</th>
<th>140°</th>
<th>150°</th>
<th>160°</th>
<th>170°</th>
<th>180°</th>
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</thead>
<tbody>
<tr>
<td>Add in</td>
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<tr>
<td>Time from Noon.</td>
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### Footnotes:
- Time from Noon.
## Table X. Change of Sun's declination.

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<th>Month</th>
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<th>Complete Years</th>
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</table>

## Table XI. The Right Ascensions and Declinations of the principal fixed Stars, adapted to the beginning of the Year 1793.

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Alphard</td>
<td>2</td>
<td>9 17 40</td>
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<td>2 52 35</td>
<td>16 8</td>
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<td>32 4</td>
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<td>Alcor</td>
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<td>7 21 22</td>
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<td>12 32 19</td>
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<td>Pollux</td>
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<td>Epsilon Canis Majoris</td>
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<td>Zeta Acubens</td>
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<td>8 47 8</td>
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Inland Navigation.

Inland Navigation, the method of conveying commodities from one part of a country to another by means of rivers, lakes, canals, or arms of the sea, penetrating far into the internal parts. See the article Canal.

The advantages of this mode of conveyance, in an extensive and populous country, are sufficiently obvious; whether we take into account the superior cheapness, facility, or quickness with which great quantities of goods can thus be carried from one place to another; or the advantages which may accrue to agriculture and other arts, by thus conveying manures, the produce of the ground, or heavy manufactured goods, to and from distant quarters; which would be altogether, impracticable by a land-carriage, without incurring a much greater expense than commodities could bear. The good effects of inland navigation are particularly evident in the vital empire of China, and in the states of Holland. In both those countries, the multitude of canals undoubtedly contributes to the opulence of the inhabitants, both by the more free scope they give to trade, and the advantages derived from them to agriculture; not to mention, that by means of the canals themselves the ground is often meliorated and made capable of producing both corn and pasture, where otherwise it would perhaps yield neither, or at least very imperfectly. These countries, however, particularly Holland, are very flat, and thus very much fitted for this kind of navigation: Great Britain and Ireland are less so, on account of the greater inequality of their surface; though in them also the making of canals is now become very common, notwithstanding the immense expense with which such undertakings are attended.

In a late treatise upon this subject by Mr Edmund Leach surveyor, the author considers the advantages which might accrue to the kingdoms of Britain and Ireland, were their Inland navigation improved as much as it might be; and he considers both countries as exceedingly proper for improvements of this kind on account of the number of fine streams of water they contain. "Every county (says he) in each kingdom is furnished with rivers and streams of water; very few, if any, of which but may be made navigable to within a mile or two of their sources," by the method he proposes.

The method of making canals hitherto practised, is so fully described under the article Canal, that nothing needs be said upon it in this place. Mr Leach observes, that all the artificial inland navigations made in this, as well as in other kingdoms, have been done by beginning them at the foot or mouth of a river, or at the utmost extent of the ebb or flow of the tide; proceeding thence upwards, either in the ordinary course of the river by sinking, widening, and cleaning it; then with the assistance of a lock and dam to raise the boats or other vessels to a higher level. This is next to be cut, widened, and cleaned as before, till we come to a third level, when the vessels are to be raised as in the former; proceeding thus, as it were step by step, till we arrive at the extent of the intended navigation. Otherwise the navigation is carried by an artificial side-cut or canal near the course of the river, raised up by locks and dams as before. These methods, however, the author considers of very great service to the country, are attended with many and considerable inconveniences.

1. Every river or other stream is the natural receptacle of all the springs, rains, and floods, which discharge themselves into it; by which means it sometimes discharges such torrents of water as sweep everything out of its way before them. This not only interrupts the navigation for a time, but is often attended with the most intolerable expense.

2. The original making of the canal with a number of locks and dams, such as is described under the article Canal, must also be very expensive.

3. Some rivers run very rapidly in particular places; and if the descent of the bed be very great, it will require a number of the locks and dams already mentioned to make such a river navigable, though the navigation should extend but a few miles from the mouth.

4. The passing of the locks is always attended with a considerable difficulty, besides the loss of time and expence.

To obviate all these inconveniences, Mr Leach proposes to begin and carry on his canal in a manner precisely the reverse of that just now described. In his method, the canal is to be begun as near the source of the river as possible; that is, as near as there is a probability of having water in the drier seasons sufficient to fill the canal; of which there can be but little required, as a stream sufficient to turn an ordinary mill must be sufficient to answer all the purposes of such a canal. Thus the navigation may be carried up much higher than in the ordinary canals with dams and locks. If a canal be made properly and the sides and bottom plastered with a cement that may be made of the same earth and clay used in making the trunk, very little water will be requisite to keep it full. Our author supposes that a stream sufficient to turn an ordinary mill will be sufficient to keep it full, even if the canal should be 20 miles long.

To construct a canal of this kind, we must make choice of a level as near the head of the river as possible; this level must be continued for a considerable way, so that the water may not have the least current, but may absolutely stagnate. Thus the original bed of the river will soon be left at a distance, and the flagrant canal will become higher and higher with respect to it, in proportion to the descent of the ground or rapidity of the river. Having proceeded this way as far as convenient, the vessels must be let down by a machine (to be afterwards described) into the bed of the original river, or from one elevated canal to another much lower; perhaps 10, 15, or 20 fathoms.

By this perfect stagnation of the water in the canals, there will be no danger of washing off the planking from the sides and bottom, so that the only waste of water will be by evaporation, and what is required for working the machine above mentioned; which, as it is only required at particular times when vessels are to be raised or lowered, must be very trifling, and cannot bear any proportion to the constant supply at the head of the canal.

In order to keep the first level easily, and for a considerable way, it will be necessary to avoid the many valleys which are naturally to be met with near the original river, by the descent of other streams into it.
Hence canals constructed on the plan recommended by our author must run out in serpentine windings a considerable way into the country, which will augment its length greatly beyond that of the original river; and thus a much greater number of people, and larger extent of country, will reap the benefit of it than if it were continued in a straight line. "One inconvenience (says our author) attending the old inland navigations that are carried on in or nigh the original rivers, is their being confined within too small a space of land, and where, for the most part, there is the least occasion either for water to water the land, or for manner to enrich the soil; whereas, by beginning a canal near the head of a river, and by continuing it on one common level, if the river have anything of a descent, the effect (says our author) attending the old common level, if the river have any thing of a descent, if it were continued in a straight line, would be mended this as the proper place for the navigation is removed from the ground. by continuing it on

1. The first and principal expence is the digging of the trunk of the canal; but this must vary so much according to the nature of the ground, that no certain estimate of the expence can be made. Sometimes the ground may be soft, and easily cut, sometimes hard and rocky, sometimes may be taken up by stones, &c. There must also be a very considerable difference in the expence of cutting the canal, according as the ground on one side of it is more or less elevated. Mr Leach, after making the proper calculations, supposes that in every perch of a canal of the kind under consideration, there must be removed 404 cubical yards, or 1085 cubical feet, of earth. Agreements with the workmen are commonly made by the cubic yard. It is rare that a cubic yard can be removed for less than 2d. "nor (says our author) will any fort of ground require more than 2d. except in passing through a rock, which will not often happen, unless where, by the situtation of the land through which the canal may pass, it should require to be cut more than four feet under the surface, as it may sometimes happen in cutting through a hill or neck of land, whereby the course of the canal may be shortened. According to this estimate, Mr Leach has formed a table of the expence of making canals from 2d. to 2l. the cubic yard to 9d. The smallest expence of these per mile is L. 107: 115: 14; the greatest L. 483: 19: 9. Sometimes, however, the expence may be even greater: so that the mile may cost L. 600, or near it; but this must be accounted an extraordinary expence, and not often to be expected.

In digging the trunk of the canal, care must be taken to preserve all the sand, stones, and gravel, for the purpose of making drains or gutters and the towing paths; also for the making of a wall, the outside face of which is to be 21 feet distant from the edge of the canal. The design of this is to prevent the earth and rubbish from being thrown to too great a distance from the side of the canal; and likewise for the purpose of raising a bank on the lower side about 16 or 18 inches above the surface of the water in the canal, when it is full up to the drains. On the top of this bank the towing path is to be made 12 feet wide on that side of the canal, and if this wall should be raised four feet above the surface of the towing path, it would be a fence to keep the cattle off from that side. In making the towing path on the other side, the surface of the land must be sunk to within 16 or 18 inches of the surface of the water in the canal when full; and the turf, earth, stones,
2. Drains or gutters must be made under the towing paths, on both sides of the canal. On the upper side they must be made through the hedge or fence at all convenient places, for admitting springs and rivulets, as well as rain water into the canal. On the higher side, these should be about 132 feet distant from one another, exclusive of those for the admission of springs. On the lower side, it is necessary to have drains at the distance of 66 feet from each other; which will be 80 drains per mile. These may be constructed for 2s. 6d. each, which amounts to £10 per mile. On the higher side they will cost about four shillings per drain; and at the distance of 132 feet between each drain, the expense will be £8 per mile.

In making the drains on the lower side, great care must be taken to have them truly level, and parallel to the horizon; the bottom part of the drain being exactly 39 inches perpendicular above the bottom of the canal; as on the true placing of these drains, and the true level of the bottom of the canal, entirely depends the regularity of the deepness of the water.

3. The value of the ground through which the canal is to pass must also be considered. From the observations and memoranda which our author took in the year 1774, concerning the ground through which the Tamar canal was to pass, he concluded that one eighth part of the land through which the tract passed was worth 40s. per acre; another eighth, 20s.; a third eighth part, 10s.; and all the rest not worth more than five; and a great deal of it not more than two; the average of the whole being 15s. an acre. "Then (says he), if the good, indifferent, and bad land be worth on an average, 15s. an acre, and as 30 years value is a capital price for lands, it will at that rate, amount to 22l. 10s. per acre. The rippled breadth of the canal with the towing paths and hedges being, as already said, 66 feet, which is exactly a gunter's chain; then, 10 such chains in length and one in breadth form exactly a statute acre of land; and ten chains in length is a furlong; so that every mile of canal will thus take up eight acres of land, which, at 22l. 10s. per acre, amounts to 180l. per mile.

4. Bridges are likewise a considerable article of expense in the making of canals. Mr. Leach supposes that there may be one common road bridge and two swivel bridges required per mile; the former may be erected for 60l. and the latter for 50l. each; so that the expense of all together will amount to 120l. per mile.

5. As in some particular places, on account of short turns, and where docks and basins and landing places are to be made, a greater wideness will be required, our author allows half an acre more land for every furlong on this account; which brings an additional expense of 90l. per mile.

6. It will always be necessary to have sluices for emptying the canal; each of which will cost 20l. Mr. Leach allows a sluice and lock-gate for every mile; and as these cost 20l. each, we have thus a farther expense of 40l. per mile.

7. The wall on the lower side against the bank of earth and towing path may be built for three shillings per perch; and as every mile contains 320 perches, the expense of the wall will be 48l. per mile.

8. Our author calculates the towing path on the lower side at the same price; so that it also makes an addition of 48l. per mile; but as he estimates the higher towing path and hedge at 8s. per perch, this will amount to 128l. per mile.

Thus, according to our author's calculation, the whole expense of making a canal with its necessary appendages will amount to £544; 13 : 4½ per mile; and by the calculation of another engineer, the particulars of which he also enumerates, it would not exceed £1032; 13 : 4½. This our author thinks a moderate expense; but an objection naturally occurs from the great lengths to which such canals must necessarily run; a remarkable instance of which he gives in the proposed Tamar canal, where, though the distance betwixt Bude Haven and the navigable part of the river Tamar is no more than 28 miles in a straight line, the length of the canal would not have been less than 80 miles. This length, however, according to our author, "ought not to be an object of discouragement, but on the contrary an inducement and an encouragement to promote the extending of it as much as possible into the country, as it will bring a market to every man's door that it draws nigh in its passage, and be a means to improve a greater quantity of uncultivated lands; and the navigation will be thereby much more extensive, and a much larger number of inhabitants will reap the advantages thereof, than if it had been carried on upon the original river."

We have already taken notice, that in the method of constructing canals just now mentioned, there will at certain intervals be places where the vessels must be raised and lowered by means of mechanical powers, instead of the dams and locks made use of in other canals. These machines are compounded of an inclined plane and wheel in axis. The inclined plane is a parallelogram whose length reaches from the end of one canal to the beginning of another, or to the sea or navigable river, to which the vessel is next to be conveyed; the breadth ought to be 22 feet. It may be made of good oak or deal plank, and sufficiently strong to bear the weight to be laid upon it; and it must be very strongly supported by beams of oak or other wood. It ought to be divided in the middle by a ledge or rib of ten inches square, the side ribs being nine by 12 inches. The elevation must depend upon particular circumstances. Fig. 1. shows the inclined part of the machine; AB being the wooden part just described, placed between the side of the hill W and the navigable river F. According to the dimensions already given, the two paths A and B on which the vessels move are exactly ten feet wide. G represents the canal, brought perhaps from the distance of several miles to the top of the precipice WW. At the end of the canal, and quite across from R to K, must be built a very strong wall; in which are two sluices with flood-gates at K and L, to let out the water occasionally. Between the head of the plane AB, and the end of the canal G, is a horizontal platform divided into two parts, as is represented in the figure by the letters HI. At the end of the canal are six rollers.
Fig. 2. shows the vehicle by which the lighters are conveyed up and down the inclined plane, by the two paths A and B, fig. 1. AA (fig. 2.) represents part of the inclined plane, B the vehicle in the position in which it rolls up and down the paths. C is the body of the vehicle, which is made hollow, to contain a quantity of water occasionally used as a counterbalance for its corresponding vehicle. DDD are three rollers between the bottom of the vehicle and the plane, for the purpose of rolling the boats up and down. EHHH are six rollers; four on the horizontal part of the vehicle on which the boat E is to rest in its passage up and down the plane; the other two rollers are in a moveable part, which is fastened to the body of the vehicle with a pair of very strong hinges; and in the passage of the vehicle up and down the plane it turns up between the head of the boat and the gable, preventing the former from rubbing against the plane. When the vehicle gets up to the top, this moveable part falls down on the platform marked HI, becoming parallel with the horizontal part of the vehicle; after which it serves as a launch and passage to place the boat upon the rollers MN (fig. 1.) at the end of the canal. This passage part of the vehicle, together with the three rollers at the end of the canal, is likewise of great use in towing a boat out of the canal, in order to place it on the horizontal part. At the bottom of the cavity of the vehicle is a large hole F, with a valve opening inwardly. Through this hole the water enters when the vehicle, sinks into the navigable river F, for the purpose of receiving a boat on the top or horizontal part of the vehicle till it is quite full; and will then sink entirely under water, while the boat is towed in on the horizontal part. A small rope K is fastened to the valve, on purpose to lift it up, and to keep it so while the vehicle and boat are ascending up the plane out of the canal, that the ropes, fall, discharge itself till as much as is necessary be got out; or till it becomes an equal balance for the corresponding vehicle and its contents, which are descending by the other path. Hence we see, that every machine must have two of these vehicles furnished with rollers as already described, and so constructed that one may be as nearly as possible a counterbalance to the other. As it is necessary that the vehicles should be water tight, the insides, of them must be caulked very tight; and they should be capacious enough to hold as much water as will balance the largest boat with its contents. Here it may be observed, that every vessel will be balanced by as many cubic feet of water as it displaces by being put into the water when loaded. The quantity may easily be known, by observing how far the boat sinks in the water, and calculating the bulk of the part immersed.

The machine which puts the vehicles in motion, may either be constructed with an under shot or breast water-wheel, by an over shot water-wheel; or by two walking-wheels, for men to walk in, as in cranes, &c.

Fig. 3. shows a front view of the under-shot water-wheel movement: where A is the end of the axis or cylinder of the cog or spur-wheel; the diameter of which axis is four feet, and its length not less than 22 feet, as it must be extended quite across the canal from one side to the other, and placed on the top of very strong supporters on each side of the canal, about seven feet above the surface of the water, as the loaded boat is to pass backwards and forwards under the cylinder, and at a convenient distance from the wall RR (fig. 1.) and placed between the two sluices S and T; on the end of which cylinder is the cog-wheel B (fig. 3.) The wheel B is supposed to be 20 feet in diameter, having on its edge 120 cogs; and underneath the cog wheel is the breast-water one, C, 24 feet in diameter from the tip of one aller-board to the tip of its opposite. On the end of the axis of the water-wheel D is a trundle two feet and an half in diameter, with 15 rounds or flaves contained therein. This must be placed between the two sluices S and T, to let the water out of the canal; when falling on the float-boards, will turn the wheel round from the right hand towards the left, when the fluese on the left hand of the wheel is opened; but the water turns the other way when the right hand is opened. The water falling upon the boards passes along with the wheel in the circular cavity EGF, and is discharged at G, whatever way the wheel may turn.

To the axis or cylinder of this machine, which must always be horizontal, are fixed two pair of strong ropes; the ends of each pair fastened to the upper part of the cylinder; it being necessary that they should act in contrary directions. Each must extend the whole length of the plane, and their strength must be proportioned to the weight necessary to be sustained. The two vehicles already mentioned are fastened to the other ends of the ropes; so that one pair of the ropes are wound up by the cylinder turning one way, and the other by its turning the contrary way. Thus, when one of the vehicles is at the upper part of the path A, ready to discharge its boat and cargo into the upper canal, the other will be at the foot of the path B, all under water in the lower canal, and ready for the reception of a boat from the horizontal part of it; so that as one vehicle rolls up on one side of the plane, the other will roll down on the other side, and vice versa.

Fig. 4. shows the movement by means of an over-shot water-wheel. It consists of a water-wheel C, and two spur or cog-wheels A and B. The water-wheel is 18 feet in diameter, and has two rows of buckets placed contrariwise to one another, that it may turn round in contrary directions, according as the one or the other fluese, S or T, is opened. On its axis F is a trundle of three feet diameter, having 18 rounds or flaves which fall into the cogs of the second spur-wheel B, caulsing it to turn round in a direction contrary to that of the water-wheel. This second wheel is likewise 18 feet in diameter, with a trundle of three feet, having 18 rounds or flaves. The diameter of the upper spur-wheel A is also 18 feet, but the diameter of its axis is six feet. On the edge of the wheel are 108 cogs. These flave in between the cogs of the axis of the lower spur-wheel; and thus the third wheel turns round the same way with the water-wheel C. The cylinder of this upper spur-wheel
The movement of the walking-wheel is shown (fig. 5.) A1 and A2 are two wheels for men to walk in, each of them 24 feet in diameter. B1 and B2 are the axes or cylinders of the two wheels, of equal lengths; viz. 11 feet each, and four in diameter. At one end of each of the two cylinders C1 and C2, is a wheel of the same diameter with the cylinder. On the edges of these wheels are teeth of an equal number in each wheel; and as the teeth of the wheels mutually fall into each other, the revolutions of both must be performed in the same time. By this contrivance also the cylinders will turn different ways; and the ropes on the two different cylinders will constantly one pair be wound up, and the other wound down, by the natural moving of the machine. DDD is the frame that supports the whole, which must be made very firm and secure.

Let us now suppose, that there is a boat in the upper canal to be brought down, but none to go up for a balance. In this case, as one of the vehicles must be at the top to receive the boat, the other will be at the bottom to take in water. Let then any of the movements just described be set to work, and it is plain, that as the upper vehicle with its boat descends, the under vehicle will ascend with the water; the valve being in the mean time filled up till a sufficient quantity of water has flowed out, to make the one nearly a counterbalance to the other; so that the vessel may slide down gently and without any violence.

If it happens that a boat is to go up while none is to come down, one of the vehicles being at the foot of the plane under water, and in readiness to have the boat towed upon its horizontal part, one of the faucis at K or L is to be opened, and a quantity of water let into the cistern of the upper vessel sufficient to counterbalance the boat with its contents which is to ascend. This being done, the machine is set to work, the valve of the under vehicle kept open till the water is all discharged; and then the boat will roll up to the top of the plane.

From this description of the canal and machinery for raising and lowering the vessels, the reader can be at no loss to understand the principles on which it depends. It would be superfluous to adduce examples, or follow our author through his calculations relative to particular cases. We shall only observe, that the difference of time in which vessels may be raised or lowered by the machinery just described, in comparison with what can be done in the common way by dams and locks, must give a very favourable idea of the new method. According to Mr Leach's computations, a boat with its cargo weighing 10 ton might be raised by the walking-machine in 12 or 14 minutes, by the under-shot-wheel in 15 minutes, and by the over-shot-wheel in 30 minutes; and that through a space of no less than 30 fathoms measured on the inclined plane, or 114 feet perpendicular.

NAULUM, a piece of money put into the mouth of a person deceased among the Romans, to enable him to pay Charon the ferryman for his passage. It was to be of the current coin of the reigning emperor: from this money then the time of the person's death may be known. The sum for poor men was a farthing, but the rich in general were very liberal to the old tar Charon, as appears from the number of coins often found in the neighbourhood of Rome on opening the graves of great men. Charon was looked upon as a very morose and obdurate old fellow, who would not carry over any man without his fare; and hence the proverbial use of that verse in Juvenal, 

Furo offidonio pendere naulum.

A similar custom took place among the Greeks; but the money put into the mouth of the deceased was called deus.

NAUMACHIA, in antiquity, a show or spectacle among the ancient Romans, representing a sea fight. These mock sea-fights are supposed to have originated at the time of the first Punic war, when the Romans first infused their men in the knowledge of naval affairs. Afterwards they were intended to entertain the populace, as well as to improve the seamen. They were often like other shows exhibited at the expense of individuals, to increase their popularity.

In these spectacles they sometimes proved to excel each other in swiftness; and sometimes engaged in a warlike manner. The Naumachie of Claudius indeed was a most savage diversion. The combatants used to destroy each other to amuse a tyrant and a cruel mob. As they passed before him, they used this melancholy greeting, "Ave Imperator, morituris tu faulus.

The emperor replied, "Avez vos." This they understood as an answer of kindness, and a grant of their lives: but they soon discovered that it proceeded from wanton cruelty, and barbarous iniquity. In the time of the emperor Domitian, such a vast number of vessels engaged as would have nearly formed two regular fleets for a real fight, and the channel of water was equal in magnitude to a natural river. The emperor Heligabalus is reported to have filled the channel where the vessels were to ride with wine instead of water. Tritons and sea monsters were frequently exhibited during the engagement. Suetonius and Dio Cassius inform us, that at one of these sea-fights of Domitian a violent shower fell; the emperor, however, continued till the end of the engagement, often changing his clothes, nor would he suffer any one to depart; and as the rain continued for several hours, many were seized with diarrheas, and some even died, Suet. cap. 4. Dio, lib. lxvii. Naumachiae were also places fitted up for these shows, a fort of circus or amphitheatres, with seats and porticos, &c.: there were several of them at Rome; three built by Augustus, one by Claudius, another by Domitian, and another by Nero; which served for the revere of his medals. Claudius used the lake Fucinus as a Naumachia.

NAUMBURG, a town of Germany, in the circle of Upper Saxony, capital of the county of Saxe-Neumburg, situated on the river Sala, in E. Long. 11. 10. N. Lat. 51. 12.

NAUPACTUS, or NAUPACTUM, (anc. geog.) a city of Etolia, at the mouth of the Euenus. The word is derived from NAU and HPAUK, because it was there that the Heraclidæ built the first ship which carried them to Peloponnesus. It first belonged to the Leoci Ozo, and afterwards fell into the hands of the Athenians, who gave it to the Meffinians, who had, 

Inland Navigation;

NAULUM, former movement, and the two pair of ropes in the same manner.
NAU [ 776 ]

had been driven from Peloponnesus by the Lacedaemonians. It became the property of the Lacedaemonians after the battle of Argos in the year 1782, when it was restored to the Lacedaemonians. Philip of Macedon afterwards took it, and, as the Lacedaemonians were not able to recover it, the town of Nauplion was built in its neighbourhood.

NAUPLIUS, (anc. geog.), a maritime city of Laconia, the naval station of the Argives. It was the naval station of the Argive. The fountain Canathos was in its neighbourhood. It appears that the approximation of one vessel towards another, or towards the land. The existence of the meteor, and the knowledge of its different modifications, are what constitute the certainty and the precision of my informations.

If I am asked, how it is possible that the approach of a ship towards the land should give birth to any meteor whatever in the atmosphere, and what connection there can be between two objects at such a distance from each other? I reply, that I am not obliged to give an account of the how and the wherefore; that it is sufficient for me to have discovered the fact, without being obliged to account for its principle.

The writer concludes, by defining to be called on for experimental proofs, and by promising in future a complete treatise of Naupcopy, with maps, plates, &c.

This complete treatise, as far as we know, has not yet been published, nor do we expect ever to see such a treatise on the subject as will satisfy the minds of those who are perused that every effect must have an adequate cause. The administrators of the island, who gave to M. Bottineau what he calls a report, containing the most authentic and most explicit testimony of the reality of the discovery, seem to be of our opinion; and yet they speak of this discovery with doubt, and with a degree of respect to which we think it can lay no claim. Their report is in the form of a letter directed to the Marshal of Castris; and that our infidelity may not deprive the public of what, in the immense catalogue of possibilities, may lead to a useful discovery, we shall here subjoin a copy of it.

Port Louis, Island of France, the 18th February 1784.

‘My Lord, A letter which you have written on the 6th of April to M. Bottineau, employed in the King and Company’s service in this colony, obliges us not to refuse him one for you, of which he proposes being himself the bearer. The desire only of being useful to his country, is (as he says) the motive which determines him to take this step. He would be angry with himself were he to conceal a discovery which hath hitherto escaped the most enlightened persons, and of which he only is in possession. This discovery is the art of announcing the presence of one or several ships, at 100, 150, and as far as 500 leagues distance. This is by no means the result of his studies, nor the fortunate application of the principles of any particular science; his science is in his eyes only, and he can have no other; what we call perception and genius cannot make up to him what he is deficient in from education. He perceives (as he says) in nature, some signs which indicate to him the presence of the vessels, as we know that there is a fire in a place when we perceive the smoke which comes from it. This is the comparison which he makes use of himself to those who have conversed with him about his art; this (though he has kept his secret to himself)
NAU [ 777 ]

"Supposing the reality of the discovery, we do not. Nautilus, believe that its utility can be as important as M. Botin- 
neau persuades himself it is; but it might perhaps 
throw a great light upon natural history. In order to 
be useful, it would be necessary that the discovery 
should be confined to one nation, and remain unknown 
to all others. This will be impossible, if every fleet, 
every vessel, and every privateer, is obliged to carry a 
man on board who is in possession of this secret. 

We remain, with respect, my Lord, your's, &c. Le 
Vax. de Soulliac, chevalier.

NAUSEA, or sickness; a retching or propensity 
and endeavour to vomit, arising from something which 
irritates the stomach.

NAUTILUS, in zoology; a genus belonging to 
the order of vermes teftacea. The shell consists of 
one spiral valve, divided into several apartments by 
partitions. There are 17 species, chiefly distinguished 
by particularities in their shells.

Bonani observes, that this genus of shell-fish is very 
well named from the Greek ναυτίλος, which signifies 
both "a ship" and "a sailor," for that the shells of 
all the nautili carry the appearance of a ship with a 
very high poop. Different authors, both ancient and 
modern, have called the nautilus by the names of 
pomphius, nautilus, nautilus, eum polybē, polybus tēs-
cus; and the French call it le voleur. It is by some 
imagined, that men first learned the art of navigation 
from this animal.

The most remarkable division of the nautili is into 
the thin and thick-shelled kinds. The first is called 
nautilus tērāceus; and its shell is indeed no thicker 
than a piece of paper when out of the water. This 
species is not at all fastened to its shell; but there is 
an opinion, as old as the days of Pliny, that this crea-
ture creeps out of its shell, and goes on shore to feed. 
When this species is to fall, it expands two of its arms 
on high, and between these supports a membrane, 
which it throws out on this occasion; this serves for 
its fail, and the two other arms it hangs out of its 
shell, to serve occasionally as ears or as a fléer-
age; but this last office is generally served by the tail. 
When the sea is calm, it is frequent to see numbers of 
these creatures diverting themselves in this manner: 
but as soon as a storm arises, or any thing gives them 
disturbance, they draw in their legs, and take in as 
much water as makes them specifically heavier than 
that in which they float; and then they sink to the 
bottom. When they rise again, they void this water 
by a number of holes, of which their legs are full. 
The other nautilus, whose shell is thick, never quits 
that habitation. This shell is divided into 40 or more 
partitions, which grow smaller and smaller as they 
approach the extremity or centre of the shell: be-
tween every one of these cells and the adjoining ones 
there is a communication by means of a hole in the 
centre of every one of the partitions. Through this 
hole there runs a pipe of the whole length of the shell. 
It is supplied by many, that by means of this pipe 
the fish occasionally pusses from one cell to another; 
but this seems by no means probable, as the fish must 
doubtedly be crushed to death by passing through 
it. It is much more likely that the fish always occu-
pies the largest chamber in its shell; that is, that it lives 
in the cavity between the mouth and the first parti-

Vot. XII.
NAV [778] NAV

NAUXISH. See Exercise. See MARITIME-SLAWS.

NAWORTH-Castle, in Cumberland, 10 miles from Carlisle, near the Celt. This castle is still entire and inhabited. It is a large pile, square, and built round a court. On the north it stands over the river Ithing, at a great height, the banks flagged with wood. The whole house is a very irregular building, the rooms numerous, accessible by 16 staircases, with most frequent and sudden ascents and descents, &c.

The great hall has a gallery at one end, adorned with four vaults carved in wood, viz. a griffin and dolphin, with the foliolls; an unicorn, and an ox with a coronet round his neck. In front is a figure in wood of an armed man; two others, perhaps vassals, in short jackets and caps; a pouch pendant behind, and the mutilated remains of Priapus to each; one has wooden shoes. These form the ludibrium aule in those frosty days. The top and upper end of the room is painted in squires, to the number of 107, representing the Saxon kings and heroes. The chimney here is five yards and a half broad. Within this is another apartment, hung with old tapestry, a head of Ann of Cleeves; on one side of her a small picture of a lady in full length, &c. and many others. Many of these paintings were brought from Kirk-Ofwald-castle when that was demolished. The chapel has a ceiling, and part of its wainscot of the fame kind, being paintings of Patriarchs, Jewisb kings, &c. It has a floor of plater of Paris, as have some other of the rooms. Some of the apartments are very large and spacious. The small Pophis chapel is above stairs, and joining to this chapel is the library, which has a wooden roof; the books are old, there are not above one or two of the manuscripts here now. This castle was built by one of the Dacre's, about the reign of Henry III. In the garden walls were flones with Roman inscriptions, which the late earl of Carlisle gave to Sir Thomas Robinson, and were by him removed to his museum at Rookby: On one of these flones is this inscription, pedium centum quinquaginta Britanniorm, whence it appears that the Romans, when in possession of Britain, sometimes indulged the national troops with the favour of garrisoning their own territories.

NAXIA, or NAXOS, a considerable islet of the Archipelago, 25 miles in length, and 86 in circumference. The whole islet is covered with orange, olive, lemon, cedar, citron, pomegranate, fig, and mulberry trees; and there are a great many springs and brooks. This islet has no harbour; and yet they carry on a considerable trade in barley, wine, figs, cotton, silk, flax, cheese, salt, oxen, sheep, mules, and oil. They burn only oil of mastic, though olive-oil is exceeding cheap. It is inhabited both by Greeks and Latins, who live in great dread of the Turks; for when the meanest of their ships appear here, they always wear red caps like galley-slaves, and tremble before the lowest officer: but as soon as they are gone, they put on their caps of velvet. The ladies are in vain, that when they return out of the country, they
they have 40 women in their train, half on foot and half on asses; one of whom carries a napkin or two, another a petticoat, another a pair of stockings, and so on; which is a very ridiculous sight to strangers. There are four archbishops' fees in this island, and a great many villages; but so thin of people, that the whole island does not contain above 8000 inhabitants. The highest mountain is Zia, which signifies "the mountain of Jupiter." There are but few antiquities, except some small remains of the temple of Bacchus. Some say they have mines of gold and silver; however, there is one of emery, which is so common here, and so cheap, that the English often ballast their ships therewith.

NAXOS, or Naxia, a considerable town, and capital of the Isle of Naxos, over-again the Isis of Paros, with a castle and two archbishops' fees, the one Greek and the other Latin. The greatest part of the inhabitants are Greeks. E. Long. 25. 51. N. Lat. 37. 8.

NAXUS, now Naxia, formerly Strongyle, Dia, Dionysia, Callipolis, and Little Sicily. It was called Strongyle, from a Greek word, signifying "round," though in reality it is rather square than round. The names of Dia or Dione, and Dionysia, were given it as being consecrated in a peculiar manner to the fabulous god Dionysus or Bacchus. The appellation of Callipolis Pliny and Solinus derive from the metropolis of the island, formerly a most beautiful city, which is the import of the word Callipolis. The great fertility of the country gave rise to the name of Little Sicily, Naxus being the most fruitful of all the Cyclades, as Agathemerus informs us, and no less fertile than Sicily itself. As for the name of Naxus, some assert that it was borrowed from one Naxus, under whose conduct the Carians possessed themselves of the island; others pretend it received its name from Naxus, the son of Endymion. Stephanus, Suidas, and Phavorinus, derive the name of Naxos from the Greek word naxos, signifying "to sacrifice," and will have it to have been so called from the many sacrifices offered here to Bacchus. With these Bocchart agrees, as to its being called Naxos from the sacrifices performed here in honour of Bacchus, but will have the word naxos to be a corruption of the Phoenician nafs, or nafs, signifying "a sacrifice, offering." Naxos is, according to Pliny, 75, but reckoned by the present inhabitants 100, miles in compass. It has Paros to the west, Myconos and Delos to the north, and Ios to the south. This island is the most fruitful of the Archipelago, and was formerly famed for the excellent wines it produced. Archilochus, as quoted by Athenaeus, compares them to the nectar of the gods; and Aeschylus, cited by Stephanus, affures us, that Bacchus took more delight in Naxos than in any other place whatsoever, having instructed the inhabitants to cultivate their vines. The wine of Naxos maintains to this day its ancient reputation, being by some deemed the best of the Levant. Besides wine, this island abounds with all sorts of delicious fruits, the plains being covered with orange, olive, lemon, cedar, citron, pomegranate, mulberry, and fig trees. It was formerly famous for quarries of that sort of marble which the Greeks called opistho, from its being green, and speckled with white spots like the skin of a serpent. The best emerald is found here on the mountains near the western coast, whence the neighbouring cape is called by the Italians ceto marmoretis, or the emerald cape. As to the inhabitants of Naxos, Diodorus relates that the island was first peopled by the Thracians. There were in a little time subdued by a body of Thracians, who having possessed the island for the space of 200 years and upwards, were compelled to abandon it by a drought and famine.

After the Trojan war, the Carians settled here and called the island Naxos, from their king, who was the son of Poseidon. He was succeeded by his son Leucippus, and Leucippus by his son Smaradius, in whose reign Theseus, coming out of Crete, landed here with Ariadne, whom he was, in his sleep, commanded by Bacchus to leave in this island. In process of time a colony of Cnidians and Rhodians settled here under the conduct of Hippothous and Xuthus; the last of all the Ionians, who, in time, possessed the whole island; whence the Naxians are, by Herodotus, called Ionians, and ranked among the Athenian colonies. E. Long. 26. 5. N. Lat. 36. 30. It is about 95 miles in circumference and about 30 broad.

NAXUS, (anc. geog.), a town of Crete, famous for its hones, called lapsis Naxius. Another of Sicily, built by the Chalcedians; situated on the south side of Mount Taurus, destroyed by Dionysius the tyrant; from whose ruins Tauromenium, built by Timoleon, either arose or was increased, (Plutarch).

NAYLOR (James), a noted English enthusiast, was born, about 1616, in the parish of Aredley, not far from Wakefield in Yorkshire. His father, though a farmer, and the proprietor of an estate, gave his son not a mean education; which is perhaps to be regretted, for his parts were very considerable. He married when very young and settled in Wakefield parish. In 1641, he was a private soldier under Lord Fairfax, being then a presbyterian: but he afterwards became an independent, and was made quarter-marshal under General Lambert. In 1651-2, he was converted by George Fox the apostle of the quakers, and soon commenced a preacher and prophet among that people. One of his prophecies was, that the last and general judgement should be on the 14th day of the ensuing November. The falsehood of this prediction was soon perceived, and of course his imposture ought to have been detected; but such is the power of enthusiasm over the human mind, that his fame rose daily; and upon his going to London in 1655, he excited to no common pitch the envy of his brethren. He had strange fancies of celestial illuminations, and considered himself as a great favourite of heaven. In 1656 he went into the west of England, but his extravagancies were so great and his opinions so blasphemous, that even in those days of fanaticical delusion, they were heard with such horror, that the author of them was imprisoned in Exeter gaol; from which however he was relieved in the space of a month. Upon this he determined to return to London: but taking Bristol in his way, he made his entrance into that city in imitation of our Saviour's entrance into Jerusalem, the people thronging the way, &c. and calling out "Holy, holy, holy; lord god of Sabaoth; huzannah in the highest, &c." So impious a conduct could
NAZ

Nayres.

Nazareth.

could not escape animadversion he was apprehended with fix of his acquaintances. On examination he defended all that had passed; and was soon after with his followers sent to London, imprisoned, and condemned to be whipt, and then put to hard labour. The sentence, though much petitioned against, was executed, and he recovered his senses, expired his repentance, and was again received by the Quakers, who, during his impious frenzy, had disowned him. In 1659 he was freed from prison; and the following year let off to see his wife and children; but being robbed and left bound by the way, he was found in that state and carried to a friend's house at Rippon, where he died in November 1660. He was accounted the author of several works. His eccentricities, however, rather than his writings, have preferred his character; and he stands forward to the world, not so much as a man of genius or parts, though he was in some measure possessed of both, but rather as a striking example of the power of enthusiasm over the human mind, and of the danger of giving way to the religious reveries of an overexcited imagination.

NAYRES, the nobility of the Malabar coast. We may with truth affirm that they are the oldest nobility in the world; for the most ancient writers mention them, and quote the law that permits the Nayre ladies to have many husbands; every one being allowed four. Their houses which stand tingle, have as many doors as the lady has husbands. When one of them visits her, he walks round the house, striking with his staff on his buckler; he then opens his door, and leaves a man and children; but being robbed and left bound by the way, he was found in that state and carried to a friend's house at Rippon, where he died in November 1660. He was accounted the author of several works. His eccentricities, however, rather than his writings, have preferred his character; and he stands forward to the world, not so much as a man of genius or parts, though he was in some measure possessed of both, but rather as a striking example of the power of enthusiasm over the human mind, and of the danger of giving way to the religious reveries of an overexcited imagination.

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NAZARETH. A little city in the tribe of Zebulun, in Lower Galilee, to the west of Tabor, and to the east of Poolemais. Eusebius says, it is fifteen miles from Legion towards the south. This city is much celebrated in the scriptures for having been the usual place of the residence of Jesus Christ for the first 35 years of his life. Luke ii. 51. It was there our Saviour became incarnate, where he lived in obedience to Joseph and Mary, and from whence he took the name of a Nazarene. After he had begun to execute his mission, he preached there sometimes in the synagogue, id. iv. 16. But because his countrymen had no faith in him, and were offended at the meanness of his original, he did not many miracles there, Math. xiii. 54, 58. nor would he dwell therein: so he fixed his habitation at Capernaum for the latter part of his life, id. iv. 13. The city of Nazareth was situated upon an eminence; and on one side there was a precipice from whence the Nazareans one day had a delign of throwing down our Saviour, because he upbraided them with their incredulity, Luke iv. 29.

St Epiphanius says, that in his time Nazareth was only a village, and that to the reign of Constantine it was inhabited by Jews alone, exclusive of all Christians. Adamnanus, a writer of the seventh age, says, that in his time there were two great churches to be seen at Nazareth, one in the midst of the city, built upon two arches, in the place where our Saviour's house had stood. Under the two arches now mentioned, was a very fine fountain, which furnished water to the whole city, and from whence water was drawn also by the help of a pulley for the use of the church above. The second church of Nazareth was built in a place where the house stood wherein the angel Gabriel revealed to the virgin Mary the mystery of our Lord's incarnation; and we are assured that the church of incarnation, which is supported by two arches, is still in being to this day. Mr Maundrell tells us, that there is a convent built over what is said to be the place of annunciation; for the chamber where the received angel's salutation was about 1500 years ago removed from Nazareth, and, according to the Roman legends, transported by angels to Lorretto, then a small village in the pope's dominions, now become a bishop's see. However, Calmet's opinion (which is certainly the true one) upon the different translations of this famous house of Lorretto is, that they were no other than so many different buildings made up upon the model of the church of Nazareth, just as in several places episcopal seats have been in several places built upon the model of that at Jerusalem. Martini tells us, that in the eastern part of the city stands the church dedicated to the Blessed Virgin: the zeal of the Cenobites raised it from the ruins of that which had been destroyed by the Saracens. It is a very handsome building, and consists of three naves, in the middle of which is the principal altar, to which there is an ascent by two magnificent stairs, much admired for their iron balustrades, the work of an ingenious monk of the convent. The descent to the grotto or annunciation chapel below is by steps of beautiful marble, cut with great taste. Two beautiful columns of oriental granite strike the eye of the observer in the entrance. They appear to have been constructed both to support and ornament the grotto. The altar of this subterranean chapel is extremely elegant; and the different kinds of marble with which it is ornamented, receive an additional lustre from the combined light of several fire lamps presented by Christian princes. On solemn festivals, the walls and the pilasters are ornamented with various pieces of tapestry, representing the mysteries of the religion; a figure of the Virgin being presented from the House of Austria. In the western part of the city stands a Christian church, built, as is said, on the site of the ancient synagogue where Jesus showed the Jews the accomplishment of the prophecies in his person. This place served a long time as a shelter for flocks, but at present it is in good repair. In the neighbourhood may be seen a fountain of excellent water, which is, however esteemed by the people on another account. They conjecture that it was contiguous to the habitation of the Virgin, and that it was used by her. At some distance is a large stone of a round form, called the Virgin's Table.
pretended that he came hither more than once with his disciples to eat. The inhabitants of Nazareth pay it a kind of worship, by burning perfumes and incens around it. It is situated in 35° E. Long. and in 32° N. Lat.; and formerly held the third rank under the patriarchs of Jerusalem. At present it is part of the domains of the chief of Acre. The ancient city, after the ravages of fanaticism, was reduced to a miserable hamlet, containing only a few Arab huts. Under the protection of Dahir Omar, however, it recovered very considerably, and is now of far more importance.

**NAZARITE, or NAZAREAN, or NAZARENE,** a term which may signify, 1. One that is of Nazareth, or any native of this city. 2. It was given to Jesus Christ and his disciples, and is commonly taken in a sense of derivation and contempt, in such authors as have written against Christianity. 3. It has been taken for a sect of heretics called Nazareans. 4. For a Nazarite, a man that has laid himself under the obligation of a vow to observe the rules of Nazarite-ship, whether it be for his whole life, as Samson and John the Baptist, or only for a time, as those mentioned in Numbers vi. 18, 19, 20. Amos ii. 11, 12. Lastly, the name Nazarite in some passages of scripture denotes a man of particular distinction and great dignity in the court of some prince. But we must speak of these several sorts of Nazarenes something more distinctly.

The name of Nazarene belongs to Jesus Christ, not only because of his having lived the greatest part of his life at Nazareth, and because this city has always been considered as his country, but also because the prophets had foretold that he should be called a Nazarene, Matth. ii. 23. "And he came and dwelt in a city called Nazareth, that it might be fulfilled which was spoken by the prophets, He shall be called a Nazarene." We find no particular place in the prophets in which it is said that the Messiah should be called a Nazarene; and St Matthew only quotes the prophets in general. Perhaps he would intimate, that the consecration of the Nazarenes, and the great purity of which they made profession, was a type and a forerun of the of those of our Saviour, or else that the name Nazar or Nazarite given to the patriarch Joseph, Gen. xxix. 26. Deut. xxxiii. 16. was a prophecy which was to be fulfilled in the person of Jesus Christ, of whom Joseph was a figure. Lastly, St Jerom was of opinion, that St Matthew here alludes to that passage of Isaiah x. 1. and ix. 21. "And there shall come forth a rod out of the stem of Jesse, and a branch (in Hebrew Nester) shall grow out of his roots." This branch or Nester, and this rod, are certainly intended to denote Jesus Christ, by the general consent of all the fathers and interpreters.

When the word Nazarene is put for the heretics known by this name, it denotes Christians converted from Judaism, whose chief error consisted in defying the necessity or expediency of the works of the law, and who obstinately adhered to the practice of the Jewish ceremonies. The name of Nazarenes at first had nothing odious in it, and it was often given to the first Christians. The fathers frequently mention the gospel of the Nazarenes, which differs nothing from that of St Matthew, which was either in Hebrew or Syriac, for the use of the first converts, but was afterwards corrupted by the Ebionites. These Nazarenes preferred this first gospel in its primitive purity. Some of them were still in being in the time of St Jerom, who does not reproach them with any error. They were very zealous observers of the law of Moses, but had the traditions of the Pharisees in very great contempt.

Nazarite, when put to signify those under the ancient law who made a vow of observing a more than ordinary degree of purity (Numb. xdi. cirt.), denotes a man or woman who engage themselves by a vow to abstain from wine and all intoxicating liquors, to let their hair grow without cutting or shaving, not to enter into any house that was polluted by having a dead corpse in it, nor to be present at any funeral. And if by chance any one should have died in their presence, they began again the whole ceremony of their consecration and Nazarite-ship. This ceremony generally lasted eight days, sometimes a month, and sometimes more than a month. When the time of their Nazarite-ship was accomplished, the priest brought the person to the door of the temple, where there offered to the Lord a he-lamb for a burnt-offering, a she-lamb for an expiatory sacrifice, and a ram for a peace-offering. They offered likewise loaves and cakes, with wine necessary for the libations. After all this was sacrificed and offered to the Lord, the priest or some other bled the head of the Nazarite at the door of the tabernacle, and burnt his hair, throwing it upon the fire of the altar. Then the priest put into the hands of the Nazarite the shoulder of the ram roasted, with a loaf and a cake, which the Nazarite returning into the hands of the priest, he offered them to the Lord, lifting them up in the presence of the Nazarite. And from this time he might again drink wine, his Nazarite-ship being now accomplished.

As to those that were perpetual Nazarenes, as were Samson and John the Baptist, it appears that they were consecrated to their Nazarite-ship by their parents, and continued all their lives in this statute, without drinking wine or cutting their hair.

Thole that made a vow of Nazarite-ship out of Palestine, and could not come to the temple when their vow was expired, contented themselves with observing the abstinence required by the law, and after that cutting their hair in the place where they were: as to the offerings and sacrifices prescribed by Moses, which were to be offered at the temple by themselves or by others for them, they deferred this till they could have a convenient opportunity. Hence it was, that St Paul being at Corinth, and having made the vow of a Nazarite, he had his hair cut off at Cenchrea, and put off fulfilling the rest of his vow till he should arrive at Jerusalem, Acts xviii. 18. When a person found that he was not in a condition to make a vow of Nazarite-ship, or had not leisure to perform the ceremonies belonging to it, he contented himself by contributing to the expense of the sacrifice and offerings of those that had made and fulfilled this vow; and by this means he became a partner in the merit of such Nazarite-ship. When St Paul came to Jerusalem, in the year of Christ 58, the apostle St James the Less, with the other brethren, said to him, Acts xxi. 23, 24, that to quiet the minds of the converted Jews, who had been
NEALING, or Annealing, is applied to the preparation of several matters, by heating or baking them in an oven, or the like. NEALING of glass, is the baking of glass, to dry, harden, and give it the due conformation, after it has been blown, and fashioned into the proper works. This is usually performed in a kind of tower called the annealing tower, built over the melting furnace. See GLASS.

NEAL, or Baking, is also used for the art of making glases with metallic colours. One fine use of glaze is in the art of annealing upon glazes, baked to be so called by the science of its own. For prepared glazing, or the crude metal, being burned on a glaze plate, will tinge it of a fine yellow or golden colour. And there are several mineral earths, and other coarse matters of use in this art, which by means of fire impart transparent colours to glazes, and sometimes very different ones from those of the bodies themselves.

NEALING of steel, is the heating it in the fire to a blood-red heat, and then taking it out, and letting it cool gently of itself. This is done to make it softer, in order to engrave or punch upon it. See Tempering and Engraving.

NEALING is also used for the art or act of burning or baking earthen or other ware in an oven. The miners at Mendip, when they meet with a rock they cannot cut through, anneal it by laying on wood and coal, and contriving the fire so that they quit the mine before the operation begins, it being dangerous to enter it again before it be quite cleared of the smoke.

NEALING of tile is used in ancient statues for the boring of tile. The word is formed of the Saxons *nael*, to bake, and *ain*, to make, as also *anneal*, to light, burn.

NEAP, or NEAP-TIDES, are those tides which happen when the moon is in the middle of the second and fourth quarters. The neap tides are low tides, in respect of their opposites the spring-tides. As the highest of the spring-tides is three days after the full or change, so the lowest of the neap is four days before the full or change. On which occasion the seamen say that it is deep neap.

NEAPED. When a ship wants water, so that she cannot get out of the harbour, off the ground, or out of the dock, the seamen say the is neaped, or benaped.

NEAPOLIS (anc. geog.), a city of the Higher Egypt, in the Nomos Panopolitanus, between Thebæ to the south, and Panopolis to the north, on the east side of the Nile; otherwise called Cæme.—A second Neapolis of Babylonia, situated near the Euphrates on the south side. A third of Campania, an ancient town and a colony from Cæme. (See Vellesius, Pliny, Strabo.) It was accounted a Greek city, and a great thicket for Greek uilages, (see Livy, Tacitus). Its name is in nothing inferior to those of Baie, according to Strabo: at two miles distance from it stands the monument of Virgil, held in religious veneration by learned poetries. The Younger Pliny relates, that Virgil's birth-day was more religiously observed by Silius Italicus than his own, especially at Naples, where he resorted to his tomb as to a temple. The city is washed by the river Sebethos. Virgil reigns the nymph Sebethis to preside over the stream. Now Naples, capital of the kingdom of that name. See NAPLES.

— A fourth, Neapolis of Caria, near the Meander. (Ptolemy).—A fifth, an inland town of Cyrenaica, situated between Ptolemais and Airinoe, (Ptolemy); and to be distinguished from the Cænopolis, or Neapolis, on the east border of the same province, (id). A sixth, Neapolis of Ionia, (Strabo); which belonged first to the Ephesians, but afterwards to the Samians, who exchanged Marathonium, a more distant city, for a nearer. A seventh, Neapolis of Macedonia Adiachis, situated at the distance of 12 miles to the east of Philippi, (Antonine). — An eighth, Neapolis of Pididia, on the borders of Galatia, situated between Ambelada and Pappa, (Ptolemy).—A ninth, of Samaria, the ancient Sichem, which see: so called upon its restoration by the Romans, (Coin, Pliny, Jofephus).—A tenth, of Sardinia, situated on the south-west side of the island, 30 miles to the north of Metalla; now called Neapolis. — An eleventh, of the Regio Syrta, called also Lepcis. A twelfth, of Zeugitana on the Mediterranean, to the east of Clypea, and south of the Promontorium Mercurii.

NEAT, or Nat Weight, the weight of a commodity alone, clear of the cask, bag, cafe, or even filth. See Nat.

NEBIO, or NEBIO, a ruined city of Italy, on the north
NEC

[738]

NEC

Necessity:

north side of the island of Corica, with a bishop's see, whose bishop resides at San Florentzo, from which it is a mile distant.

NEBO, (anc. geog.), a very high mountain, a part of the mountains Abaris, and their highest top, whether Moses was ordered to ascend to take a view of the land of Canaan, and there die. Situated in the land of Moab, over-against Jerico; with a cognominal town at its foot (Isah) belonging to the Reubenites, which afterwards returned to the Moabites; in Jerome's time desolate: eight miles to the south of Heshbon.

NEBO, or Nabó. See NABO.

NEBUCHADNEZZAR. See NABUCHANTENZAR.

NEBULY, or Nebule, in heraldry, is when a coat is charged with several little figures, in form of words running within one another, or when the outline of a bordure, ordinary, &c. is indented or waved. NECESSITY, whatever is done by a cause or power that is irresistible; in which sense it is opposed to freedom. Man is a necessary agent, if all his action be so determined by the causes preceding each action, that not one past action could possibly not have come to pass, or have been otherwise than it hath been; nor one future action can possibly not come to pass, or be otherwise than it shall be. But he is a free agent, if it be able, at any time, under the circumstances and causes then, to do different things; or in other words, if he be not unavos tape determined in every point of time, by the circumstances he is in, and the causes he is under, to do that one thing he does, and not possibly to do any other thing. Whether a man is a necessary or a free agent, is a question which has been debated with much ingenuity by writers of the first eminence, from Hobbes and Clarke, to Priestley and Gregory. See Metaphysics, Part III. chap. 5. and Predestination.

Necessity, in mythology, a power superior to all other powers, and equally irresistible by gods and by men. Herodotus, as he is quoted by Cudworth, mentions an oracle which declared that "God himself could not slum his destined fate." And among the fragments of Philoemen collected by Le Clerc, is the following sentence:

Δεναι βασιλευε, κερν αι βασιλεις θεος, ει δει ημεις

"We are subject to kings, kings to the gods, and God to necessity." Hence it is, that in the Iliad, we find Jove himself the fire of gods and men, regretting that he was restrained by necessity from revenge his favourite son from the sword of Patroclus, Nay to such a height was this impiety carried in the reign of Greece, that we find Jove himself the fire of gods and men, being justifiably by the commands of that magistrate which endeavoured to restore Superstition, under the holy auspices of its merceless flarer, Persecution.

As to persons in private relations, the principal case where constraint of a superior is allowed as an excuse for criminal misconduct, is with regard to the matrimonial subjection of the wife to her husband; for
Necessity, for neither a son nor servant are excused for the commission of any crime, whether capital or otherwise, by the command or coercion of the parent or master; though in some cases the command or authority of the husband, either express or implied, will privilege the wife from punishment, even for capital offences. And therefore, if a woman commit theft, burglary, or other civil offences against the laws of society, by the coercion of her husband, or even in his company, which the law confines a coercion, the is not guilty of any crime; being considered as acting by compulsion, and not of her own will. Which doctrine is at least 1000 years old in this kingdom, being to be found among the laws of King Ina the West-Saxon. And it appears, that, among the northern nations on the continent this privilege extended to any woman transgressing in concert with a man, and to any servant that committed a joint offence with a freeman: the male or freeman only was punished, the female or servant exonerated.

And it seems, that, among the northern nations on the continent this privilege extended to any woman transgressing in concert with a man, and to any servant that committed a joint offence with a freeman: the male or freeman only was punished, the female or servant exonerated. But (besides that in our law, which is not less than a frailer, no impunity is given to servants, who are as much free agents as their masters) even with regard to wives, this rule admits of an exception in crimes that are male in fe, and prohibited by the law of nature; as murder, and the like: not only because these are of a deeper dye, but also, since in a state of nature no one is in subjection to another, it would be unreasonable to screen an offender from punishment due to natural crimes, by the refinements and subordinations of civil society. In treason also (the highest crime which a member of society can, as such, be guilty of), no plea in coverture shall excuse the wife: no presumption of the husband's coercion shall extenuate her guilt: as well because of the odiousness and dangerous consequence of the crime itself, as because the husband, having broken through the most sacred tie of socia community by rebellion against the state, has no right to that obedience from a wife, which he himself as a subject has forgotten to pay. In inferior misdemeanors also, we may remark another exception, that a wife may be indicted and sit in the pillory with her husband, for keeping a brothel: for this is an offence touching the domestic economy or government of the house, in which the wife has a principal share; and is also such an offence as the law presumes to be generally condoned by the intrigues of the female sex. And in all cases where the wife offends alone, without the company or coercion of her husband, she is responsible for her offence as much as any female.

Another species of compulsion or necessity is what our law calls ducus per minus; or threats and menaces, which induce a fear of death or other bodily harm, and which take away for that reason the guilt of many crimes and misdemeanors, at least before the human tribunal. But then that fear which compels a man to do an unwarrantable act ought to be just and well grounded; such, "qui cadere posset in virum confiditutum, non timidum et meticulosum," as Bradon expresses it, in the words of the civil law. Therefore, in time of war or rebellion, a man may be justified in doing many treasonable acts by compulsion of the enemy or rebels, which would admit of no excuse in the time of peace. This, however, seems only, or at least principally, to hold as to positive crimes, so created by the laws of society, and which therefore society may excuse; but not as to natural offences, so declared by the law of God, wherein human magistrates are only the executioners of divine punishment. And therefore though a man be violently assaulted, and hath no other possible means of escaping death but by killing an innocent person, this fear and force shall not acquit him of murder: for he ought rather to do him himself than escape by the murder of an innocent. But in such a case he is permitted to kill the assailant: for there the law of nature, and self-defence its primary canon, have made him his own protector.

3. There is a third species of necessity, which may be distinguished from the actual compulsion of external force or fear: being the result of reason and reflection, which act upon and constrain a man's will, and oblige him to do an action which without such obligation would be criminal. And that is, when a man has his choice of two evils set before him, and, being under a necessity of choosing one, he chooses the least pernicious of the two. Here the will cannot be said freely to exert itself, being rather passive than active; or, if active, it is rather in rejecting the greater evil than in choosing the less. Of this sort is that necessity, where a man by the commandment of the law is bound to arrest another for any capital offence, or to disperse a riot, and resistance is made to his authority: it is here justifiable, and even necessary, to beat, to wound or perhaps to kill, the offenders, rather than permit the murderer to escape, or the riot to continue. For the preservation of the peace of the kingdom, and the apprehending of notorious malefactors, are of the utmost consequence to the public; and therefore excuse the felony, which the killing would otherwise amount to.

4. There is yet another case of necessity, which has occasioned great speculation among the writers upon general law; viz. whether a man in extreme want of food or clothing may justify stealing either, to relieve his present necessities. And this both Grotius and Puffendorf, together with many other of the foreign jurists, hold in the affirmative; maintaining by many ingenious, humane, and plausible reasons, that in such cases the community of goods, by a kind of tacit concession of society, is revived. And some even of our lawyers have held the same; though it seems to be an unwarranted doctrine, borrowed from the notions of some civilians; at least it is now antiquated, the law of England admitting no such excuse at present. And this doctrine is arguable not only to the sentiments of many of the wisest ancients, particularly Cicero who holds, That "quod cuique incommendat ferendum est, potius quam de aliiuis commudar dea et caulends; but also to the Jewish law, as certified by King Solomon himself: "If a thief steal, and be hungry, he shall restore seven folds, and shall give all the substance of his house:" which was the ordinary punishment for theft in that kingdom. And this is founded upon the highest reason; for mens properties would be under a strange insecurity, if liable to be invaded according to the wants of others; of which wants no man can possibly be an adequate judge, but the party himself who pleads them. In England efpe-
especially, there would be a peculiar impurity in admitting so dubious an excuse: for by the laws such sufficient provision is made for the poor by the power of the civil magistrate, that it is impossible that the most needy stranger should ever be reduced to the necessity of thieving to support nature. The case of a stranger is, by the way, the strongest instance put to Baron Puffendorf, and whereon he builds his principal arguments: which, however they may hold upon the continent, where the parimonious industry of the Pufprenfors, and whereon he builds his principal article to repose, again whom had no advantage which is wanting in many cases of peculiar hardship. An especially those which are democratical; and these have in this privilege to the necessitous; especially when we consider, that the king, on the representation of his ministers of justice, hath a power to soften the law, and to extend mercy in cases of peculiar hardship. An advantage which is wanting in many states, particularly those which are democratical: and these have in their head introduced and adopted, in the body of the law itself, a multitude of circumstances tending to alleviate its rigour. But the founders of that constitution thought it better to veil in the crown the power of pardoning particular objects of compassion, than to countenance and establish theft by one general undistinguishing law.

NECHO, king of Egypt, began his reign 690 B.C. and was killed eight years after by Sabacon king of Ethiopia. Pharnaciaus his son succeeded him, and was the father, as Herodotus informs us, of Necho II. who reigned in the 676 B.C. This Necho II. is celebrated in history for attempting, though in vain, to cut a canal from the Nile to the Arabian gulf. He carried his arms as far as the Euphrates, and conquered the city of Carchemish. This prince is not only known in scripture under the name of Necho, but also in profane history. He no sooner succeeded to the crown than he raised great land armies, and fitted out vast fleets, as well upon the Mediterranean as upon the Red Sea: he gave battle to the Syrians near the city of Migdol; routed them, and made himself master of the city of Cadiz. The learned, however, are not agreed about this city Cadiz. Some will have it to be Cades in Arabia Petraea, others Jerusalem; and others say it is the city of Cedes, or Cadeia, in Galilee, in the tribe of Nathaniel.

The scriptures acquaint us with the whole expedition of Necho in all its particulars, 2 Kings xiii. 29. &c. and 2 Chron. xxxv. 20. 21 &c. In the year of the world 3394, this prince having drawn out his army into the field to make war with the Assyrians or Babylonians, and to take the city of Carchemish, otherwise called Ciregiun, upon the Euphrates, Josiah king of Judah, who was a tributary to the king of Babylon, marched to oppose his passage. Necho, who had no design against him, sent to tell him, What have I to do with you, King of Judah? It is not against you that I am come forth, but against another people, against whom the Lord has commanded me to make war. Leave off therefore to set yourself against me, for fear the Lord should punish you for your resistance. But Josiah would not hearken to the remonstrances of Necho, but gave him battle at Megiddo, where he received the wound of which he died. The people of Jerusalem set up Jehoahaz for king of Judah, and Necho soon passed forwards, without making any longer stay in Judea.

But at his return from his expedition, which was very successful, he halted at Riblah in Syria; and sending for Jehoahaz king of the Jews, he deposed him, loaded him with chains, and sent him into Egypt. Then coming to Jerusalem, he set up Eliakim, or Jehoiakim, in his place, and exacted the payment of 100 talents of silver and one talent of gold from the country. Jeremiah (xlvi. 1.) acquaints us, that the city of Carchemish was taken from Necho by Nebuchadnezzar king of Babylon, in the fourth year of Jehoiakim king of Judah; so that Necho did not enjoy his conquest above four years. Josephus adds, that the king of Babylon purifying his victory, brought under his dominion all the country which is between the Euphrates and Babylon, excepting Judaea. Thus Necho was again reduced within the limits of his own country.

NECK, in anatomy, is the slender part situated between the head and trunk of the body. See AnatoMy, n° 31.

NECOPHORON, in botany, a name used by Pliny and other authors for the *ficus alperea*, or rough bindweed.

NECROLOGY, nekrologium, formed of *nekros*, "dead," and *logos*, "discourse or enumeration," a book anciently kept in churches and monasteries, wherein were registered the benefactors of the time, the time of their deaths, and the days of their commemoration; as also the deaths of the priors, abbots, religious, canons, &c. This was otherwise called *colender* and *obituary*.

NECROMANCY, the art of revealing future events by a pretended communication with the dead. This superstitious and impious impertinence appears to have had its origin at a very early period in Egypt, and to have been thence propagated in every nation with the manners of which history has made us acquainted. The conquests of Selene might introduce it into India; the Israelites would naturally borrow it from the people among whom they sojourned 400 years; and it would easily find its way into Phocis from the vicinity of that country to the land of its nativity. From the Egyptians and Phcenicians it was adopted, with the other rites of paganism, by the Greeks; and it was imported into Rome with Grecian literature and manners. It was not however confined to the pagan nations of antiquity; it spread itself through all the modern nations of Europe, and took such deep root as to be long retained even after those nations were converted to the Christian faith.

Of its early antiquity we have complete evidence in the writings of Hosea, where it is severely condemned as an abomination to the Lord; and though it appears to have been even then spread into Phcenicia, we might yet conclude its birthplace to have been 11, 12. Egypt, because, at their ex 35, the Israelites were corrupted
Necromancy, corrupted only by Egyptian superstitious, and because necromancy seems to be one of those whore-doms which the prophet Ezekiel represents his countrymen as having brought with them from Egypt, and continued to practize until they were carried captives into Babylon.

If from sacred we proceed to consult profane authors, we shall find them not only affirming Egypt to have been the birth-place of necromancy, but in some degree accounting for the origin of so impious a delusion. From Diodorus the Sicilian,† we learn, that the Grecian fable of Charon, the ferry-man of hell, of Styx, Coccyx, the Elysian Fields, Tartarus, the judgement of Minos, and Kadamanthus, &c. with the whole scenery of the infernal regions, were imported from Egypt into Greece. The ancient Egyptians, and indeed all the people of the eall, made use of caves for burying places, which were well suited to the solemn fadness of the surviving friends, and proper receptacles for those who were never more to behold the light. In Egypt, many of those subterraneous cavities being dug out of the natural rock, still remain and command the admiration of travellers; and near to the pyramids in particular there are some apartments of a wonderful fabric, which though they extend in length 4400 feet, and are about 30 feet in depth, appear to have been, if not entirely dug, at least reduced to form by the chisel, or pick axe of the artif. Ic.

From the practice of burying in such caverns sprung the opinion that the infernal mansions were situated somewhere near the centre of the earth, which by the Egyptians was believed to be not very distant from its surface. In these dreary mansions, it was very easy for such adepts as the priests of Egypt to fabricate Eræbus, Tartarus, the Elysian Fields, and all those scenes which were displayed before the initiated (see Mysteries), and by them described to the million of the people. As it was in those dark abodes that necromancy was practiced, it would be no difficult matter for such magicians as withfoth Moses to impose on far upon the credulous vulgar, as to make them believe, that in consequence of their avocations they actually saw the ghosts of their friends ascend out of the earth. It appears from the book of Exodus, that the Israelitish women were, even in the wilderness, well acquainted with the use of the mirror, which was therefore undoubtedly known to the Egyptians. But a mirror of a particular form and properly illuminated at the instant required, might easily be made to reflect, in a cavern from which all other light was carefully excluded, the image of the deceased, who was called upon by the necromancer; and we can readily conceive, that with necromancy respect to the question to be proposed, a person might be concealed, prepared to give such ambiguous answers as would satisfy the inquirer, and at the same time save the credit of the oracle. The terrified imaginations of the spectators would aid the delusion, and make a very flight resemblance pass for the ghost or spirit, of their departed friend; or the necromancer might affign plausible reasons why a spirit, after having dwelt for some time in the infernal regions, should lose something of its resemblance to the body which it animated. Such juggling tricks, though performed by artists left accomplished than James and Jambres, have gained credit among people much more enlightened than the Egyptians can possibly have been when the science of necromancy was invented by their priests.

That the Israelites, notwithstanding the prohibition of their legislator, continued to practice the rites of necromancy, is apparent from Saul's transact with the witch of Endor (see Magic). From the same transaction, it is likewise apparent that the witches of Israel, and therefore in all probability the necromancers of Egypt, pretended to evoke the ghosts of the dead by a demon or familiar spirit, which they had at their command to employ upon every emergency. This demon was called əs; and therefore Saul directs his servants to find him a woman who was mistress of an os (א). It is probable that those wretched impostors had in their pay some persons who occasionally acted the part of the demon, and when the execution of the plot required their agency, emitted, by means of a cavity dug for that purpose, a low hollow voice from below the ground. Hence we find Isaiah, in his denunciations against Ariel, saying, "Thou shalt be brought down, and shall speak out of the ground; and thy voice shall be low out of the dust, and thy speech shall whisper out of the dust."

But though the Egyptian priests were undoubtedly the inventors of the whole mystery of necromancy, and though it was from them imported into Greece by the Selli or priests of Dodona, it does not appear that the Grecian necromancers pretended to be masters of os or familiar spirits. Mopsus, Orpheus, Linus, Eumolpus, &c. who either travelled into Egypt in quest of knowledge, or were actually natives of that country, instructed the early Greeks in this occult science; but whatever might be the practice of their apostles themselves, their disciples professed to do all

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(1) The original or radical signification of this word occurs in Job xxxii. ver. 19; where Eliphaz compares his belly to new bottles, which lie calls ἀποσθ, the plural of ἀσθ. But as bottles were then made of leather, new bottles filled with wine and ready to burst, as Eliphaz describes them, would of course be of a form nearly globular. Hence it may be inferred that the original import of ἀσθ was round or globular; but əs being labials, are often changed into each other; and therefore from the Hebrew əs is derived the Greek əς, the Latin opis, a name under which the earth was worshipped. ἀποσθ was a name of Diana or the moon; the father of one of the Dioscuri was likewise ἀποσθ; but this ἀποσθ was undoubtedly the sun. Now the difference between ἀποσθ and ἀποσθ is nothing; hence we are led to believe that as they are all derived from əs, this word was employed by the early idolaters of Egypt to denote the first and greatest of Pagan gods, the sun. If so, those wretches who pretended to be mistresses of ἀποσθ, were exactly the same kind of impostors with the Pythonesses of the Greeks.
Necromancy is all the feats of magic by performing certain rites, by offering certain incantations, by muttering a certain form of words, by charms, spells, and exorcisms. By these they pretended to evocate the dead as certainly as the Egyptians and Jews did by their familiar spirits. By a small display of critical learning this might be easily proved from the popular story of Orpheus and Eurydice, which certainly was founded on one of these necromantic deceptions exhibited in a cave near Dodona, where the priests had a huta or infernal manison, in humble imitation of those with which the first of them were well acquainted in Egypt. It is indeed evident, without the aid of criticism, no man of any letters is ignorant, that whatever proved from the bottoms of their graves; and Lucan indeed evident, without the aid of criticism; no man of any letters is ignorant, that whatever proved from the bottoms of their graves; and Lucan of any letters is ignorant, that whatever proved from the bottoms of their graves; and Lucan from the same secret. This is evident from the name of the people, and a steady friend to the writer of this article, we have been informed, that not many years ago some of the Highlanders relied implicitly upon certain oracular replies, called in their language taghaim. This word seems to be compounded of ta, which in some parts of the highlands is still used to denote a spirit or ghost, and ghairm, which signifies calling upon or invoking. Taghaim, therefore, in its original import, is necromancy in the most proper sense of that word.

There were different kinds of taghaim, of which one was very lately practised in Skye. The diviner covered himself with a cow's hide, and repaired at night to some deep founding cave, whither the person who consulted him followed soon after without any attendants. At the mouth of the cave he prepared about the questions of which he wanted solutions; and the man within pronounced the responses in a tone of voice similar to that with which the one, or pretended demons of antiquity, gave from beneath the ground their oracular answers. That in the latter days of taghaim, the Gallic diviners pretended to evocate ghosts, and from them to extort solutions of difficulties proposed, we have no positive evidence; but that such was the original pretence, there can be little doubt, when we reflect either upon the place where this species of divination was practised, or upon the import of the word by which it was denominated.

As we have been led to mention taghaim, we shall beg leave to make a few observations on another species of it, called taghaim an usge, or "taghaim by water." This too was late practised in the Isle of Skye, by a man of the name of McCallum, whose ancestors had long been famous for the art. He lived near a beautiful cascade on a small river; and when consulted on any matter of consequence, he covered his whole body with a cow's hide, that necessary implement of Highland divination, and placed himself between the water of the cascade and the rock over which it flowed. Then another man with a heavy pole gave repeated strokes to the water, and the diviner behind it crying out now and then in Gaelic, "Is this a flock of arn?" This operation was continued till McCallum was perceived to be frantic or furious, when he was considered as in a condition to answer the most important questions. He was frequently consulted about felicity; and though he could not in a proper sense of the word, be called a necromancer, his responses were listened to as proceeding from something more than human. A degree of frenzy, either real or affected, seems to have accompanied the predictions of certain kinds of diviners in all ages; and we cannot help remarking the similarity between the madness of McCallum and that of the Sybil in the sixth book of the Aeneid; though we cannot...
NEC

NEC

NEC

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That all these pretences, whether ancient or modern, to the power of divination by means of familiar spirits, or by the art of necromancy, were groundless as well as impious, it would be affronting the understandings of our readers to offer any proof. Under the article Magic we have said enough on the subject, and perhaps more than enough, to those who know that demons, if they have any existence, and the departed spirits of good and bad men, are all under the control of Him who governs the intellectual as well as material world by fixed and equal laws. These details of superstition, however, will not be useless, if, by showing how poor and wretched a creature man becomes when left to his own inventions, they shall make any one grateful for the benefits of good government, and the blessings of revealed religion.

NECROPOLIS, a suburb of Alexandria in Egypt. It signifies "the City of the Dead," wherein there were temples, gardens, and superb mausoleums. Here Cleopatra is said to have applied the aspho to her breast, to prevent being led in triumph by Augustus, who endeavoured to save her.

NECTORIS, πηχεχος, in medicine, a complete modification of any part; called also sideratio and sphaecula.

NECTANEBUS, or Nectanebas, a king of Egypt, who defended his country against the Persians. His grandchild of the same name made an alliance with Agesilaus king of Sparta, and with his affidavit he quelled a rebellion of his subjects. Some time after he was joined by the Sidonians, Phrenicians and inhabitants of Cyprus, who had revolted from the king of Persia. This powerful confederacy was soon attacked by Darius the king of Persia, who marched at the head of his troops. Nectanebus, to defend his frontiers against so dangerous an enemy, levied 20,000 mercenary soldiers in Greece, the same number in Libya, and 60,000 were furnished in Egypt. This numerous body was not equal to the Persian forces, and Nectanebus, defeated in a battle, gave up all hopes of resistance, and fled into Ethiopia, where he found a safe asylum. His kingdom of Egypt became from that time tributary to the king of Persia.

NECTAR, among ancient poets, the drink of the fabulous deities of the heathens; in contradistinction from their solid food, which was called ambrosia.

NECTARINE, a fruit differing in nothing from the common peach, of which it is a species, than in having a smoother rind and a firmer pulp. See Persica.

NECTARIUM, from nectar, the fabled "drink of the gods," defined by Linnaeus to be a part of the corolla, or appendage to the petals, appropriated for containing the honey, a species of vegetable fluid under Nectarium: a fluid form, that oozes from the plant, and is the principal food of bees and other insects.

Notwithstanding this definition which seems to consider the nectarium as necessary a part of the corolla as the petals; it is certain that all flowers are not provided with this appendage, neither indeed is it essential to fructification.

There is, besides, a manifest impropriety in terming the nectarium a part of the corolla. Linnaeus might Milne's with equal propriety, have termed it a part or appendage of the flamina, calyx, or pointal, as the appearance in question is confined to no particular part of the flower, but is as various in point of situation as of form. The truth is, the term nectarium is exceedingly vague: and, if any determinate meaning can be affixed to it, is expressive of all the singularities which are observed in the different parts of flowers.

The tube, or lower part of flowers with one petal, Linnaeus considers as a true nectarium, because it is generally found to contain the sweet liquor formerly mentioned. This liquor Pontedera compares to that called amnios in pregnant animals, which enters the fertile or impregnated seeds: but that this is not at least its sole use, is evident from this circumstance, that the honey or liquor in question is to be found in flowers where there are either no seeds, or those which, from the want of male organs, cannot be impregnated. Thus the male flowers of nettle and willow, the female flowers of sea-side laurel and black bryony, the male and female flowers of clivia, higgelaria, and butcher's broom, all abound with the honey or nectar alluded to.

Dr. Vaillant was of opinion, that the nectarium was an essential part of the corolla; for which reason he distinguished the singular appearances in fennel-flower and columbine by the name of petals: the coloured leaves which are now termed the petals he denominates the flower cup.

That the nectarium, however, is frequently different from the petals, is evident, both from the well known examples just mentioned, as likewise from the flowers of monkhood, hellebore, isopyrum, fennel-flower of Crete, barrenwort, grafs of Parnassus, chocolate-nut, cherleria and sauvagea.

These general observations being premised, we proceed to take a nearer and more particular view of the principal diversities, both in form and situation, of this striking appendage to the flower. 1. In many flowers the nectarium is shaped like a spur or horn; and that either in flowers of one petal, as valerian, water-milfoil (articularia), butter-wort, and calves' shout; or in such as have more than one, as lark spur, violet, fumatory, balism, and orchis. 2. In the following plants, the nectarium is properly a part of the corolla, as lying within the substance of the petals: ranunculus, lilac, iris, crown-imperial, water-leaff, mouse-tail, ananas or pine apple, dog's-tooth violet, piperdidge bush, valinfloria, hermannia, uvalaria, and serfria. 3. The nectarium is frequently placed in a series or row within the petals, though entire disconnected with their substance. In this situation it often resembles a cup, as in narcissus. A nectarium of this kind is said by Linnaeus to crown the corolla. The following are examples: daffofil, sea-daffofil, camcon, vicous campia,
only to two-thirds of the body in length. On the contrary, in those whose thorax is black, they are likewise black, and somewhat longer than the body. The thorax is margined; in some it is yellow and longer; in others it is black, shorter, and edged only with a little yellow. The elytra are blackish, somewhat clearer in the middle, and terminating in a lemon-coloured spot. The wings are rather black, something longer than the body, exceed the elytra by one-third, and are crooked one over the other. In those that have their thorax yellow, the legs and under part of the belly are so likewise. In individuals with a black thorax, the legs are black as well as the belly, which has only a little yellow on the sides. I Tuped the latter to be the males. The larva is as yet unknown."

NEDHAM (Marchmont), an English satirical writer, was born at Burford, Oxon. about the month of August 1620. His father died in 1621; but the following year his mother was again married to one Christopher Glynn, vicar and schoolmaster of Burford, who perceiving his son-in-law's pregnancy of parts and genius, took him under his own tuition, and at the age of 14 sent him to All Soul's College, Oxon. Here he was made one of the choristers, and continued till 1637, when having taken the degree of A. B., which made it inconsistent to continue in that office, he went to St Mary's Hall till he became an usher in Merchant Taylor's school, London. About the beginning of the civil wars, he became clerk to an attorney at Gray's Inn, where, writing a good court hand, he obtained a decent subsistence. Not long after this he began a weekly paper, under the title of Mercurius Britannicus, on the side of the parliament: it commenced about the middle of August 1643, coming out on Mondays, in one sheet, and continued till the end of 1646. It procured him popularity, and being an active man he was distinguished by the title of Capt. Nedham of Gray's Inn. Of these mercures (for there were a number of them published on both sides of the great question which then divided the nation) it is well observed by Johnson, that they taught many to talk whom they could not teach to judge. Nedham's was, indeed, addressed as much to the passions as to the reason; and, by telling every man that he was equal to his king, he so flattered vulgar pride, that his licentious opinions were received as the dictates of an oracle. About this time he finished phyric, and in 1645 began to pradete; by which, and his political writings, he supported a genteel figure. But, for some scorn and affront put upon him, he suddenly left his party, and, obtaining the favour of a royalist, was introduced into the king's presence at Hampton-court in 1647, and asking pardon upon his knees readily obtained it; so that being admitted to the king's favour, he wrote soon after another paper, entitled Mercurius Pragmaticus; which being equally witty with the former, as satirical against the Presbyterians, and full of loyalty, made him known and admired by the wits of that side. However, being narrowly sought after, he left London, and for a time lay concealed at the house of Dr Peter Heylin, at Minster Lovel, near Burford, till length being discovered, he was imprisoned in Newgate, and in danger of his life. Lenthall, the Speaker of the house of Commons, who knew him and his relations...
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relations well, and Bradshaw, president of the high court of justice, treated him favourably, and not only got his pardon, but with promise of rewards and places persuaded him to change his side once more for the independents, who then were the uppermost party.—

In this temper he published a third weekly paper, called Mecurus Pollicus, which came out every Wednesday, in two sheets 4to, commencing with the 9th of June 1649, and ending with the 6th of June 1650, which being Thursday, he began again with number 1. from Thursday June 6, to Thursday June 13, 1650, beginning, "Why should the commonwealth have "a fool, as well as the king had, &c." This paper, which contained many discourses against monarchy, and in behalf of a free state, especially those that were published before Cromwell was made protector, was carried on without any interruption till about the middle of April 1660, when, as several times before, it was prohibited by an order of the council of state. 

Upon the return of Charles II. our author lay hid, till, by virtue of some money well placed, he obtained his pardon under the great seal; after which he exercised the faculty of physic among the Delfenters, which brought him in a considerable benefit till his death, which happened suddenly in 1678. Wood, who knew him, tells us that he was a person endowed with quick natural parts, was a good humanist, poet, and boon droll; and, had he been constant to his cavalierizing principles, would have been beloved and admired by all; but being mercenary, and preferring his interest to his conscience, friendship, and love to his prince, was much hated by the royal party to the last. In short, there was no depending on this scurrilous ill-natured author. He followed whenever interest or passion led, and remains a notorious instance of the danger of brilliant parts, of which he certainly was possessed, without judgment or integrity to control them. Wood, who in his Athen. Oxon. quoted above, gives a very copious account of him, says: "At length this most seditious, mutable, and railing "author, M. Needham, died suddenly, in the house "of one Kidder, in D'Euret-court near Temple "bar, London, in 1678, and was buried near the "entrance of the chancel of the church of St Cle- "ments Danes." 

NEEDHAM (John Tuberville), was born at Lon- "don the 10th of September in the year 1713. His "parents were descended from ancient and noble fami- "lies. His father, who had once possessed a considerable patrimony at Hulton; in the county of Monmouth, was of the younger and Catholic branch of the Need- "ham family; the head of the elder and Protestant branch was lord Kilmory, created vicompt in the year 1625. The father of Mr Needham died young, and left but a small fortune to his four children. His eldest son, who is the subject of this article, prosecuted his studies under the secular clergy of the English college of Douai, where he took orders, taught rhetoric for several years, gave eminent proofs of sagaci- ty and genius, and surpassed all the other professors of that seminary in the knowledge of experimental philo- 

osophy. In 1740, he was engaged by his superiors in the service of the English mission, and was entrusted with the direction of the school erected at Twy- "ford, near Winchester, for the education of the Ro- 

man Catholic youth. In 1744, he was appointed "professor of philosophy in the English college at Lis- "bon, where, on account of his bad health, he remain- "ed only 15 months. After his return, he passed sev- "eral years at London and Paris, which were principally employed in microscopical observations and in other branches of experimental philosophy. The results of these observations and experiments were published in the Philosophical Transactions of the Royal Society of London in 1749, and in a volume in 12mo at Pa- "ris in 1750; and an account of them was also given "by M. de Buffon, in the first volumes of his Natural History. There was an intimate connection between this illustrious French naturalist and Mr Needham: they made their experiments and observations together; though the results and systems which they deduced from the same objects and operations were to- 

tally different. Mr Needham was admitted to a place in the Royal Society of London in the year 1747, and in the Antiquarian Society some time after. From the year 1751 to 1767 he was chiefly employed in finishing the education of several English and Irish noblemen, by attending them as tutor in their travels through France, Italy, and other countries. He then retired from this wandering life to the English semi- "nary at Paris, and in 1768 was chosen by the Royal Academy of Sciences in that city a corresponding member. 

When the regency of the Austrian Netherlands, in order to the revival of philosophy and literature in that country, formed the project of an Imperial academy, which was preceded by the erection of a small literary society to prepare the way for its execution, Mr Need- 

ham was invited to Brussels by Count Cobentzel and the president Neny, and was appointed successively chief director of both these foundations. He held this place, together with some ecclesiastical preferments in the Low Countries, until his death, which happened the 30th of December 1781. "His piety, tempera- "ence, and purity of manners (we follow the expres- "sion of the Abbé Mann) were eminent: his at- "tachment to the doctrines and duties of Christianity was inviolable. His zealous opposition to modern infidels was indefatigable and even passionate. His probity was untainted. He was incapable of every species of duplicity; his benevolence was universal, and his unostentatious conduct rendered him often a dupe to perfidy." These and other good qualities the panegeyric attributes to his deceased friend; and the learned authors of the Monthly review, to whom Mr Needham was known, admit the justice of the panegeyric. He was undoubtedly (say they) both a honest man and a worthy citizen; but though his de- "ath be a real loss to the literary world, yet he died feanably for himself; for had he lived to see Joseph "the 1st. and the Great making so free with the paint, "patches, and trinkets of the mother church, confiscating "her lands, abolishing her convents, suppressing her ho- "olidays, introducing common fents into her worship, "creating political conductors to disparage the thunder "of the Vatican, and achieving many other things in "this style of improvement, it would have vexed full "fore his feeling heart. For this honest man was narrow "even to superstitition and bigotry in his religious sys- "tem; and we never knew a man in whom there was such an "unaccountable
Needham, in little heaps ving twifl:ed the the too they take experience. When they are thus hardened, they are to move them from time to time. This serves to

The corners are, by force of a puncheon of well-tempered coal fire; and when taken out thence, are and a little cavity filed on each side

The sizes are from the steel are brought upon paper in a hurry, than finifhed dity nor method; his writings are rather the great of needles: obferving every time it

The dipping needle, so hung, as that, instead of playing hori-zontally, and pointing out north and south, one end dips, or inclines to the horizon, and the other points to a certain degree of elevation above it. The dipping needle was invented in the year 1776 by one Robert Norman a compa{fes-maker at

The effect led him at length to observe the percise quantity of the dip, or to measure the greatest angle which the needle would make with the horizon; and this at London he found to be 71° 50'. In 1723 Mr Graham made a great many obser-vations on the dipping-needle, and found the angle to be between 74 and 75 degrees. Mr Nairne, in 1772, found it to be somewhat above 72°. It is not certain whether the dip varies, as well as the horizontal direction, in the same place. The tripling difference between Mr For-man and Mr Nairne would lead us to imagine that the dip was unalterable; but Mr Graham, who was a very accurate observer, makes the difference more confiderable. It is certain, however, from a large number of experiments and obser-vations, that the dip is variable in different latitudes, and that it increases in going northwards. It appears from a table of ob-ser-vations made with the marine dipping-needle in a voyage

NEEDHAM, in Suffolk, 73 miles from London, stands on the Orwell, 9 miles from Ipswich, in the road to Huntingdonshire. Its market is on Wednesday, and fair in October 28.

NEEDLE, a very common little instrument or utensil made of steel, pointed at one end, and pierced at the other, used in forge, embroildery, tapestry, &c.

Needles make a very considerable article in commerce, though there be scarce any commodity cheaper, though there is scarce any commodity cheaper, though there is scarce any commodity cheaper, though there is scarce any commodity cheaper, though there is scarce any commodity cheaper, though there is scarce any commodity cheaper, though there is scarce any commodity cheaper.
Needle voyage towards the north pole in 1733, that in lat. 60° 18'. the dip was 75°; and in lat. 70° 45', it was 77° 52'; in lat. 80° 12', it was 81° 52'; and in lat. 80° 27', it was 82° 2'.

Several authors have endeavoured to apply this discovery of the dip to the finding of the latitude, and Mr Bond attempted to apply it to the finding of the longitude also; but for want of observations and experiments he could not make any progress. The affair was farther prosecuted by Mr Whitton, who published a treatise on the longitude, and for some time imagined it was possible to find it exactly by means of the dip of the needle; yet he at last despaired of it, for the following reasons. 1. The weakness of the magnetic power. 2. The concurrence of the ship, which he found it exceeding difficult to avoid so much as was necessary for the accuracy of the experiments. 3. The principal objection was an irregularity in the motions of all magnetic needles, both horizontal and dipping, by which they, within the compass of about a degree, vary uncertainly backward and forward; even sometimes, in a few hours time, without any evident cause. For a particular account of these variations both of the horizontal and dipping needle, fee the article Variation.

Mr Nairne made a dipping-needle in 1772 for the board of longitude, which was used in the voyage towards the north-pole. This is represented Plate CCCXLV, fig. 2. The needle AA is 12 inches long, and its axis, the ends BB of which are made of gold alloyed with copper, rests on friction-wheels CCCC, of four inches diameter, each end on two friction-wheels; which wheels are balanced with great care. The ends of the axes of the friction-wheels are likewise of gold alloyed with copper, and moved in small holes made in bell-metal; and opposite to the ends of the axes of the needle and the friction-wheels, are flat agates, set in at DDD, finely polished. The magnetic needle vibrates within a circle of bell-metal, EEE, divided into degrees and half degrees; and a line, passing through the middle of the needle to the ends, points to the divisors. The needle of this instrument was balanced before it was made magnetic; but by means of a crofs, the ends of which are FFFF, (contrived by the reverend Mr Mitchell) fixed on the axis of the needle, on the arms of which are very fine screws to receive small buttons, that may be screwed nearer or farther from the axis, the needle may be adjusted both ways to a great nicety, after being made magnetic, by reverting the poles, and changing the sides of the needle. GG are two levels, by which the line of 0 degrees of the instrument is set horizontal, by means of the four adjusting screws LLLL: H is the perpendicular axis by which the instrument may be turned, that the divided face of the circle may face the east or west; to this axis is fixed an index I, which points to an opposite line on the horizontal plate K when the instrument is turned half round; MMMM are screws which hold the glass-cover to keep the needle from being disturbed by the wind. When this needle is constructed for sea, it is suspended by an universal joint on a vertical thread, and adjusted vertically by a plummet-line and button above the divided circle and the dovetail work at the upper go; and the divisors on the circle are adjusted so as to be perpendicular to the horizon by the same plummet-line, and an adjoining screw; and when it is adjusted, a pointer annexed to a firew, which serves to move the divided circle, is fixed at the lowest go. Whenever the instrument is used to find the dip, it must be so placed that the needle may vibrate exactly in the magnetic meridian.

Magnetical Needles, in navigation, a needle touched with a loadstone, and sustained on a pivot or centre; on which playing at liberty, it directs itself to certain points in or under the horizon; whence the magnetical needle is of two kinds, viz. horizontal or inclinatory. See the article Magnet.

Horizontal needles are those equally balanced on each side of the pivot that sustains them; and which playing horizontally with their two extremes, point out the north and south points of the horizon. For their application and use, see the article Compass.

In the construction of the horizontal needle, a piece of pure steel is provided; of a length not exceeding six inches, left its weight should impede its volubility; very thin, to take its verticity the better; and not pierced with any holes, or the like, for ornament fake, which prevent the equal diffusion of the magnetic virtue. A perforation is then made in the middle of its length, and a brass cap or head folder on, whose inner cavity is conical, so as to play freely on a ydle or pivot headed with a fine steel point. The north point of the needle in our hemisphere is made a little lighter than the southern: the touch always depressing the balance, if well adjusted before, and rendering the north end heavier than the south, and thus occasioning the needle to dip.

The method of giving the needle its verticity or directive faculty has been shown already under the article Magnet; but if, after touching, the needle be out of its equilibrium, something must be filed off from the heavier side, till it balance evenly.

Needles in sea compasses are usually made of a rhomboidal or oblong form: we have given their structure already under the article Compass.

The needle is not found to point precisely to the north, except in very few places; but deviates from it more or less in different places, and that too at different times; which deviation is called its declination or variation from the meridian. See the article Variation.

Surgeons Needles are generally made crooked, and their points triangular; however they are of different forms and sizes, and bear different names, according to the purposes they are used for.

The largest are needles for amputation; the next, needles for wounds; the finest needles for futures. They have others very short and flat, for tendons; others, still shorter, and the eye placed in the middle, for tying together of veins, &c. Needles for couching cataracts are of various kinds: all of which have a small, broad, and sharp point or tongue; and some with a follicus at the point. Surgeons have sometimes used two needles in this operation; one with a sharp point for perforating the coats of the eye, and another with a more obtuse point for deprefling or couching the opaque crystalline lens: but care should be taken in the use of any of these, that they be first well polished with cloth or leather, before they are applied to the eye.

Mr Warner observes, that the blade of the couching needle
neede should be at least a third part larger than those generally used upon this occasion, as great advantages will be found in the depressing of the cataract, by the increased breadth of the blade of that instrument. The handle, also, if made somewhat shorter than usual, will enable the operator to perform with greater facility, than he can do with a larger handled instrument.

It is to be observed, that needles of silver pierce more easily in stitching arteries after an amputation, than those made of steel.

**Needle-Phb.** See Syngnathus.

**Needles,** sharp-pointed rocks north of the Isle of Wight. They are situated at the western extremity of the island, which is an acute point of high land, from which they have been disjoined by the washing away of the land, which is an acute point of high land, called La's Wife, which are about 120 feet above low-water mark, and in its shape resembling a needle, being undermined by the constant efforts of the waves, overfit, and totally disappeared.

**NEEDS,** or St Neots, six miles from Huntingdon, 58 miles from London, so called from the monument of a saint of that name in it, who was burnt by the Danes, is a large well-built town, having a handsome strong church, with a prodigious fine steeple, and a good stone-bridge over the Ouse, by which coaches are brought to it, and fold through the country. It has a charity-school for 25 poor children. Its market is on Thursday; fairs on Holy Thursday, Aug. 1. Corpus-Chrifti Thursday, June 13, and December 17; and it is famous for a medicinal spring.

**NEEDWOOD-FOREST,** in Staffordshire, between the Trent, Dove, and Blythe, and near Uttoxeter, is said to exceed all the forests in England in the excellence of its soil and the fineness of its turf.

**NE EXEAT REGNO,** in law, is a writ to remove one thing to be different from another: as that the soul is not matter. See Logic.

NEGATION, in logic, an act of the mind affirming one thing to be different from another: as that the soul is not matter. See Logic.

**NEGATIVE**, in general, something that implies a negation: thus we say, negative quantities, negative powers, negative signs, etc.

**NEGATIVE-Sign.** The use of the negative sign, in algebra, is attended with several consequences that at first sight are admitted with difficulty, and has sometimes given occasion to notions that seem to have no real foundation. This sign implies, that the real value of the quantity represented by the letter to which it is prefixed is to be subtracted; and it serves, with the positive sign, to keep in view what elements or parts enter into the composition of quantities, and in what manner, whether as increments or decrements, (that is, whether by addition or subtraction), which is of the greatest use in this art.

In consequence of this, it serves to express a quantity of an opposite quality to the positive, as a line in a contrary position; a motion with an opposite direction; or a centrifugal force in opposition to gravity; and thus often saves the trouble of distinguishing, and demonstrating separately, the various cases of proportions, and prefers their analogy in view. But as the proportions of lines depend on their magnitude only, without regard to their position, and motions and forces are said to be equal, or unequal, in any given ratio, without regard to their directions; and, in general, the proportion of quantity relates to their magnitude only, without determining whether they are to be considered as increments or decrements; so there is no ground to imagine any other proportion of \(-b\) and \(a\) (or of \(-1\) and \(1\)) than that of the real magnitudes of the quantities represented by \(b\) and \(a\), whether these quantities are, in any particular case, to be added or subtracted. It is the same thing to subtract a decrement, as to add an equal increment, or to subtract \(-b\) from \(b\); or to add \(+a\) to it, and because multiplying a quantity by a negative number implies only a repeated subtraction of it, the multiplying \(-b\) by \(-n\), is subtracting \(-b\) as often as there are units in \(n\); and is therefore equivalent to adding \(-b\) to many times, or the same as adding \(+n\) \(b\). But if we infer from this, that \(1\) is to \(-n\) as \(-n\) to \(n\), according to the rule, that unit is to one of the factors as the other factor is to the product, there is no ground to imagine that there is any mystery in this, or any other meaning than that the real magnitudes represented by \(b\), \(a\), \(b\), and \(n\) are proportional. For that rule relates only to the magnitudes...
The origin of the negroes, and the cause of their remarkable difference from the rest of the human species, has much perplexed the naturalists. Mr Boyle has observed, that it cannot be produced by the heat of the climate: for though the heat of the sun may darken the colour of the skin, yet experience does not show that it is sufficient to produce a new blackness like that of the negroes.

In Africa itself, many nations of Ethiopia are not black; nor were there any blacks originally in the West Indies. In many parts of Asia, under the same parallel with the African region inhabited by the blacks, the people are but tawny. He adds, that there are negroes in Africa beyond the Southern tropic; and that a river sometimes parts nations, one of which is black and the other only tawny. Dr Barriere observes, that the gall of Negroes is black, and being mixed with their blood is depofited between the skin and subcutaneous vesicles. However, Dr Mitchell of Virginia, in the Philosophical Transactions, No. 476, has endeavoured by many learned arguments to prove, that the influence of the sun in hot countries, and the manner of life of their inhabitants, are the remote caufes of the colour of the Negroes, Indians, &c., Lord Kaims, on the other hand, and fuch philosophers as he, whose genius and imagination are too lively to submit to a dry and painfuit investigation of facts, have contended, that no physical caufe is fufficient to change the colour, and what we call the regular features of white men, to the dark hue and deformity of the woolly-headed negro. Their arguments have been examined with much acutenefs and ingenuity by Dr Stanhope Smith of New Jersey, Dr Hunter, and professor Zimmerman, who have made it in a high degree probable, that the action of the fun is the original and chief caufe of the black colour, as well as diftorted features, of the negro. See America, No. 48—51, and Complexion.

True negroes are found in no quarter of the globe where the heat of the climate is not very great. They exit no where but in the Torrid zone, and only in three regions situated in that zone, to wit, in Senegal, in Guinea, and on the western shores of Africa, in Nubia, and the Papous land, or what is called New Guinea. In all these regions the atmosphere is scorching; and the heat excessive. The inhabitants of the north are whiter; and as we advance southwards towards the line, and these countries on which the fun's rays fall more perpendicularly, the complexion gradually assumes a darker shade. And the fame men, whose colour has been rendered black by the powerful action of the sun, if they remove to the north, gradually become whiter (at least their pofterity), and lose their burnt colour. Whites, when transported into the burning regions of the Torrid zone, are at first subject to fever; the skin of the face, hands, and feet, becomes burnt, hardens, and falls off in flakes. Hitherto the colour of negroes appears to be only local, extrinfic, and accidental, and their short frizzled
frizzled and sparse hair is to be accounted for in the very same manner.

Climate poises great and evident influence on the hair, not only of men, but of all other animals. If in one case these transmutations are acknowledged to be consistent with identity of kind, they ought not in the other to be esteemed criteria of different species. Nature has adapted the planety of her work to the situations in which she may require it to be placed. The beaver and sheep removed to the warm latitudes exchange, the one its fur, and the other its wool, for a coarse hair that preserves the animal in a more moderate temperature. The coarse and black flag of the bear is converted, in the arctic regions, into the fine and white fur. The colour of the hair is likewise changed by climate. The bear is white under the arctic circle; and, in high northern latitudes, foxes, hares, and rabbits, are found white. Similar effects of climate are discernible on mankind. The hair of the Danes is generally red; of the English, fair or brown; and of the French, commonly black. The hair of all people of colour is coarse and curled in a manner peculiar to themselves; but this peculiarity is analogous to the effect which a warm climate has on almost every other animal. Cold, by obstructing the perspiration, tends to throw out the perspirable matter accumulated at the skin in an additional coat of hair. A warm climate, by opening the pores, evaporates this matter before it can be converted into the substance of hair; and the lassens and aperture of the pores render the hair liable to be easily eradicated by innumerable incidents. Its curl may result in part from the nature of the secretion by which it is nourished, and from part from external heat. That it depends in some degree on the quality of the secretion is rendered highly probable from its appearance on the chin and other parts of the human body. Climate is as much distinguished by the nature and proportion of the secretions as by the degree of heat: (See Physiology, sect. 6.) Whatever be the nutriment of the hair, it is evidently combined in the torrid zone of Africa with some fluid of a highly volatile or ardent quality which produces the rank smell of many African nations. Saline secretions tend to curl and to burn the hair. The evaporation of any volatile spirits would render its surface dry and disposed to contract; whilst the centre continuing unaltered, would be made to grow inward. External and violent heat parching the extremities of the hair, tends likewise to involve it. A hair held near the fire instantly coils itself up. Africa is the hottest country on the globe; and the influence of its heat, either external or internal, or both, in giving the peculiar form to the hair of the natives, appears, not only from its sparreness and its curl, but from its colour. It is not of a thinning, but of an adult black; and its extremities tend to brown, as if it had been scorched by the fire.

The peculiarities of the negro-features and form may likewise be accounted for from the excessive heat of the climate and the state of African society. Being fagades, they have no arts to protect them from the rays of a burning sun. The heat and serenity of the sky preserving the lives of the children without much care of the parents they seem of course to be, in the interior parts of the country, negligent of their offspring. Able themselves to endure the extremes of that ardent climate, they nurse their children to it from their most tender age. They suffer them to roll in the dust and stand beneath the direct rays of a vertical sun. The mothers, if the be engaged, lays down the infant on the first spot she finds, and is seldom at the pains to seek the miserable shelter of a barren shrub, which is all that the interior country affords. When we reflect on the influence of a glare of light upon the eye, and on the constrictions of countenance produced by our efforts to retire or prevent it, we need not wonder that the plant features of a negro-infant should, by constant exposure, acquire that permanent irregularity which we term their characteristic ugliness. But besides the climate, food and clothing and modes of life have prodigious effects on the human form and features. This is apparent even in polished societies, where the poor and labouring part of the community are much more coarse in their features, and ill-formed in their limbs, than persons of better fortune and more liberal means of subsistence. What an immense difference exists in Scotland, in foreign between the chiefs and the commonalty of the Highland clans? If they had been separately found in different countries, they would have been ranged by some philosophers under different species. A similar distinction takes place between the nobility and peasantry of France, of Spain, of Italy, and of Germany.

That food and clothing, and the different modes of life, have as great an influence upon the shapes and features of the Africans as upon the natives of Europe, is evident from the different appearances of the negroes in the southern republics of America according to the stations in which they are employed. "The field slaves (says Dr Smith) are badly fed, clothed, and lodged. They live in small huts on the plantations, where they labour, remote from the society and example of their superiors. Living by themselves, they retain many of the customs and manners of their African ancestors, The domestic servants, on the other hand, who are kept near the persons, or employed in the families of their masters, are treated with great lenity; their service is light; they are fed and clothed like their superiors; they see their manners, adopt their habits, and infensibly receive the same ideas of elegance and beauty. The field slaves are, in consequence, slow in changing the aspect and figure of Africa. The domestic servants have advanced far before them in acquiring the agreeable and regular features, and the expressive countenance of civil society. The former are frequently ill-shaped, They prefer, in a great degree, the African lips, nose, and hair. Their genius is dull, and their countenance sleepy and stupid. The latter are straight and well proportioned; their hair extended to three, four, and sometimes even to fix or eight inches; the fize and shape of the mouth handsome, their features regular, their capacity good, and their look animated.”

Upon the whole, we hope that the reader, who shall candidly weigh in his own mind what we have said at present and under the article Description, will agree with us, that the black colour in the torrid zone, the sparse crisp hair of the negroes, and the peculiarities of their features and form, proceed from causes altogether extrinsic, that they depend on local temperature and the state of society; and that they are as accidental as the
Negroes are born slaves to great men, reared as such, held as property, and as property sold (see Slavery). There are indeed many circumstances by which a free man may become a slave: such as being in debt, and not the West able to pay; and in some of such cases, if the debt be large, not only the debtor, but his family likewise, become the slaves of his creditor, and may be sold. Adultery is commonly punished in the same manner, both the offending parties being sold, and the purchase money paid to the injured husband. Obi, or pretended witchcraft (in which all the negroes firmly believe, see Witchcraft), is another, and a very common offence, for which slavery is adjudged the lawful punishment; and it extends to all the family of the offender. There are various other crimes which subject the offender and his children to be sold; and it is more than probable, that if there were no buyers, the poor wretches would be murdered without mercy.

In such a state of society what dispositions can be looked for in the people, but cruelty, treachery, and revenge? Even in the civilized nations of Europe, mankind are sometimes displayed to their lordly masters of European extraction the same spirit that has been so generally displayed by the lower orders of Frenchmen to their ecclesiastics, their nobles, and the family of their murdered sovereign! When we consider that the majority of the negroes groan under the cruel slavery, both in their own country and in every other where they are to be found in considerable numbers, it can excite no surprise that they are in general treacherous, cruel, and vindictive. Such are the caprices of their tyrants at home, that they could not preserve their own lives or the lives of their families for any length of time, but by a perpetual vigilance, which must necessarily degenerate, first into cunning, and afterwards into treachery; and it is not conceivable that habits formed in Africa should be instantly thrown off in the West Indies, where they are the property of men whom some of them must consider as a different race of beings.

But

(A) 1. A white man with a negro woman, or a negro man with a white woman, produce a mulatto, half white and half black, or of a yellow-blackish colour, with black, short, frizzled hair. 2. A white man with a mulatto woman, or a negro with a mulatto woman, produce a quadroon, three fourths white and one fourth black, or three fourths black and one fourth white, or of a lighter yellow than the former. The name of ebriet is given to those who are descended from a black man and a mulatto woman, or a mulatto man and a black woman, who are three fourths black and one fourth white, and who are not so black as a negro, but blacker than a mulatto. 3. A white man with a quadroon woman, or a negro with a quadroon woman, produce a mellite, seven eighths white and one eighth black, or seven eighths black and one eighth white. 4. A white man with a mellite woman, or a negro with a mellite woman, produce, the one almost a perfect white, the other almost a perfect black, called a quinteroon. This is the last gradation, there being no visible difference between the fair quinteroons and the whites; and the children of a white and quinteroon consider themselves as free from all taint of the negro race.
But the truth is, that the ill qualities of the negroes have been greatly exaggerated. Mr Edwards, in his valuable History of the West Indies, affirms us that the Mandingo negroes display such gentleness of disposition and demeanour, as would deem the result of early education and discipline, were it not that, generally speaking, they are more prone to theft than any of the African tribes. It has been supposed that this propensity, among other vices, is natural to a state of slavery, which degrades and corrupts the human mind in a deplorable manner; but why the Mandingoes should have become more vicious in this respect than the rest of the natives of Africa in the same condition of life, is a question he cannot answer.

The circumstances which (according to the same author) distinguish the Koromantyn or Gold Coast negroes from all others, are firmness both of body and mind; a ferocioufness of disposition; but withal, activity, courage, and a hubbonness, or what an ancient Roman would have deemed an elevation of soul, which prompts them to enterprize of danger, and enables them to meet death, in its most horrible shape, with fortitude or indifference. They sometimes take to labour with great promptitude and alacrity, and have constitutions well adapted for it; for many of them have undoubtedly been slaves in Africa. But as the Gold Coast is inhabited by various tribes, which are engaged in perpetual warfare and hostility with each other, there cannot be a doubt that many of the captives taken in battle, and sold in the European settlements, were of free condition in their native country, and perhaps the owners of slaves themselves. It is not wonderful that such men should endeavour, even by means of the most desperate, to regain the freedom of which they have been deprived; nor do I conceive that any further circumstances are necessary to prompt them to action, than that of being fold into captivity in a distant country. One cannot surely but lament (says our author), that a people thus naturally intrepid, should be sunk into so deplorable a state of barbarity and oppression; and that their spirits should ever be broken down by the yoke of slavery! Whatever may be alleged concerning their ferocioufness and implacability in their present notions of right and wrong, I am persuaded that they possess qualities which are capable of, and will deserve, cultivation and improvement.

Very different from the Koromantyns are the negroes imported from the Bight of Benin, and known in the West Indies by the name of Eboes. So great is their constitutional timidity and dependancy of mind as to occasion them very frequently to seek, in a voluntary death, a refuge from their own melancholy reflections. They require therefore the gentlest and mildest treatment to reconcile them to their situation; but if their confidence be once obtained, they manifest as great fidelity, affection, and gratitude, as can reasonably be expected from men in a state of slavery. The females of this nation are better labourers than the men, probably from having been more hardly treated in Africa.

The natives of Whidah, who, in the West Indies, are generally called Papaws, are unquestionably the most docile and well-disposed slaves that are imported from any part of Africa. Without the fierce and savage manners of the Koromantyn negroes, they are also happily exempt from the timid and despising temper of the Eboes. The cheerful acquiescence with which these people apply to the labours of the field, and their constitutional aptitude for such employment, afford, without doubt, from the great attention paid to agriculture in their native country. Bofman speaks of the improved state of the soil, the number of villages, and the industry, riches, and obliging manners of the natives. He observes, however, that they are much greater thieves than thofe of the Gold Coast, and very unlike them in another respect, namely, in the dread of pain, and the apprehension of death. They are, says he, so very apprehensive of death, that they are unwilling to hear it mentioned, for fear that alone should hasten their end; and no man dares to speak of death in the presence of the king, or any great man, under the penalty of suffering it himself, as a punishment for his presumption. He relates further, that they are addicted to gaming beyond any people of Africa. All these propensities are observable in the charader of the Papaws in a state of slavery in the West Indies. That punishment which excites the Koromantyn to rebel, and drives the Ebo negro to suicide, is received by the Papaws as the chastisement of legal authority, to which it is their duty to submit patiently. The cause seems to be, that the generality of these people are in a state of absolute slavery in Africa, and, having been habituated to a life of labour, they submit to a change of situation with little reluctance.

Having recited such observations as occurred to him on contemplating the various tribes of negroes from each other, Mr Edwards thus estimates their general character, influenced as they are by circumstances which soon efface the native and original impressions which distinguished one nation from another when newly imported into the West Indies.

Notwithstanding what has been related of the firmness and courage of the natives of the Gold Coast, it is certain that the negroes in general in our islands (such of them as have not been long in a state of servitude) are of a diffitful and cowardly disposition. So degrading is the nature of slavery, that fortiitude of mind is lost as free agency is restrained. To the same cause probably must be imparted their propensity to conceal or violate the truth, which is so general, that the vice of falsehood is one of the most prominent features in their character. If a negro is asked even an indifferent question by his master, he seldom gives an immediate reply; but, affecting not to understand what is said, compels a repetition of the question, that he may have time to consider, nor what is the true answer, but what is the most politic one for him to give. The proneness observable in many of them to the vice of theft has already been noticed; and I am afraid (says our author), that evil communication makes it almost general. It is no easy matter, I confess, to discriminate those circumstances which are the result of proximate causes, from those which are the effects of national customs and early habits in savage life; but I am afraid that cowardice and slavery have been the properties of slavery in all ages, and will continue to be so to the end of the world. It is a situation that necessarily suppresses many of the best affections of the human heart.
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A flat coast; which of itself so refreshes the water, that ships lying at anchor, at the distance of three leagues from its mouth, generally make use of it, and fill their water there for their voyage home. When the rains are at an end, which soon happens in October, the intense heat of the sun usually dries up those stagnating waters, which lie on the higher parts, and the remainder form lakes and marshes, in which are found all sorts of dead animals. At last, those too are quite dried up; and then the effluvia that arise are almost quite insupportable. At this season the winds blow so hot from the land, that they may be compared to the heat proceeding from the mouth of an oven, and they bring with them an intolerable smell. The wolves, tigers, lions, and other wild beasts, then repair to the river, steeping their body under water, and only their snout above it for the sake of breathing. The birds soar to an immense height in the air, and fly a vast way over the sea, where they continue till the wind changes, and comes from the west.

**NEG ROMANCY.** See **NEGROMANCY**.

**NEGROES.** See **HELIOPHOB** and **ALBINO**.

**NEGROES White.** See **HELIOPHOB** and **ALBINO**.

**NEGROPONT,** anciently *Eubra,* an island of the Archipelago, stretching along the eastern coast of Achaia or Livadia, from which it is separated by a narrow channel called the *Euripus.* This strait is so narrow, that the island is joined to the continent by a bridge thrown over it; and here, it is thought, there was formerly an istmus. The irregularity of the tides in the Euripus hath from the remotest antiquity been very remarkable, and this irregularity is found to be connected with the age of the moon. From the three last days of the old moon to the eighth day of the new moon, and from the 14th to the 20th day inclusive, they are regular; but on the other days they are irregular, flowing 12, 13, or 14 times in the space of 24 hours, and ebbing as often. The island is 90 miles long and 25 broad in the widest part; and produces corn, oil, fruit, and cattle, in great abundance. The only place in the island worth notice is the capital, which is also called *Negropont,* and which is walled, and contains about 15,000 inhabitants; but the Christians are said to be much more numerous than the Turks. The captain-bashaw, or admiral of Turkey, who is also governor of the city, the island, and the adjacent continent of Greece, resides here; and the harbour, which is very safe and spacious, is seldom without a fleet of galleys, ready to be put to sea against the pirates and the Maltese. A part of the bridge between the city and the coast of Greece, consists of a drawbridge no longer than just to let a galley pass through.

**END OF THE TWELFTH VOLUME.**
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