Mr. Reaumur was very ſenſible of the advantages that water inſects, and animals, have over others, as to the healing of their wounds, but was reſolved to try the experiment on ſome land animals. The creature he firſt choſe for theſe experiments was the earth-worm; and on cutting theſe creatures aſunder, though many of the pieces dried, yet he had the pleaſure of ſeeing ſome ſucceed ſo perfectly, that the tail part, which wanted not only the head, but alſo the organs of generation of both ſexes (which in theſe animals are always both contained in the ſame individual) has been ſeen to reproduce both theſe organs and the head, and become as perfect a worm as the whole was. Philoſ. Tranſ. N° 464. Append.

STAR-*gazer*, in ichthyology, the Engliſh name of the uranoſcopus. See the article URANOSCOPUS.

STAR-*ſhot*, the common name of a gelatinous ſubſtance often found lying on the ſurface of the earth, and called by ſome *ſtar-jelly*, and *ſtar-fallen*.

The vulgar have been always of opinion, that this was produced from that meteor which they call a *falling-ſtar*; others have imagined it a vegetable ſubſtance, and ſuppoſed it grew out of the earth: neither of theſe however appear, upon a cloſe examination, to be the caſe, but that it is really the half-digeſted food of herons, bitterns, crows, ſea-mews, and coddy-moddies, principally when they have fed upon frogs or earth-worms.

The heads of frogs have been found whole in maſſes of this matter, as have alſo parts of worms; and theſe birds, when ſhot, have been found, when dying, to diſgorge a ſubſtance of the ſame kind.

It is a gelatinous ſubſtance, reſembling a thick mucilage of gum tragacanth, and is cold to the touch. There are often yellow ſpecks, and ſmall clots, like grumous blood, in it. It ſtinks like putrid fleſh when kept, and is principally found in miſty mornings, and in wet weather in autumn, winter, and ſpring. *Moreton*'s Northampt. p. 353.

Mr. Boyle ſays, he has ſeen this jelly reſolved by digeſtion only into a permanent liquor; and that a phyſician of his acquaintance extolled it as a ſpecific, outwardly applied, to wens. Works Abr. Vol. 1. p. 310.

STAR-*ſtone*, *aſteria*, in natural hiſtory, the name of a kind of extraneous foſſil, of a very regular figure and ſtructure, and approaching very much to the nature of the entrochi, having the ſame ſubſtance and inner ſtructure, and being much of the ſame ſize, though different in form: and as thoſe foſſils have fragments of ſhelly bodies, to which they are ſometimes found affixed, and appendages like branches, or the rudiments of ſuch, growing from them, ſo theſe have both the one and the other; the firſt called *aſteropodia*, and the others the *appendiculæ*, or wires of the *aſteriæ*.

The *aſteropodia*, in ſubſtance and inner ſtructure, agree perfectly with the ſhells of the echinitæ, found in our chalk-pits, and with the *aſteriæ* and entrochi; theſe bodies being all compoſed of obliquely-arranged plates of a tabulated ſpar: they are uſually compoſed of ſeveral joints, but they are only very imperfect fragments of the body of the animal the *aſteriæ* have once been a part of; the ſeveral parts of which they are compoſed are all convex on one ſide, and concave on the other, but they are of very different ſhapes, being ſometimes roundiſh, ſometimes oblong, often quadrangular, and not unfrequently of different numbers of angles. They have frequently two, ſometimes more ridges running acroſs them, and ſometimes they have tubercles, or ſmall protuberances, ſtanding either on their upper or under ſide: they are ſometimes found ſingle, but more frequently compound, or arranged into ſmaller or larger parcels, being placed one over another in the manner of the tiles of a houſe, and ſeem truly to have been originally part of an imbricated ſhell, or cruſt of ſome yet unknown ſpecies of ſea-fiſh. They are in theſe compound maſſes even very evidently fragments, and are uſually of irregularly broken figures, though ſometimes they reſemble, in ſome degree, parts of the rays of one or other of the kinds of *ſtar*-fiſh. They are uſually found looſe from the *aſteriæ*, though lying among them; but ſometimes the *aſteriæ* are regularly fixed on them, juſt as the entrochi on the modioli, and are plainly ſeen to have originally grown out of them.

The *encrinos* of authors is one kind of *aſteropodium*, and has been affirmed by ſome perfectly to agree in figure with a ray of the magellanic *ſtar*-fiſh. This is, however, ſeldom found in ſuch a compound ſtate; it uſually is met with in ſingle joints, and then is what authors call the *aſteropodium minus*, or ſmall *aſteropodium*. *Hill*'s Hiſt. of Foſſ. p. 653.

Theſe bodies are uſually of a pale bluiſh grey, or aſh colour; ſometimes they are whitiſh, and ſometimes, though more rarely, yellowiſh, or reddiſh.

Having thus far deſcribed the *aſteropodia*, which ſeem properly the baſes of the *aſteriæ*, we ſhall be more intelligible in the account of the *aſteriæ* themſelves, which are to be treated of merely as branches of them; though, from their being much more frequent than theſe their baſes, they are much more familiarly known, and uſually more regarded.

The *aſteriæ* are ſhort, and commonly ſomewhat crooked angular columns, compoſed of ſeveral joints, each reſembling the figure of a radiated *ſtar*, with a greater or ſmaller number of rays in the different ſpecies: they are uſually found of about an inch in length, and of the thickneſs of a gooſe-quill. Some of them have five angles, or rays, and others only four, and in ſome the angles are equi-diſtant, while in others they are irregularly ſo; in ſome alſo they are ſhort and blunt, while in others they are long, narrow, and pointed; and ſome have their angles ſo very ſhort and obtuſe, that at firſt ſight they might be taken for *entrocha-aſteriæ*. The ſeveral joints in the ſame ſpecimen are uſually all of the ſame thickneſs; this however is not always the caſe, but in ſome they are larger at one end, and in others at the middle, than in any other part of the body; and ſome ſpecies have one of the rays bifid, ſo as to emulate the appearance of a ſix-rayed kind.

All the *aſteriæ* are naturally ſulcated between the angles, but this in a very different degree; ſome are very little ſo, while others are cut ſo deeply, that the ſingle joints of them reſemble the rowels of a ſpur. One end of the column is frequently found finely engraved along the edges of the angles, or rays, while the other end is ſmooth, or nearly ſo; and the ſame is often the caſe alſo in the ſingle joints. Not unfrequently, alſo, one end of a column is indented, and the other has five ſtriæ, running from a hollow center to the ſulci between the rays.

They are found of various bigneſſes and colours; the longeſt ſeldom arrive, however, at two inches, and they are found of all the intermediate bigneſs from this down to the length of a barley-corn: they are not unfrequently found, alſo, compreſſed and flatted, as is common to the foſſils that have been formed in animal moulds.

They are uſually found bedded in the ſtrata of clay, though not unfrequently in thoſe of a lax ſort of quarry-ſtone, and ſometimes in a harder, but that leſs frequently. They uſually have ſea-ſhells, and other marine remains, lying about them; and ſometimes theſe ſhells adhere to the *aſteriæ*, and when ſeparated from them do no injury to the *aſteriæ*, but themſelves ſhew a mark of the figure of the body, or part of the column, when a part has been always wanting in the ſhell. Had theſe ſhells been ſtuck into the bodies of the *aſteriæ*, it would have been a proof that theſe ſhells were the bodies firſt formed, and that the matter of the *aſteriæ* had been formed, or had gathered about them afterwards; but as it is, we have by it abundant proof on the other ſide of the queſtion, and may plainly diſcover that theſe *aſteriæ* are really of marine origin; and that however they may be altered in their matter or ſtructure, ſince they were depoſited in the earth, yet that they were really exiſting in this their proper form in thoſe ſeas, when the ſhells that are found adhering to them acquired their growth.

From the columns of the *aſteriæ* there are ſometimes propagated certain ſmall branches, like thoſe of the entrochi; theſe are called by authors *appendiculæ aſteriarum*, or the wires of the *aſteriæ*.

They are compoſed of ſeveral ſhort cylindric joints, with obliquely-truncated ends, and each hollowed to the middle, where there ſtands a ſmall tubercle. Theſe branches are ſometimes two inches long, and the largeſt or thickeſt joint always adheres to the *aſteria*, all the ſucceeding ones growing ſmaller, and the branch taperer toward the end. In their natural ſituation on the *aſteria*, they ſtand in regular circles at different diſtances, one above another: there is always one wire in each of the ſulci, or channels of the body, and theſe ſtand evenly againſt one another.

Theſe wires, or *appendiculæ*, are very ſeldom, however, found in this their native ſtate, or fixed to the bodies of the *aſteriæ*; they are commonly found broken off, and lying looſe among them, and the rudiments only of them remaining on the *aſteriæ*, and very rarely even theſe. The wires themſelves are more frequently found wholly ſeparate from them, and either in fragments of different lengths, or in ſingle joints, immerſed in ſtone, or lying among the ſtrata of clay. *Hill*'s Hiſt. of Foſſ. p. 654.

The *aſteria* is alſo denominated *aſtrites*, *aſtroites*, *aſtrobulus*, and *aſteriſcus*; by Geſner *ſphragis aſteros*, *ſigillum ſtellæ*, in Engliſh the *ſtarry-ſtone*.

The *aſteriæ* may be reduced to two kinds; the firſt, thoſe whoſe whole bodies make the form of a *ſtar*; the ſecond, thoſe which in the whole are irregular, but which are adorned, as it were, with conſtellations in the parts.

Dr. Liſter, for diſtinction's ſake, only gives the name *aſteria* to the former ſort, diſtinguiſhing the latter by the appellation of *aſtroites*; the other naturaliſts generally uſe the two indiſcriminately [b]. The *aſteria*, ſpoken of by the antients, appears to be this latter kind [g].—[b] *Plott*, Nat. Hiſt. Oxfordſh. cap. 5. ſect. 16. ſeq. [g] Mercat. Metalloth. arm. 9. cap. 10.]

Some antient writers indeed ſpeak of another more extraordinary ſpecies of *aſteria*, or *aſterites*, which the ſun's rays would ſet on fire, and which on that account came into uſe for the compoſition of philtres for kindling love. *Bail.* Dict. Crit. in voc. Eſope, n. (A).

The quality of moving in vinegar, as if animated, is ſcarce perceivable in the *aſtroites*, but is ſignal in the *aſteria*.

The former muſt be broken in ſmall pieces before it will move; but the latter will move, not only in a whole joint, but in two or three knit together. *Plott*, Nat. Hiſt. Oxfordſh. ſect. 26, ſeq.

STAR-*wort*, *after*, in botany, the name of a genus of plants, the characters of which are theſe. The flower is of the radiated kind. Its diſk is compoſed of floſcules, and its border of ſemifloſcules: theſe all ſtand on the embryo ſeeds, and are contained in one common ſquammoſe cup. The embryos finally ripen into ſeeds, which are winged with down, and fixed to the thalamus of the flower.

The ſpecies of *after*, enumerated by Mr. Tournefort, are theſe. 1. The common blue Attic *ſtar-wort*. 2. The Attic *after* with white flowers. 3. The round-leaved hairy Auſtrian *ſtar-wort* with large blue flowers. 4. The long-leaved mountain *ſtar-wort* with large blue flowers. 5. The purple-flowered Alpine *after*. 6. The blue-flowered dwarf mountain *ſtar-wort*. 7. The blue-flowered Alpine Attic *ſtar-wort*. 8. The purple tripolium-flowered *after*. 9. The broader-leaved *after* with tripolium flowers. 10. The common acrid blue-flowered *after*, called the *blue fleabane*. 11. The great blue Attic *ſtar-wort*. 12. The leſſer blue Attic *ſtar-wort*, called the *blue Alpine fleabane*. 13. The blue-flowered willow-leaved ſea *ſtar-wort*, called *tripolium*. 14. The leſſer *tripolium*. 15. The ſmall white-flowered *tripolium*. 16. The early Pyrenean *after* with large blue flowers. 17. The autumnal Pyrenean *after* with ſmaller blue flowers. 18. The broad-leaved American *after* with pale blue umbellated flowers. 19. The tall hairy New England *after* with very large violet-purple flowers. 20. The late-flowering hairy willow-leaved American *after* with blue flowers. 21. The tall-branched, wild daiſy-leaved, late-flowering *after*. 22. The branched late-flowering purple *after*. 23. The broad-leaved paniculated *after* with deep violet-coloured flowers. 24. The blue-flowered hyſſop-leaved branched African *after*. 25. The white-flowered branched hyſſop-leaved African *after*. 26. The annual Canada branched *after*, called by ſome the *branched daiſy*. 27. The African *after* with helichryſum leaves. 28. The hairy yellow mountain *after atticus* with very large flowers. 29. The ſmooth mountain *after* with large yellow flowers. 30. The yellow-flowered *after* with ſweet-ſcented roots. 31. The fleabane-leaved autumnal meadow *after*, commonly called the *middle fleabane*. 32. The meadow Alpine *after* with gold-yellow flowers. 33. The yellow-flowered woolly Dutch *after*. 34. The very hairy and woolly Alpine *after*. 35. The hairy mullein-leaved *after*. 36. The rock *ſtar-wort* with viſcous, hairy, and ſtrong-ſcented leaves. 37. The long-leaved mountain yellow *after*. 38. The yellow marſh *after* with long woolly leaves. 39. The ſea *after* with a thick cylindric, and three-pointed leaf. 40. The yellow jagged-leaved marſh *after*, called the *jagged-leaved marſh fleabane*. 41. The marſh *after* with ſmall globoſe flowers. 42. The yellow-flowered tuberous-rooted ſea *after*, called *ſea-fleabane*. 43. The mountain willow-leaved *after* with yellow flowers. 44. The yellow ſweet-ſcented *fleabane* like *after*. 45. The fleabane-leaved yellow Alpine *after*. 46. The mullein-leaved *after* with yellow flowers. 47. The primroſe-leaved American *after* with yellow flowers, and a thick large cup. 48. The American primroſe-leaved *after* with a ſingle purple flower. 49. The ſhrubby yellow ſtœchas-leaved American *after* with umbellated yellow flowers. 50. The American *after* with large ragwort leaves, hairy underneath. 51. The yellow-flowered ſtœchas-leaved Æthiopian *after*. 52. The great *after*, commonly called *elecampane*. *Tourn.* Inſt. p. 481.

All the ſpecies of this plant are propagated by parting their roots early in ſpring, and they will grow in almoſt any ſoil or ſituation; and the larger ſorts encreaſe ſo faſt, that if not prevented, they will in a little time over-run a large ſpace of ground. They grow beſt in the ſhade. But the lower kinds do not run ſo much at the root, but ſhould be taken up and tranſplanted every other year, which will make them produce much fairer flowers. *Miller*'s Gard. Dict.

Golden STAR-*wort*. See the article ASTER *Atticus*.

STAR *of Bethlehem*. See the article ORNITHOGALUM.

STARAPHAXAT, a name uſed by ſome of the old writers for any medicine that reſtrains fluxions upon the eyes, noſe, or fauces.

STARTING, in the manege. A horſe is ſaid to be *ſtarting*, ſkittiſh, or timorous, that takes every object he ſees to be otherwiſe than it is; upon which he ſtops, flies out, and ſtarts ſuddenly to one ſide, inſomuch that the rider can't make him come near the place where the object is. This fault is more common to geldings than ſtone-horſes. Such horſes alſo as have bad eyes are moſt ſubject to it, as well as thoſe that have been kept a long time in a ſtable without airing; but theſe laſt are eaſily cured of it. When you have a ſkittiſh horſe, never beat him in his conſternation, but make him advance gently, and with ſoft means, to the ſcarecrow that alarms him, till he recovers it, and gains aſſurance.

STARVING *to death*, a kind of puniſhment uſed by the people of Arragon ſome ages ago; and it is reported by Tavernier, that the chief ladies in the kingdom of Tunquin are at this day ſtarved to death for adultery.

STASIS, a word uſed by phyſicians to expreſs a ſtagnation of the humors.

STATELY, in the manege. A horſe is ſaid to be *ſtately*, that goes with a proud, ſtrutting gate.

STATER, the name of a weight among the antients, equal to four drachms.

STATHEUSIS, a word uſed by the old writers to expreſs the torrefaction, or roaſting of ſome medicines before a ſlow fire, as is done frequently at preſent with rhubarb, *&c.*

STATICAL, (*Cycl.*) is ſometimes applied in a peculiar ſenſe to the experiments made as to the quantity of perſpiration, and other excretions of the human body.

We have a very particular account of ſome experiments of this kind in the Philoſophical Tranſactions, N° 470, made by Dr. John Lining of Charles-Town, in South-Carolina.

STATICAL *hygroſcope*. See the article HYGROSCOPE.

STATICE, *thrift*, in botany, the name of a genus of plants, the characters of which are theſe. The flowers are collected into a head of a ſort of globular form, which is ſurrounded by a common ſcaly cup. The head is compoſed of a number of caryophylleous flowers, compoſed of ſeveral petals, and each ariſing from its own proper tubular cup. The piſtil ariſes alſo from the ſame cup, and finally becomes an oblong fruit, covered by the cup.

The ſpecies of *ſtatice*, enumerated by Mr. Tournefort, are theſe. 1. The larger *ſtatice*, *thrift*, or *ſea July flower*. 2. The ſmaller *ſtatice*. 3. The large white-flowered Alpine *ſtatice*. 4. The ſmalleſt mountain *ſtatice*. 5. The Portugal *ſtatice* with ſcorzonera leaves. 6. The large ſhrubby Portugal ſea *ſtatice* with great flowers. 7. The great Portugal *ſtatice* with capillaceous leaves. 8. The ſmalleſt Portugal *ſtatice* with capillaceous leaves. And 9. the low ſea *ſtatice* with rigid capillaceous leaves. *Tourn.* Inſt. p. 340, ſeq.

STATICULA, among the Romans, thoſe little figures with which it was uſual to adorn their drinking-cups, called *ſcyphi*. *Pitiſc.* in voc.

STATICULI, among the Romans, a kind of dancing pantomimes. *Pitiſc.* in voc. See PANTOMIME.

STATION (*Cycl.*)—We have a method of meaſuring diſtances at one *ſtation*, in the Philoſophical Tranſactions, N° 7, by means of a teleſcope. But the practice of this method does not anſwer to the theory.

STATION, *ſtatio*, στασις, in the antient muſic, was ſometimes uſed for any fixed pitch, or degree of ſound, whether produced by intention or remiſſion. Vid. *Wallis*, Append. ad Ptolem. Harmon. p. 154.

STATION-*line*, in ſurveying. See the articles LINE and SURVEYING, *Cycl.*

STATIONARY (*Cycl.*)—STATIONARY *fevers*, a term uſed by Sydenham to expreſs a peculiar kind of fever, adapted, and owing to ſome general conſtitution of the air and ſeaſons. There are certain general conſtitutions of years, which owe their origin neither to heat, cold, dryneſs, nor moiſture, but rather depend upon a certain ſecret, and inexplicable alteration in the bowels of the earth, whence the air becomes impregnated with ſuch kinds of effluvia, as ſubject the human body to peculiar diſtempers, ſo long as that kind of conſtitution prevails, which after a certain courſe of years declines, and gives way to another. Each of theſe general conſtitutions is attended with its own proper and peculiar kind of fever, which never appears in any other; and this is thence called a *ſtationary fever*.

STATIVA, among the Romans, a ſtanding camp kept for the defence of the frontiers of the empire. Theſe camps gave riſe to a great many towns, which took their names from the legion ſtationed there. *Pitiſc.* in voc.

STATORES, among the Romans, made a part of the emperor's life-guard. *Pitiſc.* in voc.

STATUARY (*Cycl.*)—STATUARY *marble*, among our artificers, the name of the ſofter white marble uſually wrought into *ſtatues*, the ſame with the Parian marble of the antients.

STATUTE (*Cycl.*)—The king's royal aſſent to a bill by his letters patent under his great ſeal, and ſigned with his hand, and declared and notified in his abſence to the lords ſpiritual and temporal, and to the commons, aſſembled together in the high houſe, is as effectual as if the king was preſent. Stat. 33 Hen. VIII. cap. 21.

Statutes were antiently proclaimed by the ſheriff, but upon the invention of printing, this method was diſcontinued. Every body is obliged to take notice of an Act of Parliament at his peril. 4 Inſt. 26.

STATUTE-*ſeſſions*, in law, a meeting in every hundred of conſtables and houſholders, by cuſtom, for the ordering of ſervants, and the debating of differences between the maſters and the ſervants, rating of ſervants wages, *&c.* 1 Eliz. cap. 4. *Cowel.*

STATUTO *mercatorio*, a writ for the impriſoning him that has forfeited a *ſtatute merchant* bond, until the debt is ſatisfied: and of theſe writs there is one againſt lay-perſons, and another againſt perſons eccleſiaſtical. Reg. Orig. 146, 148. *Cowel.*

STATUTO *ſtapulæ*, a writ that lies to take the body to priſon, and ſeize upon the lands and goods of one who hath forfeited the bond called *ſtatute ſtaple*. Reg. Orig. 151. *Blount*, *Cowel*.

STATUTUM *de laborariis*, an antient writ for the apprehending ſuch labourers as refuſe to work according to the *ſtatute*. Reg. Judic. 27. *Blount*, *Cowel*.

STAVESACRE, *ſtaphiſagria*, in botany. See the article STAPHISAGRIA.

Staveſacre grows in Provence, Languedoc, and many other parts of Europe. The leaves are large and finger'd, the flower blue, and ſomewhat like that of the larkſpur. The ſeed, which is the only part of the plant uſed in medicine, is of a duſky brown, and very rough on the outſide, and of a pale yellow within, and of a bitter, diſagreeable, and very acrid taſte. The ſeed ſhould be choſen new, clean, and plump. Taken inwardly they are a violent purge and vomit, in a very ſmall doſe, and are never preſcribed; but outwardly they have always been famous for deſtroying lice in children's heads. Some take it into their mouths alſo for the tooth-ach, and others have ventured to uſe gargariſms of it to cure phlegm, and as an errhine, ſnuffing it up the noſtrils. It is alſo commended for the cleanſing old ulcers. *Lemery*'s Dict. de Drog.

The chief uſe of *ſtaveſacre*, as a medicine, is the deſtroying vermin in children's heads: to this end it is powdered and mixed with *cocculus indicus*, and ſeldom fails of ſucceſs. It is a violent purgative, and therefore ſeldom uſed at preſent.

STAUROPHORI, Σταυροφόροι, in church-hiſtory, certain eccleſiaſtics, whoſe buſineſs it was to carry the croſs in proceſſions. *Hofm.* Lex. in voc.

The word is compounded of σαυρος, a croſs, and φερω, I carry.

STAUROPHYLAX, Σταυροφυλαξ, in church-hiſtory, a dignified officer in the church of Conſtantinople, to whoſe care the keeping of the croſs, found by Helena, was committed. *Hofm.* Lex. univ. in voc.

The word is derived from σαυρος, a croſs, and φυλασσω, I keep.

STAXIS, a word uſed by the antient phyſicians to expreſs a diſtillation of blood in drops from the noſe.

A *ſtaxis*, in the doctrine of criſes, is juſtly condemned as indicating a weakneſs and decay of ſtrength in nature; whereas, on the contrary, free and copious diſcharges of blood from the noſe are eſteemed good indications, and often make happy criſes.

STAY (*Cycl.*)—STAY, in the manege. To *ſtay*, or ſuſtain your horſe, is to hold the bridle firm and high. We likewiſe *ſtay* or ſuſtain a horſe with the in-leg, or in-heel, when he makes his croupe go before his ſhoulders upon volts: as alſo when we hinder him to traverſe, and ride him equally, keeping him always ſubject, ſo that his croupe can't ſlip out, and he can't loſe either his cadence, or his ground, but marks all his times equal.

STEAMS. Subterranean *ſteams* often affect the ſurface of the earth in a very remarkable manner, and influence or prevent vegetation more than any thing elſe. The ſurface of ſome ground is ſo hollow and light, and ſo ſwoln by a warm and continually working ferment, that it muſt needs ſend up a warming *ſteam*; and that it does ſo, even in the coldeſt weather, is evident from the immediate melting of the ſnow that falls on it: nay, in many places, the effect of this *ſteam* is ſo great, that it melts the ſnow before it reaches the ground, ſo that it falls on it in form of rain.

Some ſtones alſo, and ſome waters, impregnate the earth by their innate warmth, ſending up a continual ſucceſſion of warm effluvia from all parts of their ſurfaces; and other ſtones have exactly a contrary effect, rendering the places where they lie barren and cold. Streams of water, which have in their ſubterranean courſe run through beds of limeſtone, marl, or chalk, are always enriched, and warmed by the *ſteams* iſſuing from thoſe ſubſtances, and mixing with them as they paſs, and conſequently theſe waters enrich the ground wherever they run; and, on the contrary, ſome waters are uliginous, or corroſive, from the *ſteams* they have received in their channels from the veins of pyrites, or beds of metalline ores. It is even reported, that the very ſubſtances of metals and minerals are thus raiſed in *ſteams*, and that the juices of plants are found loaded with them; thus we are told, that in Italy crude quickſilver is found in the juices, and at the roots of plants; and that in Moravia, Hungary, and Peru, the ſubſtances of the metals are found in the bodies of plants, particularly lead and ſilver. The Miſcellanea Curioſa of Leipſick ſpeak of wonderful appearances of gold in the form of plants, which, if true, muſt be owing to that metal's having been raiſed in *ſteams*, and carried into the veſſels of the plants in ſuch quantity, as in fine to deſtroy the vegetable appearance, and leave the figure of the plant in metal. Phil. Tranſ. N° 110.

STEATITES, in the hiſtory of foſſils, a name given by late authors to a ſubſtance called in Engliſh *ſoap-earth*, and which, though the authors on theſe ſubjects had not taken notice of that circumſtance, was the very ſubſtance called *Cimolia purpuraſcens*, or purple earth of Cimolus, by the antients. The later ages finding the purple Cimolian earth of the old writers to be wholly different from their white kind, have given that name (though it is not eaſy to gueſs why) to the common fuller's earth, which has no tinge of purple in its whole ſubſtance.

This earth however, called by us *ſoap-earth*, and *ſteatites*, is well worth enquiring after, as a ſubſtance for imitating the fine porcelain ware of China. Dr. Woodward much recommends it on this account, and repeated trials have been made of it ſince his time, and ſome of them very lately; in all which it has afforded the fineſt earthen-ware ever made with us, and promiſes fair, with good management, for the equaling any in the world.

It is dug in many parts of Devonſhire and Cornwall, and the neighbouring counties; the cliff of the Lizard point is almoſt wholly compoſed of it, and the adjacent little iſlands abound with it; and from all theſe places it might be brought, at ſmall expence, in any quantities. It is known from all other earths by theſe characters. It is compoſed of extremely fine particles, and is of a firm, equal, and regular texture, and great weight. It is very firm and hard as it lies in the earth, but when it has been ſome time expoſed to the air, it becomes almoſt of a ſtony hardneſs. It is of a perfectly fine, ſmooth, and gloſſy ſurface, ſofter to the touch than any other ſpecies of earth, and does not at all adhere to the tongue, or ſtain the fingers in handling; but drawn along a rough ſurface, as a piece of cloth, or the like, it marks it with a fine and even white line. In colour it is a clear white, veined and variegated very beautifully with purple of different degrees of deepneſs; and is of ſo fine a ſtructure of parts, that when cut into thin pieces it is in ſome degree tranſparent. It makes no efferveſcence with acids, and burns to a pure white, even in its purple parts. *Hill*'s Hiſt. of Foſſ. p. 22. See TERRA *Cimolia*.

STEATOCELE, a term uſed by the antients to expreſs a ſort of rupture, occaſioned by a large quantity of fat or ſuety matter lodged in the ſcrotum.

STEEL (*Cycl.*)—The difference between *ſteel* and iron is, that *ſteel* being much the harder, will not yield to the hammer, but is brittle, inſtead of being ductile, and reſiſts the file. Malleable iron grows rigid by being ſimply extinguiſhed in cold water, but it yet retains a conſiderable degree of ductility in the cold, and may be extended in all dimenſions with the hammer.

Steel, however, if heated again, and cooled by ſlow degrees, may be filed, and extended more or leſs by the hammer. But there are many degrees in the hardening of *ſteel*; for if it has been made extremely red-hot, and is then quenched in cold water in motion, it becomes greatly harder than if it had been but moderately red-hot, and had been quenched in warm water.

Steel is alſo of a darker colour than iron, and the ſurface of it, when broken, appears to conſiſt of ſmaller granulated, or even ſtriated particles, than the iron it was made of. This appears moſt diſtinctly, when *ſteel* is welded to the ſame iron of which it was made, and the maſs made red-hot, and well incorporated by hammering. If then you harden it again, by extinguiſhing it in cold water, and poliſh it, the veins of iron are eaſily diſtinguiſhable from thoſe of the *ſteel*; the iron ones being whitiſh, and of a ſilver-like hue, the *ſteel* ones blackiſh, or like water; and when broken, the ſize of the particles is found extremely different. *Cramer*'s Art of Aſſaying, p. 346.

The manner of making iron into *ſteel* had remained very long a ſecret, but many authors of late date have given the proceſs, though it does not appear the ſame in all, and in many is encumbered with circumſtances, intended only to diſguiſe it. Mr. Reaumur has taken greater pains, than almoſt any man, to come at the truth; but to be rightly informed of his reaſons, we ought to begin where he did, that is, at the origin of the iron in its pure metallic ſtate.

The ores of this metal are mixed bodies, compoſed of ſome particles truly metallic, and of others ſulphureous, ſaline, and terrene; this compound maſs is put in fuſion by the fire, and on this operation the metallic parts being heavieſt, ſubſide to the bottom of the veſſel, or furnace, and are then eaſily ſeparated from the lighter ſubſtances which float at the top. This ſeparation, however, is not ſuppoſed to be perfect, but the metal, after this its firſt fuſion, retains many heterogene particles, which prevent it from being malleable. It is after this to be refined, that is, to be melted again, and that ever ſo often performed, the metal becomes yet more and more pure and perfect, ſome heterogene matter being every time depoſited, or thrown off, and this is uſually much leſs after every fuſion.

The metal, when thus purified by melting, yet remains hard and brittle: theſe are two qualities which we do not want in iron, and this hardneſs and friability are no incompatible qualities, ſince their origin is this, that the iron in this ſtate is compoſed of a multitude of ſmall granules, every one of which is very firm and compact in its own texture, though they

they cohere but ſlightly one with another. The knife, or the file, cannot eaſily cut any one of theſe granules, but a blow of a hammer eaſily ſeparates large parcels of them from thoſe to which they were joined: this caſt iron is therefore uſed only for ſuch purpoſes as requires a ſubſtance poſſeſſed of theſe qualities; purpoſes where hardneſs is required, and where no blows are to be met with. Thus backs of grates, iron pots, and the like, are made of it.

One of the general properties of metals is, that they are malleable; that is, their ſeveral particles cohere ſo well together, that they are ductile and extenſible under the hammer, and will ſuffer the whole maſs to bend any way without breaking, that is, without their ſeparating from one another. In the words of the artizans, ſuch ſuppleneſs and pliability is called *body* in a metal, and the caſt iron, which wants this, is ſaid to have no body, and is what they call *no ſoft metal.* It is therefore no way fit for ſuch works as require faſhioning by the hammer or the file, nor of ſuch as are to ſtand any violent blows; but as it is eaſily fuſible, it ſerves for caſt works where there is no great delicacy in the figuring, ſince it does not run ſo thin as to adapt itſelf to every lineament of a fine figure, nor is qualified to be repaired by inſtruments.

The ill qualities of caſt iron are, in a great degree, remedied in the forged or wrought iron, taken from the ſame quantity, and the ſame fuſion. The forging of iron is only the placing it over the fire till heated to a certain degree, and then beating it out with large hammers till it becomes ſoft. When it has been ſufficiently forged, it becomes ſoft and malleable, even when cold, and when heated, is eaſily wrought into any figures, which it retains always afterwards; and it is eaſily cut by the file when cold, and is not brittle on being ſtruck, as is the caſt iron.

While it gains theſe properties by the forging, it loſes, however, another by the ſame means, which is its fuſibility. It will no longer melt in the fire, but when the workmen give it the ſtrongeſt heat they can, it is only reduced to a ſort of ſoft paſte, and *ſweats* a little, as they expreſs it; that is, ſome few drops of truly melted iron fall from it.

It is very certain, that both the caſt and the forged iron are mixtures of metalline, ſaline, and ſulphureous particles; and the different arrangement of theſe, in their mere ſimple running together in the fuſion, and their being driven intimately into, and among one another, by the hammering, makes the fuſibility different in the two ſtates.

If the forged iron differ greatly from the caſt, there is however a third ſtate into which it is reducible by art, which is yet different from both, this is what we call *ſteel*; and the quality of iron on receiving this change is not one of its leaſt valuable ones, ſince from this we have all our inſtruments for cutting, ſawing, boring, and the like purpoſes, the value of which to us is almoſt infinite. The German *ſteel* has always been in great repute, and though ſeveral other nations have made it, yet the Germans have kept their method a ſacred myſtery, to keep up their trade in it.

Steel is conſiderably harder than forged iron, and ſo it is neceſſary that it ſhould be, in order to many of the purpoſes it is employed in. Shears of *ſteel*, which are intended to cut iron, muſt be harder than iron, otherwiſe their edge will turn, and they will not cut; whereas, if the metal is too hard, then the granules will fly off, and the edge break away in ſmall fragments. This is the caſe with all edged tools; and hence it is that good *ſteel* is ſo nice and difficult a thing to make, ſince there is required ſuch a degree of hardneſs, and no more.

It is very well known, that *ſteel* acquires its hardneſs from the plunging it into water; it is to be heated to a certain degree, and then immediately plunged, while the fiery particles yet remain in it, into water perfectly cold; it is then to be ſpeedily drawn out of the water, and thus the whole operation is finiſhed. It acquires its hardneſs in degrees, proportionate to its heat when plunged into the water; and this hardneſs, or temper, remains with it only till it is heated as high again; for after that, if it is left to cool leiſurely, and not thrown into water, it is loſt. All the maſſes of *ſteel* which are ſold are thus tempered; nevertheleſs, when they are wrought into tools, their temper is loſt, and is to be renewed by plunging them again into cold water, when they have been forged into the ſhape of which they are to be.

Mr. Reaumur affirms, that *ſteel* differs in nothing from forged iron, except that it contains more ſulphurs, and more ſalts. Hence it follows, that caſt iron ſhould be *ſteel*, ſince it evidently differs from forged iron in the ſame manner, and by the ſame properties; and in effect, caſt iron is *ſteel*, ſuch as it is, eſpecially the white ſort, which is more pure, and more perfectly diveſted of its earth, than the browner ſorts; and this white kind may be accordingly brought to all the hardneſs of *ſteel*, by repeated heating and quenching in cold water. It follows alſo, that in order to convert iron into *ſteel*, we are to give it new ſalts, and new ſulphurs. It may be aſked, where is the neceſſity of giving again that, which the mere caſt iron poſſeſſes? To which the anſwer is, that *ſteel* is required to be malleable in ſome degree, which the mere caſt iron is not; and it is to be added to this, that it may be poſſible for us to give to forged iron ſuch ſalts and ſulphurs as are more proper for the *ſteel*, than thoſe which the caſt iron naturally poſſeſſes.

We have great variety of ſalts and ſulphurs, out of which to chuſe for this purpoſe, and Mr. Reaumur made many trials to find which would ſucceed beſt; and the reſult of all was, that for ſulphurs, powdered charcoal and common ſoot; and for ſalts, ſea-ſalt alone ſucceeded beſt, and that theſe were properly to be mixed with aſhes, by way of an intermediate ſubſtance. Theſe ſubſtances muſt alſo have their allotted doſe; that is, there muſt not only be a certain proportion of the ſeveral ingredients one to another, which however need not be very preciſe or exact, but there muſt alſo be a proportional quantity of the whole employed to the quantity of iron that is to be wrought upon; and in this alſo regard muſt be had to the ſeveral ſorts of ores from which the iron was obtained, ſince the iron of ſome ores is much ſooner convertible into *ſteel* than that of others, and makes alſo a better *ſteel.*

The manner of beſt introducing theſe ſalts and ſulphurs into the body of the iron, was found by this author a matter of great difficulty to determine. He ſoon perceived, that fire was the only agent that could convey theſe bodies into the metal; and in contriving how this might be done moſt eaſily, and with leaſt expence, he found out, after many trials, a new ſort of furnace, which effected this purpoſe with great eaſe, and which was not ſubject to the inconveniences of other furnaces.

As *ſteel* is iron with an admixture of heterogene particles, it follows that it muſt be leſs metallic, that is, leſs malleable, or more brittle; and it is alſo neceſſary that it muſt be, in ſome degree, malleable for the purpoſes it is required for; and it is eaſy to conceive that theſe properties cannot be given it, in a proper degree, but by means of a very accurate operation; and even when all the parts of the proceſs are the ſame, there is yet much depending on the iron itſelf, which can never be perfectly known but by trial. Something, however, may be judged of the iron by breaking bars of it: the ſeveral ſorts of iron, when broken, ſhew ſome of them only granules, others flakes, and others fibres; ſome alſo ſhew all three of theſe moleculæ at once, and others two of them; but it is eaſy, in either of theſe caſes, to ſee which ſort is in the greateſt number. The laminated and the fibrous iron are the two extremes; the firſt is very brittle, the latter very malleable. The laminated iron is ever the worſt of all kinds for making into *ſteel*; and of this kind ſuch pieces are worſt of all, the laminæ of which are very white and ſhining, and are large and irregularly diſpoſed, and arranged in different inclinations. Mr. Reaumur began to reckon from theſe an arrangement of all the kinds of iron, which coming, each by degrees, to have the laminæ ſtill ſmaller and ſmaller, and at the ſame time leſs glittering, and placed more evenly together, ſunk at laſt into the irons of the granulated kind. It is eaſy to conceive how many differences there muſt be between theſe; and from theſe the fibroſe ones may be deduced, owing their texture merely to the granulæ, which in theſe are diſpoſed into long ſtrings or ſtreaks. Tho' in this arrangement of the irons, the firſt are, of all others, the leaſt proper for making *ſteel*, it does not follow that the laſt are the moſt ſo: theſe indeed uſually make a very ſoft and pliant ſort of *ſteel*, which has what the workmen call the *greateſt body* of all the kinds of *ſteel*, and is therefore moſt proper of all for certain purpoſes, as the making watch-ſprings, and the like; but the want of hardneſs makes it very unfit for cutting tools of all kinds, from the razor to the ax. The granulated iron always makes the fineſt and hardeſt *ſteel*; and of theſe ſuch ſucceed beſt, whoſe granules are ſmalleſt.

One thing remarkable is, that all *ſteel*, though made of iron of the granulated or ſtriated kind, yet is, before it has been hammered, of a flaky, or a ſort of laminated ſtructure; but this ſeems owing to the fire's having melted ſome of the granules in the operation, and run ſeveral numbers of them together into theſe plates. The ſmallneſs of theſe flakes in *ſteel*, which has not been worked, are a proof of its being but of a bad kind.

A bar of iron, when converted into *ſteel*, is not equally ſo converted in all its parts; the fire has always acted more ſtrongly upon its ſurface than on its central parts, and it is therefore more perfect *ſteel* there than in its inner parts; but a perfection in the operation is not neceſſary to the *ſteel's* being good and uſeful, and the whole bar is often very good *ſteel*, as are alſo many bars made at the ſame time, yet all perhaps ſomewhat differently affected.

If the compoſition, which is to convert the iron into *ſteel*, be too ſtrong, or if the fire be too violent, or the matter continued too long in it, in all theſe caſes the *ſteel* will be over made; that is, there will be an over proportion of ſaline and ſulphureous parts added to the iron: theſe will therefore too far ſeparate the particles of the metal aſunder, and the conſequence will be, that the *ſteel* will be too brittle to bear hammering, and will be of great loſs to the proprietor in the great quantities that will be broken, beſide the loſs he

will

will ſuſtain from the abundance of ſcales which will fly off in the working. The way to meliorate ſuch *ſteel* as this, muſt be to diveſt it of part of its ſalts and its ſulphurs, but peculiarly of the laſt; and Mr. Reaumur found, that the burying the bars of ſuch *ſteel* in lime, or any other alkaline ſubſtance that would readily abſorb the ſulphurs, and placing it for a proper time in the fire, it would be in a manner decompoſed again, and come out a very good and perfect *ſteel*; and this is no trivial proof, that the account given of the manner of iron's becoming *ſteel* is the true one.

By this management *ſteel* may again be converted, or reduced to its primitive iron, and a body of any middle degree, between *ſteel* and iron, may be produced, by ſtopping this proceſs at different points of time, or continuing it till all the adventitious ſalts and ſulphurs are drawn off or abſorbed. Hardneſs and flexibility are the two great points in this operation, and what the metal gets of the one of theſe, it aſſuredly loſes of the other. The greater hardneſs is from the greater quantity of the adventitious ſalts and ſulphurs; and the greater flexibility, or, as the workmen call it, the *greater body*, is from the greater quantity of the metallic; and he who is able to calculate properly the quantities of his ſalt, charcoal, and ſoot, and to regulate exactly the degree of fire, is capable to make *ſteel* of what degree of temper or perfection he pleaſes.

Iron, impregnated with new ſalts and new ſulphurs, is not however perfectly reduced to the ſtate of what the workman expects in *ſteel*; there wants yet the quenching it while hot in cold water, to compleat the operation. The *ſteel* penetrated every way by the particles of fire, and at that inſtant plunged into water, is by that quenching ſtopt in the very ſtate in which it was, and is not ſuffered to exhale the igneous bodies, as it would otherwiſe have done. It was, while in the fire, rarified and dilated, and this quenching continues it in that ſtate, and it is found, on meaſuring, conſiderably thicker and larger than it was while unheated. It might be ſuppoſed from hence, that the particles of fire, which were lodged in the *ſteel* while red-hot, were thus detained and impriſoned in it, and ſo wrought the change, as they are known to remain in many calcined bodies, though they have not been ſo ſuddenly quenched; but if this were the caſe, the *ſteel* muſt be encreaſed in weight as well as bigneſs, as many calcined bodies are, but this is not found to be ſo in fact.

Recourſe muſt be had therefore to ſome other operation on the *ſteel*, and this appears, in reality, to be no other than the change of its texture, or internal ſtructure. If a body be naturally compoſed of a number of particles, which are in themſelves hard and compact, but between which there are certain ſpaces; if one take from thoſe hard and compact particles ſomewhat to fill up thoſe voids, it muſt appear very evidently, that though by this the proper particles are rendered leſs hard, yet the whole body muſt be made harder than it was before.

In the converting of iron into *ſteel*, Mr. Reaumur conceives that the particles of iron, being naturally very covetous of ſalts and ſulphurs, have imbibed great quantities of theſe adventitious bodies, while the ſpaces between them have been able to retain very few. This being then the firſt ſtate of the *ſteel*, when it is afterwards heated, in order to its being tempered by quenching, the fire drives theſe ſulphureous and ſaline particles, ſo abundant in the iron, out of its granules, and diſperſes them throughout the ſpaces between theſe granules; and that it is to this equal and regular diſtribution of theſe ſalts and ſulphurs, fixed in that ſtate by the immediate quenching, that the hardneſs, and other qualities of *ſteel* are owing.

To the advantage the metal gets by this means, there is however always joined a diſadvantage, which is, that its grain naturally and neceſſarily becomes coarſer by it, and the *ſteel* has the leſs body. The hardeſt *ſteel* always muſt neceſſarily have the leaſt body; but according to the rules laid down by Mr. Reaumur, one may diſpoſe the hardneſs in what degree one pleaſes, and conſequently all the other properties are in the direction of the ſame laws.

If the oppoſition of the qualities of *ſteel* be nicely conſidered, we ſhall find, that inſtead of being hurtful, they are truly what ſhould be moſt wiſhed for, and are productive of the moſt deſirable conſequences. It may appear ſomewhat ſtrange, that hardneſs and flexibility in *ſteel* ſhould be ſuch directly oppoſite and contradictory principles, and that the quenching, which makes *ſteel* more powerful to reſiſt preſſure or rubbing, ſhould at the ſame time make it more feeble in action; but this is plainly the caſe, and a piece of *ſteel* wire, which, before it is tempered by quenching, will, when hung vertically, ſuſpend a certain weight, will not ſuſtain the ſame weight when tempered, but will be broken even by a leſs; and that if the trial be made by tempering it up to one certain part, and no farther, the wire will aſſuredly break at that very part where the tempered and untempered portions meet. The encreaſe of ſize in every grain of *ſteel*, from the quenching, gives the plain ſolution of this phænomenon. The rupture of any body whatever, that is, the ſeparation of its parts, by whatever means it is done, muſt be more difficult, the more intimately thoſe parts touch, or the more points they touch in. The granules of *ſteel* are theſe touching parts, and it is very evident that theſe granules becoming larger on the quenching, muſt after this touch in fewer points, in the whole combination of the maſs; and on the other hand, as they are larger, they alſo muſt mutually touch each other in a larger ſpace. Here are two contrary principles, which conſtitute the facility and the difficulty of the rupture by different means; and it cannot be, but that the one of theſe conſtructions muſt give the greater force to reſiſt preſſure or friction, and the other to reſiſt drawing or traction.

It has been already obſerved that *ſteel* is the harder, according as it was more or leſs hot at the time when it was plunged into the water; and it muſt be added to this, that it alſo is the more ſo, the more cold the water is into which it is plunged. The degree of heat in the *ſteel* is eaſily known by its colour, and the diſtinctions in it are familiar to the workmen. Several perſons have thought there was great virtue to be communicated to the water by means of different ingredients; this Mr. Reaumur carefully tried, and the reſult was, that he found common cold water the beſt, and moſt uſeful of all liquors: it is true, that vinegar and verjuice harden the *ſteel* ſomewhat more, and aqua fortis greatly ſo, but the latter of theſe renders it too hard for ſervice; and repeated trials have evinced, that common water alone will give *ſteel* all the hardneſs it can be wiſhed to have, provided only that it be plunged into it at a time when it is ſufficiently hot.

If *ſteel*, after the tempering, be found too hard, there is a very familiar way of bringing it back to what ſtate one pleaſes, between that and iron, which is only the heating it in the fire; for it may be kept in the fire ſo long, as to be reduced wholly to iron again. It is eaſy to infer from hence, what was before obſerved, that caſt iron is *ſteel* of a peculiar kind; its properties plainly evince, that it is *ſteel* with an over proportion of all that makes it ſo, and conſequently of all its properties. It is not malleable, is very brittle, and too hard for the file, or any other tool, to cut. Theſe are the qualities of *ſteel* which is over tempered, or, as it may be called, too much *ſteel*: it owes theſe qualities to its being overcharged with thoſe ſulphurs and ſalts, which in a due proportion makes *ſteel* of iron. The method of reducing this to the ſtate of wrought iron, is the ſame with what we have before obſerved is to be uſed to untemper too high tempered *ſteel*, that is, keeping it in the fire till part of its ſalts and ſulphurs are driven off; and if the fire alone be thought too difficult, or too tedious a method, Mr. Reaumur has found that thoſe alkaline ſubſtances, which naturally abſorb ſulphurs, will aſſiſt the reducing this to the ſtate of wrought iron, as they do to the untempering of *ſteel*, and that the very ſame ſubſtances of this kind, which have been found beſt in the untempering *ſteel*, ſucceed beſt in the rendering this malleable; ſuch are lime, chalk, and the like.

Caſt iron may be taken for theſe operations in two ſtates; the one, that of ſimply melted iron in its firſt fuſion, the other that of the iron, which has been run into the mould. When a caſt piece of iron, in a certain form, is heated again with the calx of animal bones, which is one common way, this being a ſubſtance extremely diveſted of ſalts and ſulphurs, it abſorbs thoſe of the metal too greedily, and diveſts it of too great a quantity of them; ſo that when the piece comes afterwards to be filed, the fragments fly off in large ſcales, and the beauty of the caſt figure muſt be loſt: to remedy this difficulty, ſome powdered ſulphur is to be added in the heating; for this being a ſulphureous and ſaline body, checks and moderates the effects of the calx of bone.

Chalk in the ſame manner can only be employed with certain regulations; it ſucceeds very well, if the fire be not too violent, or too long continued, but if it be exceſſive in either of theſe particulars, the chalk throws into the body of the iron ſalts and ſulphurs of its own, which lay hid in its ſtructure, and which would not have been diſlodged by a ſmaller fire; but which being diſlodged, and thrown into the iron, act upon it, and render the ſucceſs of the operation quite different from what was intended, the iron becoming more hard and more brittle by it.

One great nicety in all theſe operations, is the underſtanding the ſigns by which it is known at what time caſt iron is ſufficiently ſoftened, or over tempered *ſteel* is ſufficiently reduced toward the ſtate of iron again; but this is only to be acquired by nice obſervation, and on this depends the whole certainty of the proceſſes, ſince every minute's continuance in the fire gives the operation a different turn in degree.

Mr. Reaumur, in one of his experiments in the ſoftening a piece of caſt iron of a beautiful figure, found, on taking it out, that it had loſt prodigiouſly of its weight, and coming to a nicer examination, he found that it was hollow; its outer cruſt having been ſooner converted into malleable, that is unfuſible, iron than the reſt, and the violence of the fire afterwards having melted away the inner part, which was not yet ſo changed. This accident led him to experiments, by which he found that he could, at any time, melt out

the central part of a thick ſquare bar of caſt iron, the outer part changing firſt into the condition of malleable iron, and ſerving as a crucible for the fuſion of the yet unaltered fuſible iron within. By a proper management of this diſcovery, it will be eaſy to take off the unwieldy weight of many works of caſt iron, which do not require ſo much ſtrength as that of the ſolid contained in their circumference. Mem. Acad. Scienc. Par. 1722.

Mr. Cramer obſerves, that the method of making *ſteel* out of iron, is either by fuſion, or by cementation. That by cementation may be performed in the following manner: chooſe ſome bars of pure iron, not too thick, prepare a cement of charcoal-duſt, moderately pulverized, one part, and wood-aſhes half a part; or of charcoal-duſt two parts, bones, horns, leather, or hair of animals, burnt to a blackneſs in a cloſe veſſel, and in a gentle fire, and afterwards reduced to powder, one part, wood-aſhes half a part; mix them together. Prepare a cylindrical earthen veſſel, two or three inches higher than the bars are long; put into the bottom of this veſſel the cement, prepared as before directed, ſo that being gently preſſed down, it may cover the bottom of the veſſel an inch and half deep; place then the iron bars perpendicularly, ſo that they may be every where an inch diſtant from the ſides of the veſſel, and from each other; fill the interſtices with the cement, and cover the bars with it, that the veſſel may be quite full, cover it with a tile, and ſtop the joints with a lute; put this veſſel into a furnace, and keep it moderately, but equally red-hot, for ſix or ten hours. When this is over, take the red-hot bars out, and dip them in cold water, they will then be brittle, and turned to *ſteel*. *Cramer*'s Art of Aſſaying, p. 344.

The method of making *ſteel* by fuſion is this: take of iron ore, or of unmalleable iron of the firſt fuſion, divide it into ſmall parcels, and put them into a bed made of charcoal-duſt in a ſmith's forge; let the quantity of the iron be but ſmall for the experiment; put to it, as a defenſitive menſtruum, ſome of the vitreſcent ſcoriæ of ſand, or ſtones of the ſame nature; then put upon them a quantity of charcoal, light this, and admit only a ſmall blaſt of the bellows, that the ſcoriæ and metal may both melt regularly: when this has been ſome time kept in fuſion, take it out, divide it into two parts, which make red-hot, and hammer into long bars; finally, heat them red-hot, and plunge them into cold water, and they will then be found to be *ſteel*, ſo very hard, as not to be filable, and ſo brittle, as to break aſunder when ſtruck with conſiderable force. *Cramer*'s Art of Aſſaying, p. 348.

Mr. Lemery ſhews a ſimple method of reducing *ſteel* to a very fine powder, without ruſting it: pour water on filings of *ſteel* in an earthen veſſel, till it is four inches above the filings; ſtir it well every day, ſupplying more water, as that in the veſſel ſubſides, ſo that the *ſteel* is always covered: continue this operation till the *ſteel* falls into an impalpable black powder, then dry it for uſe. Mem. de l'Acad. des Scienc. 1736.

Mr. Boyle tells us of his having opened the body of *ſteel*, by a highly rectified ſpirit of urine made *per ſe*, and poured upon new filings of the *ſteel*. This being put into a warm place, the menſtruum diſſolved a conſiderable part of the metal. See his Works Abr. Vol. I. p. 77.

Annealing, or *nealing of* STEEL, is by ſome uſed for the ſoftening it, in order to make it work eaſier; which is uſually done by giving it a blood-red heat in the fire, and then taking it out, and letting it cool of itſelf. *Mox*. Mechan. Exerc. p. 60.

Some have pretended to ſecrets in annealing, by which they could bring down iron or *ſteel* to the temper of lead: this was to be done by often heating the metal in melting lead, and letting it cool again out of the lead. But this method is found by Moxon to have no other effect than what is had from the former. *Hought*. Collect. N° 276.

Steel may indeed be made a little ſofter than in the common way, by covering it with coarſe powder of cow-horn, or hoofs; thus incloſing it in a loam, heating the whole in a wood fire till it be red-hot, and then leaving the fire to go out of itſelf, and then the *ſteel* to cool. *Mox*. loc. cit.

STEEL *glaſſes*, a name given by ſome authors to the metalline ſpheres uſed in optics. Theſe, according to Cardan, are made of three parts of braſs, one part of tin, and one of ſilver, with an eighteenth part of antimony; but moſt either totally leave out the ſilver, or add only a twenty-fourth part, to ſave the expence. There are many other methods, directed by ſeveral authors, but moſt uſe arſenic and tartar, mixed with the metals. Theſe are afterwards to be poliſhed with emery, rotten-ſtone, putty, and the like. *Merret*'s Notes on Neri, p. 342.

STEEL-*ore*, is uſed to ſignify a particular kind of lead-ore. See LEAD-*ore*.

STEEL-*waters*. See the article *Mineral* WATERS.

STEELING, in cutlery, the laying on a piece of *ſteel* upon a larger maſs of iron, to make that part which is to receive the edge harder than the reſt. The body of an ax may very well be of iron, as it never comes into uſe to cut with, and perhaps is ſtronger, and leſs liable to break, than if of *ſteel*; but it muſt have a quantity of *ſteel* at that part where the edge is to be made.

STEELYARD (*Cycl.*)—*Chineſe* STEELYARD. The people of China carry this ſtatera about them to weigh their gems, and other things of value. The beam, or *yard*, is made of wood, and is round, and a quarter of an inch over, and about a foot in length; upon this are three rules of meaſure, made of a fine ſilver-ſtudded work, as in a watch-caſe. One of theſe rules is divided into inches, and every inch into 25 parts; the other two are divided alſo into equal parts, but not into inches. They all begin from the end of the beam, whence the firſt is extended 8 inches, the ſecond 6 and $\frac{1}{2}$, the third 8 and $\frac{1}{2}$. The firſt is the European meaſure, the other two ſeem to be China meaſure, and that of ſome other nation trading with them. At the other end of the *yard* hangs a round ſcale, marked with China characters, and at three ſeveral diſtances from this end are faſtened ſo many ſlender ſtrings; the firſt diſtance makes $\frac{3}{5}$ of an inch, the ſecond is double to the firſt, and the third 4 inches and $\frac{4}{5}$. When they weigh any thing, they hold up the *yard* by ſome of theſe ſtrings, and hang a ſealed weight, of about an ounce and $\frac{1}{4}$ troy weight, upon ſome point of the rule, as the thing requires. *Grew*'s Muſeum, p. 369.

STEELYARD-*ſwing*. In the Philoſophical Tranſactions we have an account of a *ſteelyard-ſwing*, propoſed as a mechanical method for aſſiſting children labouring under deformities, owing to the contraction of the muſcles on one ſide of the body. The crooked perſon is ſuſpended with cords under his arm, and theſe are placed at equal diſtances from the center of the beam. It is ſuppoſed that the gravity of the body will affect the contracted ſide, ſo as to put the muſcles upon the ſtretch; and hence by degrees the defect may be remedied. See N° 462. ſect. 7.

STEEVE, aboard a ſhip. The ſeamen ſay that the bow-ſprit, or the beak-head of a ſhip *ſteeves*, when it ſtands too upright, and not ſtrait enough forwards.

STEEVING, in merchant ſhips, is uſed for the ſtowing of cotton, or wool, by means of ſcrews, to force it cloſe together.

STEINBIZA, in ichthyology, a name given by Hildegard, and ſome other writers, to that ſmall ſpecies of cobitis, called by others *cobitis aculeatus*, and *tænia cornuta*. It is the *cobitis* with a forked ſpine under each eye, deſcribed by Artedi. *Hildegard*, lib. 4. p. 1. See COBITIS.

STEINHUN, *ſtone-hen*, a name given by the Germans to a bird of the lagopus kind, more commonly known by the name of *otomo*, and in ſome places by that of *colmeſtre*.

It ſeems not to differ from the lagopus in any thing but colour, and that bird being known to change its colour in the ſummer months, it is probably no other *ſpecies*. *Ray*'s Ornitholog. p. 127. See the articles LAGOPUS and OTOMO.

STELE, Στηλη, in antiquity, a kind of puniſhment, being a pillar whereon a criminal was expoſed, and on which was engraven an account of his crime.

The perſons, thus expoſed to the laughter and reproaches of the people, were called *ſtelitæ*. *Potter*, Archæol. Græc. lib. 1. cap. 25. Tom. I. p. 130.

STELECHEIA, a word uſed by ſome authors to expreſs the vena portæ.

STELECHITES, in the materia medica, a name given by Dioſcorides, and ſome other of the Greek writers, to a peculiarly fine kind of ſtorax. It was the ſame with the calamite, only that this name was given to the larger, and the name *calamite* to the ſmaller or ſlenderer pieces. Pliny, Strabo, and many others, join in telling us, that the wood of the ſtorax-tree was the moſt ſubject to be eaten by worms, of that of any tree in the world.

The ſoftneſs, and ſweet taſte it had, probably rendered it liable to theſe injuries. When the worms attacked a branch, they generally eat away all the wood, and left an empty caſe of the bark, ſo that inſtead of a ſtick, there was a hollow tube like a reed: all the while that the worms were eating, the wounded veſſels poured out their balſam, and covered at length the whole ſurface with their fine pellucid yellowiſh balſam. This was doing without, while the vermin were at work within, and in conſequence, the whole ſtick, or twig, became a hollow tube, covered over with the moſt pure and fine ſtorax. This was eſteemed beyond any other ſtorax for medicinal uſes; and when in ſmall twigs, it was called *calamites*, or *calamita*, and when on larger ſticks, it was called *ſtelechites ſtorax*. When the worms attacked the body of the tree, the duſt they made by their eroſion formed a hillock or heap round the tree, or at its foot, and the extravaſated balſam running among this duſt, made a maſs that was called the *cymatius ſtorax* at that time, and was the ſame with the common ſtorax now in uſe.

STELECHITES *ſtibii facie*, in natural hiſtory, a very uncouth name given by Aldrovandus, and ſome others, to the entrochi. He gave them this name from the reſemblance of ſome of the longeſt pieces to fragments of the trunks of trees, the arms parting out from the ſides of theſe main branches, the rudiments of which are very frequent in many of

of the entrochi, passing for the remains of boughs, and the hollow in the middle, for the cavity where the pith of the tree was. The addition of *stibii facie*, was only from the observing that the top and bottom were radiated, or striated, from the central hole to the circumference, in the manner of antimony. These are truly no vegetable remains, but parts of the arms of that strange fish called *stella arborescens*.

They are all fragments, or short pieces, broken from larger; the longest pieces we meet with seldom exceed two inches in length, and we find from these down to single joints, as thin as a sixpence: these single joints are distinguished by authors from the compound bodies, or entrochi, by the name *trochitæ*. The largest that we find measure two inches in circumference, but we have from this size to the thickness of the finest pin; about a quarter of an inch in diameter is, however, the most frequent size. The longest pieces consist of from twenty to thirty joints, and are very various in their thickness. These bodies are found sometimes in clay, and sometimes in marble. The Derbyshire marble, of late come so much into esteem, owes all its beauty to the great quantity of them it contains; and they in some places make up all the substance of the masses of rock, only with a very slender portion of stone to join them.

They are usually found thrown in irregular directions, and often shew that they have suffered injuries by accident. In some the joints they are composed of are dislocated, and thrust out of their place; in others the whole substance is crushed flat, as if a hollow cane were trod upon, and squeezed to flatness; and in this case, the cracks occasioned by the injury are always manifest. These injuries must have happened to the entrochi, while their matter was yet soft; for at this time they are so brittle, that the force employed to dislocate, or crush them, would only shatter them to pieces, not take that regular effect. In some the whole series of joints are dislocated, and the entrochus resembles a pile of crown pieces placed on a table, and then pushed aside, so as not to break the pile, but force all the several crowns, or joints of it, to hang over one way. Some of them are found twisted like a cord, and some have the taints evenly arranged, but stuffed full of extraneous matter, as bricks are laid in mortar. The joints of the entrochi vary in thickness, from the thickness of a sixpence to a quarter of an inch; but this is not proportioned by their size, for there are some of them as small as pins, which yet consist of very thick joints.

The outermost joint is in some more deeply, and in others more slightly furrowed; and the outer circle of the points, though generally smooth, is sometimes radiated. The rudiments of branches from the entrochi are small knobs, evidently broken off: they are always placed in the middle of a thick joint, between future and future, and sometimes are single; but sometimes there is a whole circle of them round the body of the entrochus in that joint; and sometimes, beside a regular circle of knots, there are other smaller eminences, like warts, which stand irregularly above and below them, and give the whole a very irregular figure. Sometimes the entrochi with thinner joints are found thus knotted, and these seem to have been all over covered with joints of smaller branches; and in the living state of the animal, when they were perfect, must have made a very remarkable figure. Some joints have three regular rows of knots on them, each perfectly encompassing the entrochus; the middle row, or circle, consists of large knots, and the upper and lower one of small ones. Some of the joints, instead of having a circle of knots, rise up regularly into a circular sharp ridge between future and future; and in some of those which have no rudiment of a knot on any part, the joints all rise thus regularly into sharp ridges in the middle, but that alternately, and in a very beautiful order; the one joint having a high and large ridge, and the other a small and low one all the way. In others there is the same sort of difference in the joints alternately, but the one ridge is blunt, and the other sharp, and edged all the way: in these the joints also are alternately larger and smaller, one than another. In some the alternate edges are knotted, and in some there is a double edge in the middle of every joint: these have the appearance of being composed of a very great number of extremely thin joints, but this is not in reality the case. Some of these last have the double edge in the center of the joint knotted at intervals, and have the appearance of serrate edges.

Most of the entrochi have had branches, in greater or smaller number, issuing from them; in all they are inserted deep into the stem, and often, when they have been displaced, leave deep holes in it. The striature of the branches runs transversely to the striature of the main stem: these branches are of various thicknesses, and sometimes very thin ones grow upon very thick stems; but the more general rule is, that the thicker the stem, the thicker are the branches from it. Some of the branches from the largest stems are found to be branched again, but this is very rare. The pieces of entrochus which we find, however large, are usually of a cylindric figure, as thick at one end as at the other; but there are some few found which swell out in the middle, and grow gradually taper to each end. These Agricola has described, and esteems them a distinct kind; but these never terminate regularly, in the manner of perfect bodies, at the ends, but are all fragments as the others are. Phil. Trans. N° 100.

STELENCHIS, a strigil, or an instrument used in the baths to rub off the sweat from the skin.

STELITÆ, Στηλῖται, in antiquity, persons who had undergone the punishment called *stele*. See STELE.

STELLA (*Cycl.*)—STELLA *crinita*, in natural history, a name given by Linkius to a genus of *star-fish*, the characters of which are these; that they have more than five rays, and from these have several other lateral processes, which are covered with a fine down or hair.

STELLA *lapis*, in the materia medica, the name of a stone which has been very differently interpreted by different writers. Some have supposed it the *asteria* of Pliny, and some the common *corolloide astroites*; but Mesue explains it to be the *lapis lazuli*.

This stone, and the sapphire, being both blue gems, have been very subject to be confounded together; and the sapphire of the antients was indeed no other than a kind of lapis lazuli; but this author has always distinguished between the modern sapphire and the lapis lazuli, by calling the latter *stella lapis*, and the former *zemphyrus*. This word has been by some written *zephyrus*, and its meaning much doubted of, but it is plainly the name of the sapphire; and this word is only formed on the Arabian name of the same gem, which is *semphir*. See the articles ZEMPHYRUS and SEMPHIR.

STELLA *lumbricalis*, in natural history, a name given by Linkius, and others, to a kind of *star-fish* with an undivided body, and with five vermiform rays.

STELLA *marina*, in natural history, a genus of animals, the characters of which are these. It is a soft animal divided into many parts, or composed of many segments, or lobes, running out from a central part, and resembling the radii of a circle, or the rays of a *star*, as it is vulgarly painted. The central part is the body, and has always a mouth in its lower side; and the rays, commonly called *arms*, and by some very improperly *legs*, all stand at equal distances from one another. The upper part of the central nucleus of this animal is called the back, and the lower the belly, but in both these the structure is very different in the several distinct species of the creature.

The skeleton of the *star-fish* examined, shews the body to be made up of joints, very different in number and figure; and in some, this articulated substance is made up of very small, and in others of very large pieces; in some also it is covered with a very thick skin, and in others with a very thin one; this however, in the firmest state, never approaches to a shelly hardness, and is rather callous than testaceous, or crustaceous, as some have called it. The parts, of which all these fish are invariably composed, are the trunk or body, and the lobes: these are of no determinate figure, nor have any thing certain, but that there is a mouth, or aperture, for the taking of food, in some part of the under plane of the trunk; and the only apparent sensation the animal has, is that of touch or feeling. The common position of the mouth is in the center of the body, and the conformation of it is this: the under part of each lobe runs toward a point with the rest at the center of the body, and these several productions of the lobes make a sort of lips, the ends of each of which are armed with a number of sharp teeth, which serve to take and convey the food into the body. From this mouth there goes a separate canal to all, or many of the lobes, which runs through their whole length, and becomes gradually narrower, as it approaches the extremity: these things are constant in all the species, all their other properties differ in the different ones.

Some genera of the *stellæ marinæ* have their body multifid, and have just as many canals in their belly as there are lobes or arms, one constantly and regularly running to each; while others have several cylindric rays or lobes, which are not perforated with any canal: hence the general number of them are divided into the whole, and the multifid kinds. In the multifid kinds the lobes, or rays, are usually five in number, though sometimes they are more, sometimes fewer: hence authors have established a triple distinction of these creatures. 1. Those which have just five rays. 2. Those which have more than five. And 3. those which have a smaller number than that. The whole bodied ones are also arranged into their several genera in the same manner.

The most frequent kind of *star-fish* is that which has five rays, which issue in the manner of so many vermiform, or worm-like processes: these therefore are called *stellæ vermiformes*, or the worm-like *star-fish*. Another kind, nearly approaching to the nature of these, has more than five rays, and from the sides of these other transverse processes being produced, which are covered with an extremely fine kind of down, or hairyness: these are called the *hairy star-fish*. A third kind is called the *astrophyta*, or plant-like *star-fish*: this is composed of a body from whence there arise a great

number

number of branches, which divaricating more and more, are at length encreaſed, or divided into a prodigious number; and theſe being cylindric in figure, reſemble very much the branches of plants.

This general diſtinction being eſtabliſhed, the general and particular arrangements are naturally deduced from the ſubordinate diſtinctions: from the moſt remarkable differences in each ſeries of *ſtellæ* of every claſs are conſtituted the genera; from the leſs remarkable difference among each genus, the ſubordinate diſtinctions, and from the minuter diſtinctions among theſe, the ſpecies are diſtinctly ſeparated from one another. The accurate Linkius has hence eſtabliſhed a very regular method of theſe animals, calling them by names expreſſive of their differences, as *oligactis*, for ſuch of the firſt general diviſion as have leſs than five lobes, or rays, and the like. Several of the ſpecies of the *ſtar-fiſh* are eatable, and ſome of them afford a very good nouriſhment. Some are preſcribed by phyſicians as ingredients in plaiſters.

The foſſile world has been greatly enriched by the fragments and remains of the ſeveral kinds of *ſtar-fiſh* which have been converted into ſtone, and have been variouſly gueſſed at in that ſtate, as to their origin. The aſteriæ are by many affirmed to be the foſſile radii of the *ſtar-fiſh* of the decempede, or ten-rayed kind; and others have thought it evident, that ſome ſpecies of them have been the remains of the common coriaceous kinds. The encrinos, or *lilium lapideum*, ſeems to be a part of one of the ten-rayed kinds; and the trochitæ, and entrochi, are plainly owing to the fragments of ſeveral of theſe kinds. *Linkius*, de Stellis Marin.

STELLA *arboreſcens*. See ARBORESCENT and BASKET-*fiſh*.

STELLA *occidens*, a word uſed by ſome of the chemical writers to expreſs ſal armoniac.

STELLA *ſcolopendroides*, in natural hiſtory, a name given by Linkius to a kind of *ſtar-fiſh* with an undivided body, and five rays, reſembling the bodies of the ſcolopendræ, as thoſe of the more uſual kind, called *ſtella lumbricalis*, do the bodies of common earth-worms. See the article STELLA *marina*, ſupra.

STELLA *vermiformis*, in natural hiſtory, a name given by Linkius, and other authors, to a common kind of *ſtar-fiſh*, which has five rays parting from the body, each ſomewhat reſembling the body of a large worm. See the article STELLA *marina*, ſupra.

STELLARIA, in botany, a name uſed by ſome authors for the *carduus ſtellatus*, or *ſtar*-thiſtle. *Ger.* Emac. Ind. 2.

STELLARIS *lapis*, a name given by many authors to the various ſpecies of *aſtroites*. See the articles ASTROITES and STAR-*ſtone*.

The near alliance between this name and the *aſteria*, though they are the names of two foſſils of an extremely different kind, has been the occaſion of great errors. Authors, not converſant in foſſils, have too haſtily attributed to one of them the properties of the other.

Cambden tells us, that about Bevor-Caſtle there are found *aſtroitæ*, which he very well deſcribes, as conſiſting of the repreſentation of ſeveral *ſtars* fixed together by a flinty, or other extraneous matter.

STELLATE *leaf*, among botaniſts. See LEAF.

STELLIO, in zoology, the name by which authors call the ſwift, or ſpotted lizard. The ſpots which diſtinguiſh this kind are not, however, ſtellated, as might be ſuppoſed from the name, but round; ſome ſmall, and ſcattered irregularly all over the body; and others larger, and diſpoſed in thirteen zones, or ſemicircles. The ſpots are much more diſtinct and clear on the back than on the belly. It is common in Syria, and ſome other places.

STELLIO *aduſta*, an affected term uſed by ſome chemical writers for cinnabar.

STELLITES, in natural hiſtory, a name given by ſome writers on foſſils to a kind of white ſtone found on Mount Libanus, and in ſome other parts of Syria, containing the lineaments of the ſtar-fiſh compleat.

The ſame ſtones frequently contain the lineaments of other fiſhes, principally of the bones, or ſkeletons of them; and it is very certain, that the real bodies of theſe ſtar-fiſhes, and the bones of other fiſh, after the fleſh and ſkin had been corrupted and worn off, have been received into this ſtone while yet ſoft, and afterwards retained in it after its concretion: our own coal-ſlates ſhew us innumerable inſtances of leaves of plants; and the black ſlate of iſleb ſhews us, fiſhes thus preſerved.

STEM (*Cycl.*)—*Falſe* STEM, in a ſhip, that fixed before the right one. When a ſhip's *ſtem* is too flat, ſo that ſhe cannot keep a wind well, they uſe to put a *falſe ſtem* above, which makes her rid more way, and bear a better ſail.

STEMPHYLA, a word uſed by the antients to expreſs the huſks of grapes, or the remains of the preſſings of wine. The ſame word is alſo uſed by ſome to expreſs the remaining maſs of the olives, after the oil is preſſed out.

STEMPHYLITES, a name given by the antients to a ſort of wine preſſed hard from the huſks.

STEMPLES, in mining, croſs bars of wood in the ſhafts which are ſunk to mines.

In many places the way is to ſink a perpendicular hole, or ſhaft, the ſides of which they ſtrengthen from top to bottom with wood-work, to prevent the earth from falling in: the tranſverſe pieces of wood, uſed to this purpoſe, they call *ſtemples*, and by means of theſe the miners in ſome places deſcend, without uſing any rope, catching hold of theſe with their hands and feet. *Ray*'s Engl. Words, p. 118.

STENO's *duct*, a name given from its diſcoverer to the ſuperior ſalival duct. See SALIVAL, *Cycl.*

Several anatomiſts, particularly Heiſter and Palfyn, have diſputed whether *Steno's duct* is pervious in recent ſubjects, as well as in the ſkeleton. Dr. Kulm affirms, he has demonſtrated it to ſeveral to be pervious in deer, bears, wild goats, hares, calves, and in the human ſubjects; and mentions the manner of tracing it. See Med. Eſſ. Edinb. Abridg. Vol. 2. p. 421.

STENOMARGA, in natural hiſtory, a name uſed by ſome authors for a light marly earth, more uſually called *agaricus mineralis*, and *lac lunæ* by the later writers, and *terra*, or *creta Seleneuſiaca*, by Dioſcorides and Galen. *Agricola*, de re Metal. p. 378.

STENTATO, in the Italian muſic, is uſed to ſignify that the voice ſhould be forced in ſome part of a ſong, or on ſome particular ſound, to expreſs an extraordinary emotion.

STEP (*Cycl.*)—STEP, in a ſhip, that piece of timber whereon the maſts or capſtans do ſtand at bottom, is called the *ſtep* of the maſt or capſtan.

STEPHANITÆ, Στεφανῖται, in antiquity, an epithet given to games and exerciſes, where the prize was only a garland. *Potter*, Archælog. Græc. Tom. I. p. 451.

STEPHANOPHORUS, Στεφανοφόρος, in antiquity, the chief prieſt of Pallas, who preſided over the reſt. It was uſual for every God to have a chief prieſt; that of Pallas was the *ſtephanophorus*, juſt mentioned, and that of Hercules was called *dadouchus*. *Potter*, Archæol. Græc. Tom. I. p. 206. See DADOUCHUS.

STEPHANOPHORUS was alſo a prieſt that aſſiſted the women in the celebration of the feſtival Theſmophoria. Id. Tom. I. p. 403. See THESMOPHORIA.

STEPHENS's *medicine for the ſtone* (*Cycl.*)—Mrs. *Stephens* having ſold medicines for the ſtone in the bladder or kidneys, Dr. Hartley publiſhed ſeveral caſes of their ſucceſs; and ſo much was ſaid of them, that the parliament appointed truſtees to examine into the truth of what was alledged in their favour. The report of theſe truſtees being favourable, ſhe had five thouſand pounds ſterling ordered her for publiſhing the receipt. Dr. Hartley leaving out the ſuperfluous part of Mrs. *Stephens*'s preſcription, reduces her receipt to a more ſimple form; to wit, to two ounces and an half of ſoap, and ſeven ſcruples and an half of egg-ſhell powder, as the mean doſe of the medicines to be taken. Dr. Hales, after ſeveral trials on the different ingredients, found that the diſſolving power of them lay in the lime, which Dr. Rutty confirmed; and Dr. Jurin having taken ſoap-lees, the ingredients of which are pot-aſhes and lime, beginning with a few drops, and increaſing the quantity till he took an ounce, or an ounce and an half every day, in a proper vehicle, was cured of bloody urine, pain, &c. and paſſed ſeveral ſmall ſtones; after which he had no uneaſineſs.

STERA, in anatomy, a word uſed by ſome of the barbarous writers to expreſs the uterus. It ſeems to have been only a corruption of the word *hyſtera*.

STERCORARIUS *piſcis*, the *dung-fiſh*, the name of an Eaſt-Indian fiſh; ſo called, from its frequenting neceſſary-houſes which are over the water, and other places, where the like naſtineſs is to be found. It is for this reaſon ſuppoſed unwholeſome by ſome, but is really a very well-taſted fiſh, and eaten by moſt people where it is to be had. It is a broad and thin fiſh, of about ſix or ſeven inches long, and nearly as much in breadth. Its back is variegated with ſpots of deep brown; its belly is bluiſh. *Ray*'s Ichthyogr. Append. p. 2.

STERCUMEZEFF, an affected word uſed by ſome of the chemical writers for litharge.

STEREO-*ſtatics*, is uſed by ſome for the *ſtatics*, or ſcience of the equilibrium of ſolid bodies. *Curtel.* Math. Univ. p. 79.

STERN (*Cycl.*)—STERN-*faſt*, aboard a ſhip, ſome faſtenings of ropes, &c. behind the *ſtern* of a ſhip, to which a cable or hawſer may be brought, or fixed, in order to hold her *ſtern* to a wharf, &c.

STERN-*poſts*, in a ſhip, a great timber let into the keel at the *ſtern* of a ſhip, ſomewhat ſloping, into which are faſtened the after-planks; and on this poſt, by its pintle and gudgeons, hangs the rudder.

STERNA, in zoology, a name by which Turner, and ſome others, have called a bird, known among authors by the name of the *hirundo marina*, or ſea-ſwallow.

It is of the ſmaller kind of *lari*, or gulls, and has a forked tail. It is called the *ſea-ſwallow*, from its having very long wings, very ſhort legs, and a forked tail, and its being almoſt always on the wing. Its uſual weight is about five ounces. Its body is of a long and ſlender ſhape, the upper part of its head is black, but it has a white line ſurrounding it; the belly, and under part of the wings, are white, the

breaſt a little greyiſh; the rump is alſo white, but the back and wings of a blackiſh grey; its beak is ſomewhat long and ſtrait, and its legs are red. It is very common on our weſtern coaſts. It feeds on fiſh, and flies uſually in large flocks. *Ray*'s Ornitholog. p. 269.

STERNOCOSTALES, commonly called the *muſculi triangulares ſterni*, are five pairs of fleſhy planes, diſpoſed more or leſs obliquely on each ſide the ſternum, on the inſides of the cartilages of the ſecond, third, fourth, fifth, and ſixth true ribs. They are inſerted by one extremity in the edges of the inſide of all the lower half of the ſternum; from thence the firſt muſcle on each ſide runs up obliquely, and is fixed in the cartilage of the ſecond rib. The ſecond runs leſs obliquely to its inſertion in the cartilage of the third rib; and the reſt are inſerted, in the ſame manner, in the cartilages of the following ribs; their obliquity decreaſing, and their length encreaſing, in proportion as they are ſituated lower down, ſo that the loweſt of all is almoſt tranſverſe. This laſt muſcle, which is fixed by one extremity in the cartilage of the ſixth true rib near the bone, ſeems to paſs the appendix enſiformis, immediately above the inſertion of the diaphragm in that appendix, and to join the muſcle on the other ſide. *Winſlow*'s Anatomy, p. 233.

The *ſternocoſtalis* was called by ſome of the older anatomiſts *ſextus thoracis*; and by Riolanus, and ſome others of the later writers, *pectoralis internus*.

STERNODACTYLÆUS, in anatomy, a name given by Riolanus, and ſome others, to a muſcle of the foot, called by Albinus the *flexor brevis digitorum pedis*, and by others the *ſublimis flexor*, or *perforatus pedis*.

STERNOHYOIDÆUS, a long, thin, flat muſcle, called by ſome *ſterno-cleido-hyoidæus*.

It is broader at the lower than at the upper part, and is ſituated, together with its fellow, on the foreſide of the throat; from whence ſome have very improperly named it *muſculus bronchialis*. It is fixed by its lower extremity in the ſuperior and lateral part of the inner, or poſterior ſide of the ſternum, in the poſterior part of the ſternal extremity of the clavicula, in the tranſverſe ligament which connects thoſe two bones, and in the inner, or backſide of the cartilage of the firſt rib. All theſe other inſertions are more conſiderable than that in the ſternum, which is ſometimes ſcarce perceivable. From hence it runs up to the foreſide of the aſpera arteria, joined to its fellow by a membrane which forms a ſort of linea alba, and is inſerted laterally in the lower edge of the baſis of the os hyoides. There is ſometimes a tranſverſe tendinous line about the middle of the backſide of this muſcle. *Winſlow*'s Anatomy, p. 256.

STERNOMANTIS, Στερνομαντις, in antiquity, a deſignation given to the delphian prieſteſs, more uſually called *pythia*. *Potter*, Archæol. Græc. Tom. I. p. 278. See the article PYTHIA, *Cycl.*

STERNOMANTIS is alſo uſed for any one that had a propheſying demon within him. *Potter*, Archæol. Græc. Tom. I. p. 300, ſeq.

STERNOMASTOIDÆUS, a muſcle, called alſo ſimply *maſtoideus*, and *maſtoidæus anterior*, or *externus*. It is long and narrow, pretty thick, and moſtly fleſhy, and is ſituated obliquely between the back part of the ear, and the lower part of the throat. It is in a manner compoſed of two muſcles, united at the upper part through their whole breadth, and ſeparated at the lower. It has two inſertions below both of them, flat, and a little tendinous; the firſt is in the upper edge of the ſternum, near the articulation of the clavicula; and the other in the clavicula, at a ſmall diſtance from the ſternum. Theſe two portions run up obliquely, and unite together at about an inch above their lower inſertions, the triangular ſpace left between them being filled by a membrane. The ſternal portion riſes foremoſt, and covers the clavicular, both forming one body, or belly, which running in the ſame oblique direction to the apophyſis maſtoidæus, is inſerted in the upper and back part of that proceſs, over which it likewiſe ſends off a very broad aponeuroſis, which covers the ſplenius, and is inſerted in the os occipitis. The two anterior maſtoidæi repreſent a great Roman V, the angle being at the lower part of the throat, and the two crura running up behind the ears. *Winſlow*'s Anatomy, p. 234.

STERNUM (*Cycl.*)—This is a long flat bone, not all of the ſame breadth, but repreſenting a kind of dagger. It is generally made up of three principal pieces; the firſt broad and ſhort, the ſecond longer and narrower, and the third a ſort of ſmall appendix, called by the Greeks *xyphoides*, from its reſemblance to the point of a broad ſword.

The firſt, or uppermoſt piece, is broad and thick at the top, but thinner and narrower below, being nearly of the figure of a triangle with the three angles cut off, or of a very irregular ſquare. The ſecond is much longer than the firſt, and is flat on both ſides, whereas the outſide of the upper is unequally convex, and the inner a little concave. This is broader alſo toward the lower, than toward the upper part, and has ſometimes ſeveral tranſverſe lines, eſpecially on its outſide, which point out the places where the pieces, of which it is made up in children, are joined together. The two lateral edges of this bone have each one cartilaginous half notch, and five cartilaginous whole notches; the half notches are at the upper part of the lateral edges, and the five entire notches come nearer to each other, in proportion as they are lower, and part of the laſt properly belongs to the third piece.

The third piece, commonly called *cartilago enſiformis*, and *xyphoides*, is entirely cartilaginous in infants, and young ſubjects, but in an advanced age it generally oſſifies, either wholly, or in part. This piece is joined to the lower extremity of the ſecond, between the cartilages of the laſt true ribs, and is often more or leſs notched on each ſide, to form part of the articular notches of the *ſternum*. Its figure and ſize vary, and in ſome ſubjects it is forked, and in others perforated. Sometimes alſo it is very large, and at others very ſmall, hardly exceeding in ſome ſubjects the third part of an inch. The inner ſubſtance of the *ſternum* is almoſt all cellulous, and very tender; it is covered with a thin, but compact lamina. The *ſternum* compleats the fore part of the cavity of the thorax, and ſuſtains the anterior extremities of the ribs; being ſufficiently fixed to reſiſt compreſſions, and other outward accidents, and yet moveable enough, by means of its articulation with the cartilages of the ribs, not to obſtruct the motions neceſſary to reſpiration. It ſerves alſo for the inſertion of ſeveral muſcles, and to ſupport the mediaſtinum. *Winſlow*'s Anatomy, p. 67.

We owe to Mr. Hunauld a very judicious account of the perforation which is ſometimes found in the lower part of the *ſternum*.

This perforation is ſometimes larger, ſometimes ſmaller; and a certain German author has found a very ſingular uſe for it, ſuppoſing that it gives paſſage to the mamillary veins and arteries; but Mr. Hunauld, though he had often found the *ſternum* thus perforated, never could obſerve any veſſels paſſing it, but always found it filled up with a cartilaginous ſubſtance. The German author does not poſitively affirm that he ſaw the veſſels paſſing through this perforation, and Mr. Hunauld ſuppoſes it to have been but a conjecture, that this might be its uſe. Its origin and formation, however, may be more rationally accounted for on much ſounder principles.

The *ſternum* is in its firſt ſtate wholly cartilaginous, and the oſſification begins afterwards in ſeveral different parts of it: the number of theſe oſſifying ſpots is wholly uncertain, but as they encreaſe they unite, ſooner or later, into three pieces, and afterwards theſe three pieces unite themſelves, ſo as to form only one. If therefore, when theſe different oſſifications begin to unite, there be ſome place where the oſſification has been impeded, this place, or ſpot, muſt remain only of a cartilaginous ſubſtance, and in making the ſkeleton, this cartilage will be ſeparated from the bones, and will conſequently leave a perforation in the *ſternum*; and what makes this the more probable, is, that this perforation, which is ſo commonly ſeen in ſkeletons, is never found in diſſecting the recent body. It may alſo have happened, that the three pieces of bone, which conſtitute the *ſternum*, by uniting at their edges, may, in acquiring their growth and ſolidity, have naturally left a vacancy between them. We never find a perforation of this kind in the upper part of the *ſternum*, which is probably owing to that part of it being only one piece in the earlier times, and not oſſifying in different places and ſpots at the ſame time; as is always the caſe in regard to this lower part of the *ſternum*, where the perforation is always found. Mem. Acad. Par. 1740.

Cartilages of the STERNUM. The *ſternum* of an adult ſubject has commonly ſixteen cartilages; fourteen of the number are articular, the other two are ſymphyſes. Of the former, two belong to the articulations of the clavicle, and twelve to thoſe of the true ribs, from the ſecond to the ſeventh incluſively; and the two ſymphyſes are both between the *ſternum*, and the firſt rib on each ſide. There is likewiſe another ſymphyſis, by which the upper portion of the *ſternum* is connected to the lower; but the cartilage of this is often obliterated in advanced age. The apophyſis enſiformis is often long toward the *ſternum*, and more or leſs cartilaginous toward the other end. This has, in very aged perſons, been ſometimes found entirely oſſified, and ſometimes wholly cartilaginous even in adults. *Winſlow*'s Anatomy, p. 149.

Ligaments of the STERNUM. The *ſternum* has ſeveral ligaments, by which it is connected to the clavicles and ribs. It is joined to the clavicles by ſtrong ſhort ligaments, fixed by one extremity round the edges of its two ſuperior notches, and by the other in the extremity of each clavicle, and by the middle to the inter-articular cartilages, ſurrounding the particular ligaments which go between the edges of theſe cartilages and the *ſternum*. *Winſlow*'s Anatomy, p. 149.

STERNUM *fractured*. The *ſternum* is equally ſubject to depreſſions and fractures, from falls and blows, with the reſt of the bones. When either of theſe accidents happen to it, the part is not only uneven and painful, but the ſubjacent arteries and veins are alſo contuſed and ruptured; whence ariſe pains in the breaſt, difficulty of breathing, violent coughs, ſpitting of blood, or elſe extravaſations of it in the

præcordia, or between the duplicatures of the mediaſtinum, with many bad ſymptoms of the like nature. The ſigns of a *fractured ſternum* will therefore be very evident by theſe, and by its being moveable to the touch, eſpecially when one part of it grates againſt another, and when there is a cavity and inequality very remarkably viſible there.

In order to reduce a fracture of this bone, the patient muſt be laid on his back on a bed, or hard even place, as a table, putting a hard pillow, a large parcel of cloth rolled up, or ſome other ſuch body, under his back, and preſſing down his ſhoulders, by which means the *fractured ſternum* will be elevated and extended; and to facilitate the reduction, the ſurgeon muſt preſs the bones of the *ſternum* together, and ſhake them very ſtrongly. But when this method is impracticable, or not proper, the ſkin muſt be divided, and the depreſſed part of the *ſternum* lifted up into its place, by means of an elevator, or elſe of a ſcrew gently wormed into the part, and afterwards pulled upwards; and when it has regained its natural ſituation, it muſt be kept in it by the proper bandages. If after the reduction violent pains continue under the *ſternum*, and if blood ſhould gather, and ſuppurate internally, between the duplicature of the mediaſtinum, the lower part of the *ſternum* ought to be trepanned, as the cranium on the like occaſions; and when the putrid matter is diſcharged, and the wound cleanſed, it muſt be healed with vulnerary balſams; and if any blood ſhould be found diſcharged into the cavity of the thorax, the cure muſt entirely depend on the evacuating that by the paracenteſis, in the manner of wounds of the thorax. *Heiſter*, p. 122.

STHENIA, Σθενια, in antiquity, a feſtival of Argos, ſuppoſed to be kept in honour of Minerva, ſurnamed Σθενιας from σθενος, ſtrength. *Potter*, Archæol. Græc. Tom. I. p. 430.

STIÆ, a word uſed by ſome of the old authors for pebbles found on the ſea-ſhore.

STIBIALIA, a term uſed by ſome to expreſs the antimonial medicines.

STIBADIUM, among the Romans, a low kind of table-couch, or bed of a circular form, which ſucceeded to the triclinia, and was of different ſizes, according to the number of gueſts they were deſigned for. They were called *hexaclina*, *octaclina*, or *enneaclina*, according as they held ſix, eight, or nine gueſts, and ſo of any other number.

STIBINUS *color*, a term uſed by St. Jerom, and others, to expreſs the falſe black colour which the antient Jews, and other Eaſtern people, gave to their eye-brows with *ſtibium*, or antimony.

STIBIUM, *antimonium*, antimony. See ANTIMONY, *Cycl.*

This is a mineral never found native in its perfect ſtate, but always intimately mixed with, and penetrated by ſulphur, and other extraneous matter, and by it reduced to the ſtate of an ore. In this condition it is ever found in the earth, and according to the different proportions of ſulphur, or other matter, it contains, it aſſumes very different appearances.

It is moſt commonly found in form of a very hard and heavy lead-coloured ſubſtance, compoſed of a number of extremely ſmall granules, all very bright and ſparkling, and giving it the appearance of a lump of the pureſt ſteel when freſh broken. This is what is commonly underſtood by the name *antimony ore*, and is what is ſold under that title in the German ſhops.

Not unfrequently, however, it appears of a ſomewhat more lax texture, leſs heavy, but much more bright, and compoſed of ſmall, but viſibly broad and flat particles, of a very pale whitiſh lead colour, and glittering appearance, like that of many of the lead ores. This is called *broad-grained antimony ore*.

Sometimes alſo, but leſs frequently, *antimony* appears in form of bright maſſes, made up of multitudes of parallel ſlender filaments, of a bright ſteel colour, and more glittering hue than in either of the former ſtates: theſe filaments are of different breadths and thickneſſes in the ſeveral maſſes. Theſe are generally known by the name of *ſtriated*, or *plumoſe antimony ore*.

Theſe are the moſt natural and ſimple appearances of this foſſil, but beſide theſe it is liable to a multitude of other very different ones, as it ſometimes contains iron mixed among its own matter, and very frequently ſilver; theſe may naturally be ſuppoſed to give it ſome differences in its appearance: but beſide theſe it is ſubject to much greater, from its admixtures with the common marcaſites and pyritæ; theſe often tinge the whole body of the ore to a ſilvery white, or to a golden yellow.

Antimony ores are found in fiſſures and veins at different depths, and often very near the ſurface, and is variouſly accompanied with ſpars, cryſtals, ſulphurs, and other ſubſtances. Sometimes the veins of it are every way ſurrounded by a tolerably pure yellow native ſulphur; ſometimes with a more debaſed matter, made of a mixture of ſulphurs, earth and ſpar, differing according to the different diſpoſition and admixture of theſe bodies.

Antimony is found in great abundance in England and Germany; we have ſeveral mines of it in Cornwall; and Germany, Hungary, and many other parts of the world, afford it in very great abundance.

To reduce it to a ſtate fit for uſe, it is to be ſeparated from its ore by the force of fire, and by the aſſiſtance of ſuch ingredients as break the mutual connection between the ſulphureous and the reguline part, which mutually diſſolving each other, keep the concrete in the ſtate of ore. The addition of iron is able to do this; and that of ſilver, copper, and other metals, has alſo the ſame effect.

There have not been wanting perſons, who have pretended to extract a mere running mercury from *antimony*, and Mr. Boyle believed it might be done: but this is one of the many great things pretended to by chemiſtry, of which we have yet no ſufficient proof.

Antimony, when ſeparated from its ore, is very eaſily fuſible, and runs the thinneſt of all the bodies of this kind. It greatly promotes the fuſion of other foſſils, but it makes every thing brittle that it is mixed with. It is of great uſe in medicine, chemiſtry, and mechanics, and in its ſeveral preparations is diaphoretic, cathartic, and emetic. The chemiſts uſe it greatly in their operations on other metals, and it is an ingredient in pewter, bell-metal, and the mixt metal, of which types are made for printing. *Hill*'s Hiſt. of Foſſ. p. 623.

Mr. Geoffroy has been the inventor of a new method of treating this mineral, by which it yields much more regulus than according to thoſe preſcribed by Kunkel and Stahl, and is purified without the addition of ſalts, and with very little loſs.

It is generally ſuppoſed, that the vapours of *antimony* are poiſonous when raiſed by fire, but it appears otherwiſe from the operations this gentleman made on it; the ſame operator having once gone through ſixty calcinations of twelve ounces of *antimony*, without receiving any harm from it: whence it is very evident, that the common opinion of the fumes of *antimony* containing an arſenical ſulphur is an erroneous one; and it may be added, that one great mark of *antimony*'s being good, is, that it loſes a great deal of its weight in calcination. It has more ſulphur in this caſe, which the fire raiſes in a vapour, and leſs of the terreſtrial matter or ſpar, which are uſually very abundant in it. It has been proved by experiment, that the ſulphur of *antimony* is a neceſſary and eſſential part of its conſtruction, ſince without this it is no longer emetic; but this ſulphur is only neceſſary in a certain proportion; for it is found, that when it is more abundant in the *antimony*, the whole loſes in proportion of its emetic quality; and Mr. Geoffroy has found by repeated experiment, that to give this virtue in its greateſt degree, the *antimony* is firſt to be diveſted of its native ſulphur, much of which is of no uſe as to this intention, and is then to be melted with a gentle fire in a crucible with a quantity of ſoap, made from a ſtrong lixivium of pot-aſhes, quick-lime, and oil, united by boiling into a ſolid maſs.

The *antimony* melted with this, after a ſufficient previous calcination, affords a ſort of glaſſy cruſt of ſcoriæ, which covers a quantity of compact regulus lying at the bottom of the crucible. Theſe ſcoriæ are a ſort of blackiſh glaſs, which melts in the flame of a candle, but does not run on being expoſed to the air. This is plainly compoſed of the burnt oil of the ſoap, united with the acid of ſulphur of *antimony*, and a vitrification made with ſome earthy particles, and the ſalts of the ſoap; this vitrification is what preſerves the fatty matter from being liquified by the air. When theſe ſcoriæ are ſeparated from the reguline matter, if that be again melted, with an addition of an alkali ſalt and of the powder of white cryſtal glaſs, there is produced a purer regulus than can be obtained by any other known method, and in a larger quantity, by two ounces from the pound, than ever Stahl, or Kunkel, were able to procure. Mr. Geoffroy, by theſe nice obſervations and experiments, diſcovered that *antimony* contained much leſs common ſulphur than had been generally ſuppoſed, ſince it can be made to loſe, at the utmoſt, only three ounces and five drachms in the pound in calcination. The emetic quality of the regulus proves, however, that it yet contains a very large ſhare of ſulphur, though of another kind: this Mr. Geoffroy diſtinguiſhes from the common ſulphur, by the name of the *metallic ſulphur*. Mem. Acad. Scienc. Par. 1736.

Acid of ANTIMONY. Mr. Charras was the firſt author who gave the world a ſuccinct method of drawing an acid liquor from *antimony*. He did it thus: he mixed crude *antimony* ore in powder with three times its weight of ſand, this he diſtilled in a large retort into a capacious receiver, filled half full of river water, and on rectifying this, the acid liquor was to be produced. Himſelf acknowledges, however, that this, though a ſuccinct, is not always a certain method, for that ſometimes the acid liquor was produced, and ſometimes not: this, however, he attributes wholly to the management of the fire, which he ſays will always afford the acid, if conducted regularly through its ſeveral degrees. But Mr. Homberg trying this experiment ſeveral times, and finding it ſometimes ſucceed, and at other times not, though the ſame cautions were uſed, diſcovered at length that this variation,

riation, in the ſucceſs of the proceſs, was not occaſioned by any difference in the fire, but by the different nature of the matter employed. The crude ore of *antimony* ſometimes being mixed with a white argillaceous earth, and ſometimes free from this admixture; he found, that when it had this white earth in any great proportion, it never failed to yield this acid liquor; and that when it had none of it, it never could be made to yield a drop of acid; and conſequently, that this was not an acid extracted from *antimony*, but merely from the earth, as common pipe-clay, or any of our argillaceous earths, will yield an acid by means of a ſtrong fire.

This liquor had therefore been very improperly called the *vinegar of antimony*; and it is evident, that whatever acid *antimony* contains, muſt be of the nature of ſpirit of ſulphur, ſince ſulphur ſo greatly abounds in the compoſition of that mineral, and its ſulphur is wholly the ſame with the common brimſtone. Whatever acid, therefore, of this kind could be produced, muſt be of the nature of that collected from the fumes of burning ſulphur; and, even though it were produced from *antimony*, could have nothing of the nature of *antimony* in it, ſince it would be wholly the produce of the common ſulphur in that mineral, and not of the reguline part, which alone is properly *antimony*. Experiment alſo proves the truth of this opinion, the *acid of antimony*, truly ſeparated from it, being no way different, in any particular, from that of crude ſulphur.

There are ſeveral ways by which it may be made, but the following ſeems the eaſieſt and moſt familiar. Powder crude *antimony* very fine, lay it in an earthen diſh not glazed, and of a conſiderable width at the top; cover this diſh with an earthen pot, with the bottom taken out, and fit to this three earthen aludels, and cover the mouth of the uppermoſt aludel with a large glaſs bell; the edges of which muſt be ſuſtained about a quarter of an inch above a veſſel of water, kept ſo hot, as to fumigate the inſide of the bell; the water that runs down from the bell, will be received again into the veſſel of water. In the middle of the earthen pot, which covers the diſh of *antimony*, there muſt be a hole, large enough to admit the handle of an iron ladle, or ſome ſuch other inſtrument, to ſtir about the *antimony*. The fire being made under the earthen diſh, and continued a proper time, there will be found the flowers of *antimony* in the aludels, a little acid liquor in the water of the veſſel kept under the bell, and the *antimony* will be found calcined in the diſh.

It is but little acid that can be obtained in this manner, but then it is aſſuredly the pure acid of the ſulphur of *antimony*. Sometimes this method furniſhes alſo little or no acid, but this depends on the care of the operator, and the temperature of the air; for the colder and moiſter the ſeaſon is, the more acid will be obtained, and the hotter and drier it is, the leſs. The operation, whenever ſo perfect, is however of little value, the acid being every way the ſame with that of common ſulphur. Mem. Acad. Par. 1700.

Infuſion of ANTIMONY. Mr. Homberg being well aſſured, that water was a menſtruum capable of diſſolving all the metals, if properly applied, uſed it, in ſeveral different manners, in his analyſis of *antimony*. He made an *infuſion of antimony* in water, putting into ſeveral glaſs veſſels crude *antimony*, coarſely powdered, five pounds into each veſſel, and to each of theſe quantities he added two pints of rain water; after the *antimony* had ſtood thus for ſix months, the ſeveral parcels were uſed on different occaſions, one only excepted, which had been forgotten, and had at length ſtood two winters and a ſummer: having at length found this veſſel, he obſerved that its inſide was every where coated over with configurations of leaves; he at firſt ſuppoſed this to be owing to ſome ſalts of the *antimony*, which had been diſſolved in the water, and had afterwards cryſtallized themſelves in this manner, as the butter of *antimony* is ſometimes known to do in ſublimation; but on rubbing the ſides of the veſſel with a finger, and afterwards ſcraping them with a knife, he found that they were covered with a yellowiſh pellicle, without the leaſt appearance of ſalt, and that the configurations of the leaves were not raiſed upon this pellicle, but ſunk, as if graved by a tool. The water taſted ſomewhat acid, and being tried on turnſol, and on different metallic ſolutions, it turned the turnſol to a light red, and turned a ſolution of ſilver white; whence it appeared to be an acid, and of the nature of that of ſea-ſalt. The ſunſhine had turned this water ſower, had made it act upon the *antimony*, and take up a part of its ſalt. This ſalt, in the winter, was probably afterwards concreted into the figures of leaves, formed upon the mud depoſited by the water on the ſides of the veſſel; and theſe ſalts being afterwards diſſolved again in ſome hotter weather, had eaten their way into this ſediment of mud, in the form of the leaves, *&c.* in which they had concreted. Mem. Acad. Par. 1693.

Texture of STIBIUM. Monſieur de Reaumur gives the following account of the contexture of *antimony*, or *ſtibium*.

Nothing is more common, than to obſerve on the ſurface of broken *antimony* long and ſhining needles, as it were; and that *antimony*, on which theſe are moſt diſtinct and viſible, is eſteemed the beſt. Sometimes theſe ſtreaks are ranged with ſo much order, and branch out ſo regularly in certain directions, that thoſe who are ever ſo converſant with it, cannot but admire its beauty. The figures of the conſtituent molecules of this mineral may poſſibly contribute ſomething to the formation of theſe needles, but the texture, and configuration of the conſtituent parts, will not alone account for the diſpoſition of theſe ſtreaks, and their arrangements, in regard to one another; ſince upon breaking different lumps of the ſame *antimony*, and thoſe of the ſame ſhape, we frequently obſerve quite different configurations of the needles. Let us take, for inſtance, equal maſſes of *antimony* of a regular conic figure, theſe being moſt frequent, from the ſhape of the veſſel they cool in, which reſembles a funnel, or inverted cone; let ſeveral of theſe conical maſſes be broken into different parts, and we ſhall ſee the needles in very different directions in theſe ſeveral parts.

In one of theſe maſſes, from a certain height, we may obſerve all theſe needles directed to the point of the cone; in a piece taken from a little higher, the needles ſhall be horizontal, or nearly perpendicular to the former; above theſe we ſhall find others, which ſometimes direct themſelves toward ſome point in the baſe of the cone, and ſometimes form themſelves into different cones with their ſeveral ſummits.

In another of theſe maſſes we ſhall not find the needles diſpoſed into a horizontal direction, but running into ſmall conical parcels, in directions quite reverſe one to another; that is, ſome of them ſhall have their ſummits toward the baſe of the cone, and others toward its apex. In ſome lumps alſo we ſhall diſcover needles every where, and in others no where at all; and often the needles are found in one part of the lump, with no appearance of them in the others. Sometimes alſo we ſhall find the inſide of a maſs regularly diſpoſed into cones, though the outſide is of no ſuch figure, for the internal cones have no dependance upon the external figure of the maſs; and ſometimes the needles are diſpoſed along the ſides of the cone, and their direction ſeems to follow the ſides of the veſſel in which they were fixed. Notwithſtanding, however, all theſe varieties in form, the cauſe of all the appearances is wholly the ſame, and is no other than that refrigeration, by which the maſs is changed from a fluid into a ſolid ſtate; and to the progreſs of this the needles plainly owe their different directions.

All melted metals cool firſt at the tops and ſides, and thence by degrees through the whole body of the maſs: the particles at the ſides and top, which firſt cool, becoming fixt to thoſe which are neareſt them, affix thoſe, and they are the next that cool, and ſo on, in ſucceſſive order; now moleculæ, of whatever ſhape, thus affixed ſucceſſively to each other, form a kind of threads or needles, the ſeveral directions of which ſhew the order in which the refrigeration has been carried on.

If the crucible, or other veſſel, in which the melted *antimony* is ſuffered to cool, were in the ſhape of a hollow bowl; if its ſides were every where equally thick, and equally warm, and acted equally upon by an air equally cold; and if the melted ſubſtance were of the ſame uniform nature, alſo, in all its parts, all the needles or fibres would be then ſo many rays, terminating in the center of the bowl; and if the ſubſtance were ſuch, that its fixed particles were naturally all of a length, we ſhould find ſo many concentrical beds of needles, formed by parcels of each ray, and lying at equal diſtances from the center.

But ſo many regular circumſtances do not concur in the cooling of melted *antimony*; and hence the beforementioned irregularities muſt neceſſarily ariſe. In melting *antimony* in conical crucibles, and ſuffering it to cool in them, the needles may be determined ſeveral ways, to any directions one may chooſe.

If, when the crucible is taken from the fire, it be ſet to cool upon ſome cold body, the conſequence is, that the bottom and top of the *antimony* muſt cool firſt, and the needles will be found diſpoſed into two cones, the one having its baſe at the apex, and the other at the baſe of the large, or general cone: but if the crucible be ſet on burning coals, and the ſurface of the *antimony* covered with more coals, then the ſides muſt cool firſt, and the needles will be found running horizontally, or forming themſelves into horizontal cones: the touching the ſides of the crucible alſo, at times, with a wet cloth, and by that means forcing the melted matter to cool firſt in ſuch particular places, will give cones of needles directed horizontally, and having their baſes at thoſe ſpots of the crucible ſo forcibly cooled.

Not unfrequently there is found a hollow in the midſt of a conical maſs of *antimony*, and in that caſe there are ever found needles proceeding in different directions from the ſides of that cavity inwards, as they, when cooled, became of the ſame nature with the ſides of the veſſel, and acted on the encloſed maſs in the very ſame manner.

To procure the needles perfect and fine, the *antimony* muſt be ſuffered to cool gradually, for if it cool too faſt, one molecula becomes fixed before it can be adapted to the end of another, and the whole is a confuſed maſs; and the ſame happens alſo if it cool too ſlowly; for then the particles of

fire get out ſo very regularly and inſenſibly, that the moleculæ cooling equally all together, form no arrangements. This is found by letting a crucible of melted *antimony* ſtand on ſome burning coals, and gradually cool as their heat burns away and decreaſes; in which caſe the maſs will have perhaps no needles at all, or if any, then but very few.

It may be objected to this, that if the refrigeration of the maſs is the only cauſe of the needles in *antimony*, all melted metals ought to afford the ſame appearance alſo, if cooled in the ſame manner: and poſſibly indeed all do ſo; we ſee them eaſily in *antimony*, becauſe it breaks with a ſlight blow, without diſordering the configuration of its parts, the combinations of its molecules into needles being more firm than that of the needles to one another; but in metals which require more force to break them, the needles may perhaps rather break than ſeparate, and by more force muſt be more diſordered; and all the parts may be as regularly arranged in a ductile maſs, as in a brittle one, though we are not able to diſcover that arrangement.

Lead, when hot to a proper degree, ceaſes to be ductile, and is brittle, and lead broken at this juncture is found to be granulated, appearing like broken ſteel; there is no reaſon to doubt but that this is alſo the caſe, when that metal is perfectly cold, but that the force required to ſeparate, or break it, deſtroys its proper ſtructure.

Mr. Reaumur melted lead in a conical crucible, and ſuffering it to cool to a certain degree only, he broke the maſs into ſeveral large lumps by a ſmart blow of a hammer, and in theſe found the ſame needles as in *antimony*, the granules having cohered in long trains, juſt as the moleculæ of the *antimony*; and the diſpoſitions of the ſeveral groupes of needles in the lead, in regard to the ſides and bottom of the crucible, were the very ſame with thoſe of *antimony*. But there is this manifeſt difference between the needles of lead, and thoſe of *antimony*, that whereas the latter are flat and extremely gloſſy, the former are viſibly round, and much leſs bright. Mem. Acad. Scienc. Par. 1724.

Ore of ANTIMONY. The way of running down *antimony* out of its ore by the aſſayers, is as follows. Take a crucible that will hold ſome pounds of *antimony* ore, broken into pieces of the ſize of a hazel-nut, and bore at the bottom of it a few ſmall holes with a common gimblet; place this bottom in the mouth of another ſmaller crucible, put in the ore, and cover the orifice with a tile; then lute all the junctures, and place this on the pavement of the hearth, making a circle of ſtones all round it, at ſix inches diſtance; fill this intermediate ſpace with aſhes, ſo high, that the lower pot may be covered up to its rim, then put freſh burning coals upon the whole, and blow the fire ſtrongly with a pair of hand-bellows, to make the upper veſſel red-hot: when it has been ſo a quarter of an hour, take away the fire, and when the veſſels are cold, open them, and the *antimony* will be found in form of a regulus in the under veſſel. *Cramer*'s Art of Aſſaying, p. 356.

The moſt ready method of fuſing *antimony*, yet known, is by means of that mineral ſubſtance called *cawk*. A lump of this, of the bigneſs of a wallnut, thrown red-hot into a pound of *antimony* in fuſion, converts almoſt the whole ſubſtance of it into glaſs, fifteen ounces of clean and fine glaſs being thus produced; and what is very remarkable, the cawk itſelf never melts in the metal.

The purification of gold, by means of *antimony*, is performed in this manner. Before you enter on the proceſs, it is neceſſary to gueſs, as nearly as may be, at the allay of the gold, by the touch-needles, or otherwiſe. If the quantity of gold in the maſs is not leſs than three quarters, that is, eighteen carats, the maſs muſt be melted in a wind-furnace, and the crucible muſt be covered, to prevent coals falling in; this done, put into it, at ſeveral times, double the quantity of crude *antimony* in fine powder, as ſoon as one portion of the *antimony* is melted, putting in another: let the whole continue in fuſion a few minutes, then pour it into a melting cone, warmed, and rubbed with tallow, and ſtrike with a hammer on the floor, near where the cone ſtands, that the heavier part may ſink to the bottom. When all is cold, invert the cone, and ſtrike it, and a maſs will fall out, having at bottom a regulus, more or leſs yellow, according to the quantity of the gold in the mixture; this may with a few blows be ſeparated from the ſulphureous cruſt, which is at top. Melt in a ſmaller fire this regulus, and when in fuſion add to it a double quantity of crude *antimony* in powder, and pour it out into the cone again a little after; ſeparate the regulus from the *antimony* at top, and then repeat this operation once more. When this is done, put the ſeparated regulus into a thick good teſt, place this in the furnace immediately before the bellows, put coals round it, and one or two pieces of wood upon them, and make a middling fire, ſuch as is ſufficient to melt the regulus, the reguline part of the *antimony* will vaniſh in a thick ſmoak; then encreaſe the fire, and keep it ſo, till the fumes are over, and the ſurface of the gold is of a fine green; and afterwards give the gold another fuſion with borax and nitre, and it will be perfectly pure.

When the gold to be purified by this proceſs is impure to an allay of eight carats, it is not proper to perform the precipitation by *antimony* alone, but there ſhould be added as many times two carats of common ſulphur, as the allay of the gold is ſo many carats leſs than eighteen. *Cramer*'s Art of Aſſaying, p. 276.

STIBIUM, in medicine, *&c.* is not only given in ſubſtance, but many preparations of it are alſo uſed; which are either emetic, cathartic, diaphoretic, or ſudorific. Crude *antimony* in powder is found good for diſſolving viſcidities, in cutaneous diſeaſes, and, as ſome very confidently aſſert, in convulſions and epilepſies. Externally, in ointments, it is commended for drying up ulcers, curing the itch, and in plaiſters for reſolving of tumors.

There appears no reaſon for people's being afraid of giving crude *antimony* internally, experience ſhews it to be a ſafe medicine, unleſs by accident the acid of the ſtomach ſhould prove ſtrong enough to be a menſtruum to it.

The preparations of *antimony* are, 1. *ſulphur præcipitatum antimonii*. 2. *Crocus antimonii*, called alſo *crocus metallorum*. 3. *Crocus antimonii lotus*. 4. *Calx antimonii*, called *antimonium diaphoreticum*. 5. *Tartarum emeticum*. 6. *Cauſticum antimoniale*. 7. *Cinnabaris antimonii*. 8. *Regulus antimonii martialis*. 9. *Tinctura antimonii*. 10. The *Kermes* mineral, or Carthuſian powder. See the articles SULPHUR, CROCUS, CALX, *&c. Cycl.* and *Suppl.*

The virtues of *antimony*, in the diſeaſes of animals, are very great, and very evident on any trial. Pigs that have the meaſles are at all times recovered by it, which proves it a great purifier of the blood. Horſes who have running heels, that cannot be cured by the common methods uſed by the farriers, will generally be cured by this medicine in a little time. The manner of uſing it is this: mix one drachm with every feeding of oats which the horſe has in a morning; it is beſt put together in one place, buried under a few oats, and the horſe's head being with-held a little, and then let go juſt againſt that place, he will take it all in at a mouthful. Some horſes do not diſlike it, others obſtinately refuſe it, but to theſe it may eaſily be given in balls. The virtues of this drug, in fattening of cattle, has by many been thought imaginary, but experiment proves it to be a real truth. A horſe that is lean and ſcabby, and not to be fatted by any other means, will become fat on taking a doſe of *antimony* every morning, for two months together. A boar fed for brawn, and having an ounce of *antimony* given him every morning, will become fat a fortnight ſooner than others put into the ſtye at the ſame time, and fed in the ſame manner, but without the *antimony*. Philoſoph. Tranſ. N° 39.

Crude *antimony* is recommended in palſies, pains, and numbneſs, which come on after a ſalivation, and is ſaid to have cured ſeveral who were paralytic from other cauſes. The method of giving it, is to begin with three grains, increaſing the doſe with three grains every day, to half a drachm; after which the doſe is diminiſhed three grains every day, till it comes down to the quantity of the firſt doſe. Commerc. Liter. Norimb. ap. Medic. Eſſ. Edinb.

Antimony, before the twelfth age, was of ſervice only in the compoſition of paint. Scripture deſcribes it to us as a ſort of paint, with which the women blackened their eyebrows. Jezabel underſtanding that Jehu was to enter Samaria, painted her eyes with *antimony*, or, according to the Hebrew, put her eyes in *antimony*.

As large black eyes were thought the fineſt, they of both ſexes, who were careful of their beauty, rubbed their eyes, eyelids, and round the eyes, with a needle dipped in a box of paint made of *antimony*, with a deſign of blackening them.

At this day the women of Syria, Arabia, and Babylonia, anoint and blacken themſelves about the eyes; and both men and women put black upon their eyes in the deſert, to preſerve them from the heat of the ſun, and the piercing of its rays. M. Darvieux tells us, that the Arabian women border their eyes with a black colour made of tutty, which the Arabians call *rehel*. They draw a line of this kind of blacking without the corner of their eyes, to make them appear larger. Iſaiah, in his enumeration of the ſeveral ornaments belonging to the daughters of Sion, has not forgot the needles which they made uſe of in painting their eyes and eyelids; nor has this practice eſcaped the laſh of Juvenal [b].

Ille ſupercilium madida fuligine tinctum
Obliqua producit acu, pingitque trementes
Attollens oculos.

Ezekiel, diſcovering the irregularities of the Jewiſh nation under the idea of a debauched woman, ſays, that ſhe bathed, perfumed herſelf, and that ſhe anointed her eyes with *antimony*. Job ſhews ſufficiently how much *antimony* was in eſteem, by calling one of his daughters a veſſel of *antimony*, or a box to put paint in, *cornu ſtibii*. Tertullian and St. Cyprian have declaimed very warmly againſt this cuſtom of painting their eyes and eyebrows [c].—[[b] *Juv.* Sat. 2. [c] *Calmet*'s Dictionary.]

STIBIUM *ceratum*. See the article VITRUM *antimonii ceratum*.

STICA, a name given by ſome authors to all external aſtringents uſed in hæmorrhages.

STICA, in our old writers, a braſs Saxon coin, of the value of half a farthing, four of them making an helfing. *Blount*.

STICHOMANTIA, Στιχομαντεια, in antiquity, a ſort of divination by verſes, (commonly thoſe of the Sibylline oracles) which being wrote on little pieces of paper, and thrown into a veſſel, the firſt drawn out was ſuppoſed to contain the will of the Gods. *Potter*, Archæol. Græc. Tom. I. p. 333. See SORTES, *Cycl.*

STICHOS, a name given by the old writers to a pectoral confection, the principal ingredient of which was the herb *marrubium*, or hore-hound.

STICKLEBACK, in ichthyology, a name given by us to that ſmall fiſh, called by authors by the ſeveral names of *ſpinachia*, *ſpinax*, and *pugnitius piſcis*; as alſo *piſciculus aſper*, *piſciculus aculeatus*, and the like; and finally, by Artedi, by the much more expreſſive name of *gaſteroſteus*, expreſſing that great ſingularity it has in the bony ſtructure of its belly. The common *ſtickleback* is diſtinguiſhed by Artedi by the name of the *gaſteroſteus* with three ſpines on the back; and by this character it differs from two other ſpecies, the one the *ſpinarella* of authors, a ſmall ſpecies with ten prickles in the back; and the other a long ſea kind with fifteen ſpines on its back, called by Willughby, and others, the *pugnitius marinus longus*. See the article GASTEROSTEUS.

As contemptible a fiſh as this may ſeem, its miſchief in eating the young fry in ponds is not greater than its value. In a ſort of manufacture carried on at Boſton, and ſome other parts of Lincolnſhire, they have fallen into a way of making oil of it, and have made annually a hundred tun, or more, to their very great advantage. All the waters thereabout ſwarm with this little fiſh, and doubtleſs a ſufficient quantity might be found in other places for the ſame ſort of uſe. They grow in the Boſton river to an inch and half in length, and about half an inch in breadth, and are taken out at a buſhel a draught. Eight chalder of them make a barrel of oil; their barrel is a hogſhead; they are obliged to uſe them very freſh, elſe the oil runs from them to waſte, and they uſually boil every night what they have caught by day. It is a wonder that this quality of this little fiſh was not found out ſooner, for in frying them in the common way for eating, they all run into an oil in the pan. Philoſ. Tranſ. N° 223.

STICKLER, in our old writers, an inferior officer, who cut wood within the king's parks of Clarendon. Rot. Parl. 1 Hen. VI. *Blount*.

STICKS *of eels*, a quantity, or meaſure of twenty five. A bind of eels contains ten *ſticks*, and each *ſtick* twenty five eels. Stat. Weights and Meaſures. *Blount*.

STIFFLE, or GREAT *muſcle*, in the manege, is the part of the hind leg of a horſe which advances towards his belly. This is a moſt dangerous part to receive a blow upon.

STIGMA, among botaniſts. See the article PISTIL.

STIGMATA, in natural hiſtory, the apertures in different parts of the bodies of inſects communicating with the tracheæ, or air veſſels, and ſerving for the office of reſpiration. *Reaumur*, Hiſt. Inſect. paſſim.

Nature has given to theſe minute animals a much larger number of tracheæ and bronchia, than to us. We have the ramifications of the trachea reaching no farther than into the breaſt, whereas, in the bodies of theſe inſects, we find them extended through the whole, and finely and admirably interlaced one with another. We have but one mouth to reſpire by; and the organization of the parts, inſervient to reſpiration, is very admirable in us; but in the inſect claſs, the mouths, or openings to breathe at, are much more numerous, and the organization much more complex.

All the two-winged and four-winged flies, which have a ſingle or undivided corcelet, to which their legs are all fixed, have alſo four *ſtigmata* in that corcelet, two on each ſide. They have them alſo on the rings of their body, but thoſe on the corcelet are the moſt conſiderable.

Of the four on the corcelet, the two anterior ones are uſually the largeſt. The beſt way to find them, in the generality of flies, is to examine them firſt in the larger ſpecies of the libellæ, where they are very diſtinct and plain, and after their ſituation is well known in that ſpecies, they will be much the more readily found in the reſt.

Theſe *ſtigmata* of the corcelet, as well the anterior as the poſterior, are oblong, and placed obliquely to the length of the body; that end of them next the head is more elevated than the other, and their ſize is ſufficiently large to render them viſible, eſpecially the firſt pair. Each of theſe ſeems not a little to reſemble a ſea-muſcle with its ſhells a little open, or is ſomewhat like the opening of an eye. It is alſo ſurrounded by two eyelids, proportionably thick; and beſide theſe, which make its outer circumference, one may diſcover two others within, which are bordered with hairs, and which, when cloſed, often quite ſhut up the opening.

The colour of the *ſtigmata* often is ſome help alſo to us for the diſcovering them; they are very frequently different in colour from the corcelet; ſome are yellowiſh, others of a coffee colour, or ſome degree of a fallow colour, in flies whoſe corcelet is brown, or black, or bluiſh.

Flies have, beſide theſe, ſeveral *ſtigmata* alſo in the rings of their bodies, perhaps in every one of them, though commonly thoſe in the two or three firſt are only to be diſtinguiſhed: theſe are not like thoſe of the corcelet, but are round, uſually a little eminent above the reſt of the ſurface, and reſembling pin's heads; they are not eaſily diſcovered, becauſe they are not only ſmall, but uſually hid by the folds, or commiſſures of the rings. They are uſually two on each ring, placed on the two oppoſite ſides, and partly under the belly. *Reaumur*, Hiſt. Inſ. Vol. 4. p. 248.

STIGMATICI, among the Romans, were ſervants marked in the face for ſome crime. *Pitiſc.* in voc.

STIGMATIZING, among the antients, was inflicted upon ſlaves as a puniſhment, but more frequently as a mark to know them by; in which caſe, it was done by applying a red-hot iron, marked with certain letters, to their foreheads, till a fair impreſſion was made, and then pouring ink into the furrows, that the inſcription might be the more conſpicuous. *Potter*, Archæol. Græc. Tom. I. p. 64.

STIGMATIZING, among ſome nations, was looked upon as a diſtinguiſhing mark of honour and nobility. *Potter*, loc. cit. p. 65.

STIL *de grain*, in the colour trade, the name of a compoſition uſed for painting in oil or water, and is made of a decoction of the lycium, or Avignon berry, in alum-water, which is mixed with whiting into a paſte, and formed into twiſted ſticks. It ought to be choſen of a fine gold yellow, very fine, tender, and friable, and free from dirt. *Pomet*'s Hiſt. of Drugs, p. 14.

STILE (*Cycl.*)—In a philoſophical *ſtile*, the only end is accurately to explain our thoughts to others; thence the particular rules to be obſerved by a philoſopher, in delivering his doctrines, naturally follow: ſuch as,

1°. Not to deviate from the received ſignifications of terms.

2°. That the ſame terms be always taken in the ſame ſenſe.

3°. To fix the meaning of ſuch words as have only a vague ſenſe.

4°. To ſignify objects, eſſentially different, by different names.

From theſe rules, the uſe and neceſſity of terms of art appear, and ſhews with how little reaſon they are vulgarly condemned.

5°. The philoſopher ought always to make uſe of proper expreſſions, and uſe no more words than what are preciſely neceſſary to eſtabliſh the truth of his doctrines. *Wolf*, Diſc. Prælim. Logic. cap. 5.

STILL-*bottoms*, in the diſtillery, a name given by the traders to what remains in the *ſtill* after the working the waſh into low wines.

Theſe *bottoms* are procured in the greateſt quantity from the malt waſh, and are of ſo much value to the diſtiller in the fattening of hogs, &c. that he often finds them one of the moſt valuable articles of the buſineſs. They might alſo be put to other uſes, ſuch as the affording a large proportion of an acid ſpirit, an oil, a fuel, and a fixed ſalt; and with ſome addreſs, and good management, a vinegar, and a tartar. Another very advantageous uſe of them, is the adding them to the next brewing of the malt for more ſpirit: the encreaſe of the produce from this, is more than could eaſily be conceived. It alſo more readily diſpoſes the new waſh to ferment, and gives the ſpirit a vinoſity that it cannot have without it; the proportion, in this caſe, muſt never exceed that of a fifth, or ſixth part of the whole quantity of liquor employed.

The liquor left behind in the *ſtill*, after the rectifying the low wines into proof ſpirit, is alſo called by ſome by the name of *ſtill-bottoms*; but this is little more than mere phlegm, or water impregnated with a few acid, and ſome oily parts, not worth ſeparating, unleſs for curioſity. The liquor left in the *ſtill*, after the rectifying the proof ſpirit into alcohol, is alſo of the ſame kind.

The *bottoms* of melaſſes ſpirits ſeem calculated for many uſes. It is very probable that the vinegar-makers would find their account in the trying them, and the ſtrong, and laſting yellow colour, with which they tinge the hands, may recommend them to the dyers. A ſmall proportion of them added to the new treacle to be fermented, greatly promotes the operation, and encreaſes the quantity of ſpirit.

The *bottoms* of the wine ſpirit, that is the remainder, after diſtilling the ſpirituous part from damaged wines, or wine lees, may be brought to afford Mr. Boyle's acid ſpirit of wine, and that ſubſtance called by Becher the *media ſubſtantia vini*. A parcel of tartar may alſo be procured in very great perfection; and the laſt remainder may be converted into excellent and genuine ſalt of tartar. The liquor may otherwiſe be ſerviceable in making vinegar and white lead. *Shaw*'s Eſſay on Diſtillery.

STILL-*houſe*. The Dutch have much the advantage of us in the ſtructure of their *ſtill-houſes*, and have every thing in

great readineſs and neatneſs. The general rules, in building theſe *houſes*, ſhould be theſe.

The firſt caution is to lay the floor aſlope, not flat, where any wet work is to be performed; it ſhould alſo be well flagged with broad ſtones, ſo that no wet be detained in the crevices, but all may run off, and be let out at the drains made at the bottom and ſides.

The *ſtills* ſhould be placed abreaſt on that ſide of the *ſtill-houſe* to which the floor has its current. The largeſt *ſtills* in Holland, for their greateſt works, are never of that monſtrous ſize that we ſee them of in England, but much more manageable and handy, as ſeldom containing more than ſix or eight hogſheads; and with ſuch *ſtills*, a ſingle hand will perform much more buſineſs than with one of a much larger ſize. Fronting the *ſtills*, and adjoining to the back wall, ſhould be a ſtage for holding the fermenting backs, and theſe being placed at a proper height, may empty themſelves, by means of a cock and a canal, into the *ſtills*, which are thus charged with very little trouble.

Near this ſet of fermenting backs ſhould be placed a pump or two, that may readily ſupply them with water by means of a trunk, or canal, leading to each back. Under the pavement, adjoining to the *ſtills*, ſhould be a kind of cellar, wherein to lodge the receivers, each of which ſhould be furniſhed with its pump, to raiſe the low wines into the *ſtill* for rectification; and through this cellar the refuſe waſh, or *ſtill*-bottoms, ſhould be diſcharged by means of a hoſe, or other contrivance. Theſe are the principal things to be regarded in the erecting a *ſtill-houſe* for the original production of ſpirits, and if theſe rules are well obſerved, malt ſpirit will be made with little more trouble than melaſſes; for by this means the buſineſs of brewing and cooling the waſh, which, according to the method generally practiſed in England, takes up ſo much time and trouble, is entirely ſaved, fermentation is carried on to a much greater advantage, and the quantity of ſpirit encreaſed. *Shaw*'s Eſſay on Diſtillery.

STINT, in zoology, the name of a ſmall bird common about the ſea ſhores in many counties of England, and ſeeming to be the ſame with the *cinclus prior* of Aldrovand, and the *ſchæniclos*, or *junco* of Bellonius, called by the French *alouette de mer*, the *ſea-lark*.

It is ſomewhat ſmaller than the common lark, and in ſhape reſembles the ſmaller ſnipe. Its beak is black, ſlender, and ſtrait; its feet of a greeniſh, or browniſh black; its back is a grey, variegated with oblong black ſpots, and its wings ſomewhat of a reddiſh brown; its neck is grey, and its head variegated with black and a reddiſh brown; its wings are long, and when folded reach beyond the end of the tail; and its rump is ſomewhat reddiſh with black ſtreaks. *Ray*'s Ornitholog. p. 226.

STIP *viſch*, in zoology, a name given by the Dutch in the Eaſt-Indies to a fiſh of the claſs of our European ones which have two back fins, the anterior of which is prickly, the hinder not ſo. Its ſkin is ſpotted, and its fleſh very delicate, and well taſted. It is generally caught by hooks. *Ray*'s Ichthyogr. Append. p. 8.

STIRRUP, (*Cycl.*) in the manege. To looſe one's *ſtirrups*, is to ſuffer them to ſlip from the foot.

The *ſtirrup-foot* is the near, or left foot before.

Stirrup-leather is a thong of leather, deſcending from the ſaddle down by the horſe's ribs, upon which the *ſtirrups* hang.

Stirrup-bearer, called in French *porte etrier*, is an end of leather made faſt to the end of the ſaddle, to truſs up the *ſtirrup* when the rider is alighted, and the horſe ſent to the ſtable.

STIRRUP *of a ſhip*, a piece of timber put upon a ſhip's keel, when ſome of her keel happens to be beaten off, and they cannot come conveniently to put, or fit in a new piece; then they patch in a piece of timber, and bind it on with an iron, which goes under the ſhip's keel, and comes up on each ſide of the ſhip, where it is nailed ſtrongly with ſpikes; and this they call a *ſtirrup*.

STOÆ, Στοαι, in antiquity, the porticos at Athens. Theſe were full of exedræ, ἐξέδραι, and ſide-buildings, furniſhed with ſeats fit for ſtudy or diſcourſe. Here it is probable philoſophers, and their ſcholars, uſed to meet. *Potter*, Archæol. Græc. lib. 1. cap. 8. Tom. I. p. 38. See the article EXEDRÆ, *Cycl.*

STOAKED, in a ſhip. When the water in the bottom cannot come to the well of the pump, they ſay, *the ſhip is a-ſtoak*, or *ſtoaked*: ſo they ſay alſo, *the limber holes are ſtoaked*, when the water cannot paſs through them; and that *the pump is ſtoaked*, when ſomething is got into it which choaks it up, ſo that it will not work.

STOAT, in zoology, the name uſed by many for the animal whoſe ſkin is the ermin. See the article ERMINEUM *animal*.

STOC *and ſtovel*, in our old writers, a forfeiture where any one is taken carrying *ſtipites* and *pabulum* out of the woods; for *ſtoc* ſignifies ſticks, and *ſtovel* pabulum. Antiq. Chart. ap. *Blount*.

STOCK *of an anchor*. See the article ANCHOR.

STOCK-*bricks*. See BRICK-*making*.

STOCK-*fiſh*, in the fiſh trade, a name given to the common cod-fiſh when cured in a particular manner, which makes it neceſſary to beat it with ſticks before it is fit for dreſſing. *Willughby*'s Hiſt. Piſc. p. 166. See COD-*fiſh*.

STOCK-*July-flower*. See the article LEUCOIUM.

STOCKER, in ichthyology, a name given by the Germans to the *ſaurus* of the antients, the *trachurus* of the later writers. It is a ſpecies of the *ſcomber*, known among us under the name of the *horſe-mackrel*; and is diſtinguiſhed from the reſt by Artedi, by the name of the *ſcomber* with the lateral line prickly, and with thirty rays in the pinna ani.

STOCKS (*Cycl.*)—STOCKS, among ſhip-carpenters, a frame of timber and great poſts, made aſhore to build pinnaces, ketches, boats, and ſuch ſmall craft, and ſometimes ſmall frigates. Hence we ſay, *a ſhip is on the ſtocks*, when ſhe is a building.

STOCKS, *cippus*, a wooden machine to put the legs of offenders in, for the ſecuring of diſorderly perſons, and by the way of puniſhment in divers caſes ordained by ſtatute, *&c.* And it is ſaid that every vill, within the precinct of a torn, is indictable for not having a pair of *ſtocks*, and ſhall forfeit 5 *l.* Kitch. 13.

STOMACACE, a word uſed by ſome authors to expreſs a ſymptom of the ſcurvy, which is a fœtor of the mouth, with a ſoreneſs and bleeding of the gums.

STOMACH (*Cycl.*)—In order to underſtand the action of the *ſtomach*, in turning the aliments into chyle, we are firſt to thoroughly conſider its form. It is eaſy to obſerve, that the two orifices of the *ſtomach*, the œſophagus, and pylorus, are not ſituated exactly over-againſt one another; but that if the *ſtomach* be regularly divided longitudinally into two halves, the œſophagus will be found wholly in the anterior half, and the pylorus, in great part, in the poſterior. Near the inſertion of the œſophagus there are two planes of muſcles, the one is placed near the bottom of the *ſtomach*, and encompaſſes all that part of the œſophagus that is neareſt that part. This muſcle throws off obliquely ſeveral bundles of fibres, which run to the middle, both of the anterior and poſterior ſides of the *ſtomach*, and many of theſe extending even to the lower part of it, make what are there called *the oblique fibres of the ſtomach*. The other muſcular plane encloſes, in the ſame manner, the other part of the mouth of the œſophagus, or that which lies toward the pylorus; this terminates on each ſide near the bottom of the *ſtomach*. Theſe two planes of fibres are, as it were, two fleſhy bands about the mouth of the œſophagus, which croſs one another both on the upper and under part of the *ſtomach*.

The longitudinal fibres are very ſlender, and appear about an inch from the pylorus, extending themſelves along both the anterior and the poſterior ſides of the *ſtomach*, quite to the orifice of the œſophagus; and finally, they are inſerted round about the pylorus by two ligamentary bands, which authors have generally paſſed over without obſerving. Theſe bands are much like thoſe of the colon, and occupy all the length of the neck, and may be eaſily diſtinguiſhed by the touch, and are not difficult to be ſeen on bending the part in an inflated *ſtomach*.

The fibres of the bottom of the *ſtomach*, when nicely examined, are found to be circular, all compoſing ſeveral ſmall concentric circles, each ſeries of which is independent of all the reſt. There is one of theſe circles placed juſt in the center of the bottom of the *ſtomach*, and from this the other circles ſpread, being of ſeveral different diameters, according to the places where they ſtand, and reaching to near the orifices where the fleſhy fibres take another courſe, as before obſerved. The bodies, called *circular fibres of the ſtomach*, and ſuppoſed to part from the upper part of the *ſtomach*, cloſe to one another, and taking the round of the *ſtomach* to return thither again, are truly a number of ſmall muſcles, or bundles of fibres, placed at ſmall diſtances from one another, no one of which ever reaches perfectly round the *ſtomach*: from theſe ſeveral ſmaller fibres are propagated in an irregular manner, which fill up the interſtices of the circular directions of theſe, and form a ſort of net-like plexus, between the fibres of which the nervous membrane of the *ſtomach* is eaſily ſeen. Theſe interſtices, in general, are of a ſort of lozenge ſhape, and the whole of theſe fibres may be ſaid to conſtitute a ſort of muſcular net, enveloping the whole *ſtomach*. All thoſe bundles of fibres, or ſmall muſcles, which are ſituated below the upper orifice of the *ſtomach*, or near about it, form together a plan, or ſeries, which runs in a ſtrait line from the upper to the lower extremity of the *ſtomach*; whereas, on the contrary, thoſe which are placed about the middle of the *ſtomach* ſeem to turn about, and form parts of circles, the convex part of all which ſtands toward the bottom of the *ſtomach*: and finally, thoſe which are placed about the neck of the *ſtomach* are much bent, and their bending is always the greater, as they approach nearer to the pylorus. This appears to be the true figure and arrangement of the fibres of the *ſtomach*; and as this is very different in many particulars, from the common accounts of anatomical authors, it was neceſſary to give this at large, in order to underſtand and explain the action of this part in

the great work of digeſtion; and according to this account, the offices of every part will be very eaſily underſtood.

The circular bands of muſcular fibres, placed round the orifice of the œſophagus, are deſigned to prevent the upper orifice of the *ſtomach* from being too much diſtended, whether by our careleſsly ſwallowing too large morſels, or by the action of vomiting. The uſe of the muſcular circles, at the bottom of the *ſtomach*, is as eaſily ſeen: the aliments received into this part of the *ſtomach*, were it not for theſe circular arrangements of fibres, would remain there, and have no tendency given them to go out of the *ſtomach*; but by this wonderful ſtructure, the whole bottom of the *ſtomach* can at once be put into a ſafe and eaſy, though a powerful contraction, by means of which the aliments are naturally ſent toward the pylorus for their diſcharge. Theſe circles give the firſt principle of the periſtaltic motion of the *ſtomach*, which is much the ſame with that of the inteſtines.

When the aliments have been thrown off from theſe circles, they are not immediately, however, diſcharged into the pylorus, but are thrown upon thoſe bundles of fibres, or ſmall muſcles, which make what has been before called the *reticular coat of the ſtomach*. That part of this coat which immediately receives them, is that compoſed of ſegments of circles, the convex parts of which are all placed toward the bottom of the *ſtomach*; and as theſe afterwards form their contractions, their middle naturally elevates, and throws off the aliment ſtill toward the pylorus, and this is done with the more force, as the action of theſe fibres is ſtrengthened by the longitudinal ones; and, in fine, thoſe longitudinal fibres, which are attached to the bands that ſurround the pylorus, when they act, contract, or pull the other parts of the *ſtomach* toward their inſertions; ſo that every thing tends to help the throwing the food upon the pylorus.

The reticular coat of the *ſtomach* has alſo other great advantages; it is eaſily capable of extenſion, and conſequently gives the *ſtomach* a capacity of enlarging, ſo as to hold a larger quantity of aliments than it otherwiſe could; and when they act, ſo as to be approaching toward their natural ſtate again after ſuch diſtention, this action, which is no other than their contraction, neceſſarily throws the aliments toward the pylorus: this contraction is always ſucceeded by a ſmall dilatation again, and that by another contraction, and theſe alternately ſucceeding one another, ſo long as any of the aliments continue in the *ſtomach*, conſtitute what authors call its periſtaltic motion. Although this motion is very ſlight, and only a kind of vermicular undulation, which is ſcarce ſenſible, yet there have not been wanting very great men, who have thought it ſufficient for the great work of digeſtion. Theſe authors ſet aſide the uſe of any liquors, or juices of the *ſtomach*, mixing themſelves with the aliments, and give the whole to this motion, which they call a kind of trituration, which they ſay breaks the aliments into ſmall and fine parts, by rubbing them againſt one another, and that theſe fine broken particles make what is called chyle; but it is ſcarce conſonant to reaſon, that ſo weak a cauſe ſhould be productive of ſuch great effects.

This motion is no ſtronger than the periſtaltic motion of the inteſtines, and that is never ſuppoſed to have any ſuch effects on their contents, but only to puſh them forward. The liquor prepared from the food is known alſo to be grey at its paſſing out of the *ſtomach*, and only to acquire its white colour in the duodenum; and how is this accountable for on the plan of trituration only? And finally, if that were all that was required to digeſtion, to what purpoſe did nature, which does nothing in vain, ordain ſuch an abundance of fluids to be preſent in all places, where the aliments were deſtined to undergo any change? To know the abundant quantity of theſe, we need only follow the courſe of the food from the time of its being taken into the mouth to that of its being changed into chyle.

All the time that the teeth are chewing the food, the parotid glands afford a prodigious quantity of ſaliva, which runs into the mouth, mixes with it, and paſſes with it into the *ſtomach*; beſide theſe, alſo, there are many other ſources of the ſaliva, which all diſcharge it at the ſame time, but the quantity from theſe alone is not eaſily conceived. A ſoldier had, by a wound in the cheek, one of the parotids cut in two, and had the wound cloſed within, but not without; it was obſerved, that whenever he uſed his jaws in chewing, this one wounded gland alone diſcharged a quantity of lymph enough to wet ſeveral napkins; what then muſt be the quantity at every meal diſcharged from both, and from all the other ſources together? Though this is all carried down into the *ſtomach*, yet there freſh juices are added to it. Wepfer diſcovered multitudes of glands in the human *ſtomach*, the orifices of which were very ſenſible; and beſide theſe, Mr. Ruyſch diſcovered ſeveral other eminences, which, by their reſemblance to thoſe in the ſecond *ſtomach* of an ox, ſeem to be only caſes encloſing cluſters of minute glands, all deſtined, with the others, to pour out their contents on the maſs of aliments. All theſe fluids, however, only change the food into a thick greyiſh liquor, which is too coarſe to be received into the lacteals, and needs a farther elaboration. This elaboration changes it into a white liquor, which we call chyle; and this is only performed in the duodenum, where there can be no trituration, but where there is a very remarkable aſſemblage of different liquors to effect it: for beſide the common ones, the liver and gall-bladder diſcharge into this inteſtine a great quantity of bile by the ductus choledocus; and the pancreas ſends thither alſo a great deal of its lympth. Brunderus has obſerved alſo, in this inteſtine, a vaſt number of glands, which, according to him, make a ſort of ſecond pancreas: theſe all furniſh, alſo, a great quantity of liquors to the duodenum, where this great change is made in the matter of the aliment; and it is very natural to conclude from the whole, that it is by means of theſe liquors that this change is effected; and if it appear, that the laſt change of the greyiſh liquor of the *ſtomach* into chyle be wrought by theſe fluids, why ſhould it be doubted but that nature, which is alike in all its works, has uſed the ſame means in the firſt change, and by the liquors, mixt with the aliments in the *ſtomach*, has wrought them into that grey liquor they are found there changed into? Trituration does not at all ſeem the buſineſs of the *ſtomach*, nature we ſee has appointed another part, the mouth, for that office, and has furniſhed that with hard bodies, capable of tearing and grinding things to pieces. The moſt natural opinion, on the whole, ſeems therefore, that the office of the mouth was thus to rend and tear in pieces the aliments before their paſſage into the *ſtomach*, that there the juices might act more ſtrongly upon them; in the ſame manner as the chemiſt beats and breaks to pieces the ſubſtances, which he is going to throw into proper liquors, to extract their tincture. Mem. Acad. Par. 1719.

The digeſtive power of the *ſtomach* of ſome fowls is vaſtly greater than that in men, or any other animals. Cryſtal bullets, ſome hollow, and others ſolid, have been crammed down the throats of hens, and have been found afterwards ſtrangely eroded, and eaten by the juices there. Hollow bullets of glaſs have been alſo crammed down by the members of the Florentine Academy, and have been found afterwards not only eroded on their ſurface, but filled within with a whitiſh liquor like cream, which ſeemed to prey upon their ſubſtance. It is probable hence, that the ſtrong digeſtion of theſe fowls may be in ſome meaſure owing to a powerful menſtruum in their *ſtomach*; glaſs and cryſtal are two things wholly indiſſoluble by any menſtruums we are acquainted with, and yet they are corroded here.

This menſtruum in the *ſtomach* of theſe animals, aſſiſted by what the gravel-ſtones, which they ſwallow, are able to do in the manner of teeth, may very well deſtroy, and reduce ſubſtances of ſuch denſe texture, as we ſcarce know how to manage. The glaſs drops with long tails, called *Prince Rupert's drops*, having been in the ſame manner forced down the throats of capons, were found entire in the *ſtomach* after many days, and burſt as uſual on breaking off the tail. Theſe loſt ſomewhat of their weight by remaining in the *ſtomach* ſome time, but the ſame ſort of drops, when untempered by heating in the fire, loſt a great deal in a very ſhort time. One of them, with which Redi made his experiments, loſt four grains of its weight in four days, and giving it to another fowl, it, in ſix days time, loſt nine grains more. This is an argument, not only of the vaſt power of digeſtion in the *ſtomach* of theſe fowls, but of the great difference of hardneſs there is between the ſame glaſs when tempered, by being dropped hot into water, and when untempered again by fire.

Experiments were alſo made, by giving diamonds, topazes, leaden bullets, jaſpers, and porphyry, to the ſame animals, and others of like kinds. The diamond loſt nothing of its weight; the topaz almoſt nothing, the loſs being ſcarce diſcernible with nice ſcales; other ſtones ſcarce loſt any thing, but the leaden bullets loſt conſiderably. Hence it is eaſy to conclude, that the ſmall gravel-ſtones, which they pick up to ſerve for grinding the food in their *ſtomachs*, do their office without parting with almoſt any thing from themſelves: theſe little ſtones, though leſs beautiful, yet approaching in their nature to the gems. There is great difference, however, between theſe and pearls; for it was found that four pearls given to a pigeon loſt one third of their weight in twenty four hours, and eight ſmall pearls given to another pigeon loſt two thirds of their weight in two days. *Redi*, Eſperienz.

STOMACH *of fiſhes*. The *ſtomach of fiſhes* is very different in the various kinds, in reſpect of ſize, thickneſs, and its ſeveral properties and qualities; but its ſituation is generally longitudinal, and it is ſingle in all the known fiſhes, except in the *ſtromateus* of Rondeletius, in which it is ſaid to be double.

The *ſtomach* in living fiſh is cold to the touch, but this is only a proof that it is leſs hot than our own fleſh. That there is heat in it, is evident enough from the digeſtion which is ſo powerful in it, the *ſtomachs* of many fiſh digeſting ſubſtances which ours could not at all effect; ſuch are the ſhells of ſhell-fiſh. It is not eaſy to ſuppoſe this could be performed without ſome degree of heat in the part, but at the ſame time we are informed by this how ſmall a

degree

degree of heat is neceſſary for working theſe effects, and how much may be done by the continual attrition of the fibres, and by a proper fluid. *Artedi*, Ichthyolog.

STOMACH *of flies*. In examining with care the bodies of theſe little animals one may perceive, that when the paſſage of the aliments is got beyond the lungs, and below the place where they form a ſort of diaphragm, one finds the canal, that ſerved for this paſſage, forming a large, though ſhort body, the diameter of which three or four times exceeds that of the canal itſelf. This body is compoſed of three fleſhy lobes, and is unqueſtionably the *ſtomach* of the animal. The inteſtine goes out of it, very nearly from the ſame part where the other paſſage is admitted into it; the inteſtine then directs itſelf toward the anus, and afterwards runs upward again toward the diaphragm, or bottom of the lungs; and thence, after many convolutions, many times running backward and forward, it terminates in the anus.

In caterpillars and butterflies, the canal from the mouth to the anus is only one ſtrait inteſtine, but it is much otherwiſe in theſe creatures, the inteſtines, both in the fly, and in the worm it is produced from, always making a number of contortions and convolutions.

STOMACH-*bruſh*. See EXCUTIA *ventriculi*.

STOMACHICA *febris*, the *ſtomachic fever*, a name given by Heiſter, and ſome others, to a ſpecies of fever, called by others a *meſenteric fever*, and by our Sydenham *nova febris* in a peculiar treatiſe. See INTESTINAL *fever*.

STOMATICA, a term uſed by ſome for all medicines uſed in diſorders of the mouth.

STONE (*Cycl.*)—Some look upon *ſtones* as unorganized vegetables, and that they grow by the accretion of ſalts, which often ſhoot into angular and regular figures. This, it is ſaid, appears in the formation of cryſtals on the Alps; and that *ſtones* are formed by the ſimple attraction and accretion of ſalts, appears by the tartar on the inſide of a claret veſſel, and eſpecially by the formation of a *ſtone* in the human body. Dr. *Berkeley*, Biſhop of Cloyne, in Philoſ. Tranſ. N° 481. p. 326.

Stones are often corroded, and conſumed by the air. Ibid.

Naturaliſts vulgarly define *ſtone* a foſſil incapable of fuſion, yet *ſtone* has been known to be melted, and when cold to become *ſtone* again. Philoſ. Tranſ. N° 481. p. 327. See the article SCIARRI.

Hence it ſhould ſeem not impoſſible for *ſtone* to be caſt, or run into the ſhape of columns, vaſes, ſtatues, or relievos; which experiment may perhaps, ſome time or other, be attempted by the curious, who following where nature has ſhewn the way, may poſſibly, by the aid of certain ſalts and minerals, arrive at a method for melting and running *ſtone*, both to their own profit, and that of the public. Phil. Tranſ. N° cit. p. 328.

Formed STONES, among naturaliſts, mineral, or *ſtony* matter, caſt in the cavities of certain ſea-ſhells, or other parts of marine animals.

Of theſe ſome are found quite naked and bare; others have the remainder of the ſhell about them: and among theſe there are alſo found many real ſhells, ſcarce at all altered from their recent ſtate, buried at great depths in the earth, far from ſeas, and even on the tops of mountains.

This is by moſt ſuppoſed an effect of the general deluge, and by many is thought a convincing proof of the truth of that hiſtory; but there have been many who have aſſerted, that theſe bodies can convey no ſuch proof, ſince, as they affirm, they are not, nor ever were marine bodies, or owed their form to ſuch, but mere *luſus naturæ*, *ſtones* formed in the places where they are found, having no relation to animals of any kind, but only accidentally reſembling them. But the aſſertors of the former opinion have plainly the better ſide of the argument. See MARINE *remains*.

It ſeems indeed contrary to the great wiſdom of nature, which is found, in all its works and productions, to deſign every thing to ſome determinate end, that theſe bodies ſhould have been ſo nicely formed by a mere plaſtic virtue in the earth, or endued with all the characters and neceſſary parts of animal coverings, &c. for no other end but merely to exhibit ſuch a form, without having any relation to the uſes theſe particulars are appropriated to in the animal. See the article FIGURED *ſtones*.

But if the origin of the *ſtones*, found in the ſhape of ſhells, be doubtful, yet the real ſhells, found in the earth, ſurely cannot be ſuppoſed to have been formed there; yet theſe are found at as great diſtances from the ſea, and that not only in the lower grounds and hillocks, but in the higheſt parts of the loftieſt mountains, and that without the leaſt particle of *ſtony* matter about them; mere ſhells, unpetrified, and uncorrupted, and of the exact figure, ſtructure, and conſiſtence with the ſea-ſhells, which are now living, of the ſame ſpecies.

Mentzel ſays that the mount near Bologna, where the Bononian *ſtone* is found, abounds with theſe *formed ſtones*: they lie in beds with ſtrata of ſand, of a yard thick, between them, and are not lodged in *ſtone*, or any cementitious matter, as we often find them in England, but are all looſe and ſeparate: and Fabius Columna tells us, that the hills about Andria, in Apulia, abound with ſea-ſhells not at all petrified, but whole and uncorrupt, and ſeeming to have undergone no change. The mountains about Genoa have alſo been found full of them; and we have in our own kingdom numerous inſtances of them in all their ſtates, ſome ſeeming mere *ſtone*, and others perfect and unaltered ſhells; ſome looſe, and others bedded in marble, in *ſtone*, or in indurated earth.

That nature ſhould form real ſhells, without ever intending them for the covering of an animal, ſeems no way probable; and indeed, were it true, would give great ſtrength to the atheiſt's opinion, that all things exiſted by mere chance, and were intended for no end or uſe. Nor are the ſhells the only inſtances of theſe foſſile bodies perfectly reſembling animal ones, but we find with them other parts of animals, as the teeth of fiſhes and land animals; which, though met with buried in earth, or on the tops of mountains, are plainly the ſame with the ſubſtances produced by the fiſhes, &c. Of this kind are the teeth of the ſeveral ſpecies of ſharks, called *gloſſopetræ*; thoſe of the wolf-fiſh, called *bufonitæ*; the vertebræ of ſeveral fiſh, and the like.

The very inſpection is abundantly ſufficient to prove, that theſe were once parts of animals; but were that inſufficient, they have not, even in this their foſſile ſtate, ſo far diveſted themſelves of their animal nature, but that they carry proofs of it; and Columna has evidently proved their true origin from theſe. He obſerves, that all animal and vegetable ſubſtances, whether of a woody, bony, or fleſhy nature, by burning, are changed firſt into a coal, before they go into a calx or aſhes; whereas *ſtony* ſubſtances, on the contrary, do not burn into a coal, but are reduced at once into their calx or lime, or elſe into glaſs. But theſe teeth, ſuppoſed by ſome mere productions of the earth, all burn firſt to a coal, while the *ſtony* matter adhering to them does not; whence alone it is ſufficiently plain, that they and that ſubſtance are of very different kinds, and that they are truly of a bony, not a *ſtony* matter. It is alſo repugnant to that great maxim, that nature does nothing in vain, to ſuppoſe theſe teeth formed in the earth where they are now found, ſince they could there have no uſe as teeth, nor the vertebræ, or other bones, as bones. It is very certain, that nature never made teeth without a jaw, nor ſhells without an animal inhabitant, nor bones without the reſt of the body they belong to; theſe things are not made in this ſeparate and uſeleſs ſtate in the element to which they naturally belong, much leſs in a foreign one.

Their very ſubſtance and place alſo evince plainly, that they were not formed where they are now depoſited; for they are uſually lodged in *ſtone*, and *ſtones* contain not the matter of which they are made; and as to their place, they muſt be ſuppoſed to have been lodged there either when formed, which proves our aſſertion, or elſe they muſt have been at ſome time either generated all of a ſudden there, or have grown from a ſmall origin, encreaſing by little and little, as the animal ſubſtances which they imitate do. Now if the *ſtone*, in which they lie, was formed before them, and they were formed all of a ſudden in it, how came the cavity there juſt correſponding to their ſize? and if they grew by little and little, how could they force a cavity in the *ſtone*, without burſting or cracking it?

Things that grow, expanding themſelves leiſurely and ſlowly, may indeed by degrees lift up great weights, and dilate the chinks or cracks of *ſtones*; but then they are ſubject to various contortions and alterations in their ſhape, as we daily ſee in the roots of trees, which make their way through the cracks of *ſtones*, and in common plants, whoſe roots meet with hard matter in their way, receding from the form they would have in a looſe open ſoil, and conforming to that of the body that ſtands in their way: thus, if foſſile ſhells and teeth were generated, and grew in *ſtone*, they muſt be liable to contortions and alterations in their ſhape and figure, from the ſhape of the cavities they found, or the hardneſs of the different matter they meet with in their progreſs; but nothing of this kind appears, and it is plain they were generated elſewhere, and then buried in the ſtrata of our fields, becauſe they are all of the ſame exact and regular ſhape, whether found looſe on the ploughed lands, buried in clay or marl, or lodged in beds of marble, or hard *ſtone*. All of the ſame ſpecies are, in theſe ſeveral matrixes, of the ſame exact form; whence it evidently appears, not only that they were not produced where they are now found, but even that the ſtrata were not hardened at the time when they received them.

It is alſo no ſmall proof of theſe teeth being of marine or animal origin; that they are not regularly ſhaped at the baſe, but are all broken, and that in various manners; which proves very plainly, that there has been no vegetation in the caſe, becauſe in all other figured foſſils it is obſerved, that they are never found mutilous, or imperfect. It cannot, with any ſhew of reaſon, be ſuppoſed, that theſe teeth were thus broken within the body of the *ſtone* where they now lie, but is plain that they were lodged in the *ſtone* at a time when it was ſoft, and were before that broken off from the jaw of the creature in this irregular manner.

It is likewiſe no weak argument, that theſe bodies are not formed at this time in the *ſtone*, that they are all found perfectly alike; for were they continually encreaſing, either in ſize or number, it is probable that the new-formed ones would be ſome way different from thoſe which were of older date; nor can any thing be more abſurd, than to think that were they mere *ſtones*, they would have been formed as we ſee they are, not only with the external ſhape and appearance, but with the whole inner ſtructure of teeth; theſe foſſile teeth being not like *ſtones*, one homogeneous body, but compounded of various parts of a different conſtitution, there muſt, in the formation of it, have been made a various election of humors; one for the root, another for the inner part, and a third for the enamel, or ſuperficial coat. The variety of ſpecies in the gloſſopetræ alone may evince, that they have belonged to the animal we attribute them to, ſince they are of extremely different kinds; ſome being ſtrait, ſome crooked, ſome bent inwards, ſome outwards, ſome to one, and others to the other ſide, ſome plain, others ſerrated at their edges, others undulated, and others beſet all about with ſmaller teeth, and ſome ſtrait and flatted, or cylindrical, others triangular, ſome plain, and others tricuſpidate, or having a ſmall point on each ſide the great one, or main body of the tooth; and all theſe varieties, and no more than theſe, are found in the teeth of ſharks of various kinds, and at various ages, and in the different parts of the mouth. The firſt row of teeth in theſe animals hanging out of the mouth, bend forward and downward, the ſecond row are ſtrait, eſpecially towards the ſides of the mouth, where they are triangular and broad, and the other rows bend downward toward the inner part of the mouth. *Columna*, de Gloſſopetra.

If the *formed ſtones* be original productions of nature, merely reſembling theſe marine bodies in form, why are we to ſuppoſe that nature ſtopt here, or confined her formations of this ſort merely to the reſemblance of fiſhes, and parts of them? why might not other natural bodies as well be imitated, and *formed ſtones* found in the ſhape of the horns and hoofs of animals? for if we deny them their origin from animals, is it yet explained how, or in what manner they are formed? They cannot ſhoot in the manner of ſalts, ſince then the ſeveral ſpecies, which are of the ſame ſubſtance, ought to be alſo of the ſame ſhape, which is not found to be the caſe; but, on the contrary, we meet with the ſame ſpecies of ſhell in ſeveral kinds of matter, and compoſed of every various ſpecies of *ſtone*; nay, and of the pyrites, a ſalino-ſulphureous matter, wholly different from common *ſtone*, and which could not, by any principle in nature, be made to ſhoot as a ſalt into the ſame form with ſo different a ſubſtance as limeſtone; whereas, if, as we obſerve, theſe bodies are really formed from ſhells, *&c.* they muſt retain the forms of thoſe bodies, of whatever foſſile matter they be compoſed; neither could it be ſuppoſed, that if a ſalt ſhould ſhoot into the figure of a ſhell, it ſhould alſo ſhoot into all the natural differences of the upper and under valve in bivalves, the one hollow, the other flat, as is neceſſary in many ſpecies, for the preſervation and well-being of the animal; and as theſe foſſile bodies are found wholly correſponding to the moſt minute particulars of the recent ſhells of the ſame ſpecies, there ſeems no reaſon to doubt their having been actually formed from them.

The perfection of the figures of theſe bodies is a farther proof of their origin from animals which they repreſent, ſince in all cryſtallizations there are many imperfect and mutilated figures, nay more than perfect ones. The hexaedral figure of common cryſtal, the cubes of marcaſites, and the cryſtals of ſalts in chemical operations, are all much more regular and ordinate in themſelves, than the figures of ſcallops, cockles, and other ſea-ſhells; yet in theſe ſimple bodies we find great defects and imperfections; often the top is cut off, and ſometimes one of the ſolid angles; and not unfrequently numbers of theſe concretions are found adhering one to another, and injuring one another's form: ſometimes, alſo, their planes greatly differ from one another in ſize and ſituation, and often they differ, or recede other ways, from their natural and perfect figure. Since this is the caſe in the cryſtallizations of bodies of ſo ſimple a figure as cubes and columns, terminated by pyramids, how much greater muſt have naturally been the varieties and imperfections, in ſuch variouſly figured bodies as the *formed ſtones*, which reſemble the ſhells of ſea-fiſhes, had they been formed like theſe by mere cryſtallization? but no ſuch defects or irregularities appear in theſe.

As there are, therefore, none of thoſe defects in theſe compound bodies, to which other much more ſimple ones are found ſubject, and that there are no irregularities obſerved in them, the like of which are not alſo found in the living animals which they repreſent; and as in whatever country they are found, and in whatever matter they are lodged, and whatever ſubſtance they are compoſed of, they are ever found alike among themſelves, and perfectly reſembling the parts of animals, it is not to be conceived that they ſhould have ſhot into theſe forms merely in the manner of ſalts, but evident that they were parts of animals; the ſimilitude of conformation in their pores, their ſtriæ, hinges, teeth, prominences, *&c.* neceſſarily inferring a ſimilitude of original, and being a ſtrong argument of the government of ſome principle ſuperior to matter figured and moved in their formations. Nor is it any ſmall argument againſt their ariſing from the ſhooting of ſalts, that in all the experiments made with the different ſalts and minerals by chemiſtry, no one ſimilar cryſtallization, no reſemblance indeed, even to the meaneſt of them, was ever produced. *Steno*, de Solido intra Solidum.

To all this it may alſo be added, as an unanſwerable proof of the foſſile ſhells having been once marine, and having lived in the ſea, that they are found with injuries which could have been no way elſe received. The purpura, and ſome other ſhell-fiſhes, have bony tongues, with which they bore regular holes through the ſhells of ſhell-fiſh of other kinds, in order to make their way in, and prey upon their fleſh. Theſe holes are always eaſily known by their regularity and ſhape; and ſhells bored through in this manner are not only frequent on our ſhores, but there are ſuch alſo found foſſile, bedded in the ſtrata of earth or *ſtone*; and ſurely, if ſalts could be allowed to have ſhot into the figures of ſea-ſhells, they could never be ſuppoſed able to ſhoot into the figures of ſuch wounds, as a few of thoſe ſhells have received in their recent ſtate from other animals.

The general opinion is, that the deluge brought all theſe ſhells into the places where we ſee them; but this ſeems not eaſily conceived; and as there is no argument ſo good, but that being carried too far it will make againſt its purpoſe, ſo the laying too much to the effects of the general deluge, has made many believe it has done nothing at all.

Theſe *formed ſtones* and real ſhells are both found in vaſt ſtrata on the tops of the higheſt mountains, the Alps, Apennines, and others in different parts of the world. The deluge laſted only ten months, and probably the tops of mountains were not covered half that time; and theſe immenſe quantities of ſhells cannot be ſuppoſed either to have bred there in that time, or to have been carried ſo high in ſuch prodigious numbers. It is more probable that theſe tops of mountains were once not ſuch, but bottoms of the ſea. The hiſtory of the marine bodies they contain is then very plain, and earthquakes may have raiſed them, or they may indeed not be ſo high above the level of the ſea, as we at firſt ſight ſuppoſe. If indeed we ſtick to the letter of the text, in the ſcripture hiſtory of the creation, we can find no account for theſe bodies from that time; for if the creation of fiſhes ſucceeded the ſeparation of the land from the water in all parts of the globe, they could not be then depoſited there; but it is poſſible, that at the creation the whole earth was not all at once uncovered, but only thoſe parts where Adam and the animals were created, and the reſt gradually afterwards, perhaps not in many years, as there ſeems no neceſſity of underſtanding the account of the creation to have been in ſix natural days. If we may thus underſtand, and conjecture in this reſpect, it is not difficult to conceive, that during the years in which the earth remained covered with ſea-water, ſhell-fiſh might breed and multiply abundantly all over its bottom; and this bottom being afterwards elevated, deſerted by the ſea, and made dry land, theſe ſhells muſt be elevated with it, and retained in thoſe ſtrata, which afterwards hardened into the various kinds of earth and *ſtone*: and ſomething of this kind ſeems to have been the caſe, much rather than, according to Dr. Woodward, that all *ſtony* matter ſhould have been diſſolved by the deluge, and afterwards have concreted again. *Ray*'s Phyſicotheological Diſcourſes.

Solution and colours of STONES. The various beauties of the form and colour of the ſeveral more precious *ſtones*, cannot but have been always the admiration of the curious part of the world, and the wits of the ableſt chemiſts have been tried, in attempting to counterfeit them; and much may be gathered even from their attempts, which have not ſucceeded, toward the learning the true nature and hiſtory of theſe beautiful bodies.

The beautiful figures of the Florentine marble, whoſe veins repreſent trees, rivers, and ruins of buildings, are well known; as are alſo the delineations of trees and ſhrubs in thoſe ſpecies of white agates, called *Mocoa ſtones*. All the *ſtones* of this kind are natural, for art has not yet been able to come up to any counterfeit of them; but it is not ſo in regard to thoſe agates which repreſent regular figures of beaſts, *&c.* theſe are all aſſiſted by art, and that by a very ſimple and eaſy proceſs; and Mr. Du Fay, in the Memoirs of the Paris Academy, has given at one view the ſeveral ways, then known, to penetrate into the ſubſtance of agate, marble, *&c.* and to lodge figures in them.

The *ſtones* ſubject to be tinged he divides into two claſſes, the harder and the ſofter. Of the harder kind are thoſe which reſiſt the force of acids, even of the moſt powerful kind; and of this claſs are agates, onyxes, and all that are vulgarly comprehended under the general name of the gems, or precious *ſtones*, with cryſtal, porphyry, granite. Theſe, and the like *ſtones*, are not ſoluble in any of the known acids, yet theſe ſame acids, impregnated with the ſolutions

of metals, are capable of penetrating very deeply into them, and tinging them with different colours. The ſimple agates and jaſpers, and other *ſtones* of the like uniform ſtructure, are eaſily coloured in an uniform manner; but thoſe which are variegated with veins are compoſed of ſeveral different ſorts of matter, and therefore are leſs eaſily, and leſs evenly ſtained. As the tinging matter does not penetrate the ſeveral beds, or veins, in the ſame manner, therefore all that can be done to theſe, is to add ſpots and veins to their natural ones, but they cannot be tinged throughout to one uniform colour, as the chalcedony, or white agate may.

If a ſmall quantity of a ſolution of ſilver, in ſpirit of nitre, be poured upon one of theſe agates, and the *ſtone* expoſed to the ſun, it will in a few hours be tinged to a reddiſh brown colour; and if more of the ſame ſolution be added, and it be again expoſed, the colour will become ſtronger, and will penetrate deeper into the body of the *ſtone*; and if the *ſtone* be not too thick, and the ſolution be rubbed on both ſides, it will tinge it throughout. Nor is this all the effect, for it will give it ſeveral veins and lineations, which were not diſtinguiſhable in it before; the reaſon of which is, that in all theſe *ſtones* there are ſome parts harder than the reſt, and conſequently more difficultly coloured, and theſe remaining, therefore, paler than the reſt of the maſs, make the lines and veins in it.

If there be added to the ſolution of ſilver, uſed for this purpoſe, a fourth part of its quantity of ſoot, and as much ſalt of tartar, the colour becomes grey; and if, inſtead of this ſoot and tartar, the ſame quantity of plumoſe alum be uſed, the *ſtone* will be tinged to a deep violet colour, tending to black.

A ſolution of gold gives agate only a pale brown colour, and that penetrates but a little way into it; and a ſolution of biſmuth gives a colour, which appears white when the light falls directly upon it, but brown when it is held againſt the ſunſhine, or a candle; and all the metallic and mineral ſolutions, employed in the ſame manner, affect the *ſtone* more or leſs in the ſame way.

The expoſing the *ſtones* to the ſun is a very neceſſary article in the proceſs, ſince without that the tinge is but very faint, and penetrates but to a very little depth. To trace in the chalcedony, or white agate, figures of any determinate kind, the uſual method is this: before the agate is poliſhed, mark out the intended figure with the point of a fine needle, and afterwards with a bruſh, or a pen, follow thoſe lines with a very ſtrong ſolution of ſilver. One would imagine that the dendritæ, or delineations of trees in Mocoa *ſtones*, might be imitated in this manner; but it is difficult to give the due blackneſs of colour, and to mark the figures with a like preciſion and exactneſs. If any *ſtone* ſhould, however, be ſuſpected to be adulterated, or counterfeited in this manner, it is eaſily brought to the trial; for if it be thus made, a ſmall heat over the fire will almoſt entirely diveſt it of its colour, and the rubbing a little ſpirit of nitre, or aqua fortis over it, will have the ſame effect. In both caſes the *ſtone* may, however, be reſtored again to its beauty; in the firſt, by tinging it afreſh with the ſame liquor, and in the laſt, by only expoſing it for ſeveral days to the ſun.

It is well known, that by means of fire alone the amethyſt, the ſapphire, and the other gems, may alſo be wholly diveſted of their beautiful colours. The method of doing this, is, to put the gems into a crucible, ſurrounding them with ſand, or with ſteel filings; then putting them into the fire, they loſe their colour as they become hot, and are taken out wholly colourleſs. If the white agate be calcined in this manner alone, it becomes of a cloudy or opake white; but if it has before been ſtained with the ſolution of ſilver, thoſe ſpots or ſtains become of a yellow colour, which aqua fortis afterwards has no power to take away. If the agate be calcined firſt, and afterwards rubbed over with the ſolution of ſilver, it receives ſome ſpots and lines of brown. The cornelian loſes a great part of its redneſs by calcination, and becomes of a duſky fleſh-coloured white; and the Mocoa *ſtone*, treated in the ſame manner, loſes all its colour, and the delineations of trees diſappear.

There are many *ſtones* on which the ſolution of ſilver has no effect; of this number are all the gems, rock cryſtal, and the like. The dendrites of Catalonia is alſo of this kind; and of this *ſtone* the artificers relate an odd phænomenon, which is, that if it be ſawn aſunder there are very few delineations obſerved in it, but if it be ſplit by a blow, it is uſually found full of them. The reaſon of this is only that theſe delineations are ſo many flaws and cracks, and the *ſtone* breaks eaſieſt in theſe places.

The effects of the ſolution of ſilver are different, as to degree of colour, on different *ſtones*. The Oriental agate receives from it a deeper and blacker tinge than the common chalcedony. Some agates, naturally diſtinguiſhed by their yellow ſpots, receive a purple colour from it. The jade *ſtone*, uſed by the Turks, takes only a faint tinge of brown. The common prime emerald, or root of the emerald, becomes blackiſh with it. The Oriental granite is tinged in many places with a violet colour by it; this is principally effected in the white parts. The ſolution does not act much on the black ones, only that it takes ſome of them away. The ſerpentine marble receives an olive colour from it; but it is remarkable that the amianthuſes, and the talcs, and other foliaceous *ſtones*, are wholly unaffected by it.

Marble being a ſubſtance greatly ſofter than agate, receives the colours with much greater eaſe, and the doing this in an accurate manner has been the ſubject of the attempts of many eminent men. Kircher has given ſome directions for the ſtaining marble, which have been tranſlated word for word into the Philoſophical Tranſactions; but they are ſo indeterminate and uncertain, that nothing can in reality be learned from them. Many others have written alſo on the ſame ſubject, but Mr. Du Fay is the only one whoſe experiments are plainly and clearly laid down, and may be followed by any body.

This gentleman choſe the common white marble without veins for making his experiments, for the ſame reaſon that he choſe the plain agates, becauſe in the veined ones there are ſeveral different ſorts of matter, all of which are not to be penetrated with equal eaſe. The ſolution of ſilver penetrates into marble to the depth of an inch, or more, and gives a tinge, reddiſh or purple, at firſt, and afterwards brown, from which colour it never varies afterwards. It always takes off the poliſh of the marble, eating away a part of its ſurface. The ſolution of gold does not penetrate ſo deep into marble as that of ſilver, but it gives a beautiful violet colour. Both theſe operations are much aſſiſted by expoſing the marble to the ſun. The liquors uſually diffuſe themſelves, and ſpread every way in the marble, ſo that it is not eaſy to make any figure with them that ſhall keep its outline tolerably regular.

The ſolution of copper gives marble a beautiful green tinge, but it does not penetrate deep, and on the application of boiling water becomes black; when the ſurface is poliſhed off afterwards, however, it becomes again of a beautiful green. Beſide the powerful acid menſtruums, there are many other liquors which have a power of penetrating deep into marble. Of this nature are all the oily fluids; but the expreſſed oils have this diſadvantage, that they leave a fattineſs in the marble which will not ſuffer it afterwards to take a good poliſh. All ſubſtances which can penetrate marble, can carry colours into it; but ſuch are moſt eligible, which having lodged the colours evaporate, and leave them there, without injuring the *ſtone*. Spirit of wine is of this number; it is excellently qualified for the extracting beautiful tinctures, and ſinks them very deep. Oil of turpentine alſo has its value, but it does not take tinges ſo well as the ſpirit. Some have recommended lixiviums of the fixt alkaline ſalts, but they very rarely produce any beautiful colour. In the uſing theſe fluids the marble is to be gently heated, and the ſpirit is by that means evaporated before it is cooled, leaving its colour always behind. White wax penetrates very deep into hot marble, and conveys colours into it in a very beautiful and determinate manner. There are however but a few bodies, which will impart their colours to wax, and therefore this valuable means is of a very limited uſe.

Several of the gums alone are alſo able to tinge marble very ſtrongly. Dragons blood, and gamboge, if rubbed on hot marble, penetrate it to the depth of about a twelfth of an inch: the gamboge requires the marble to be hotter than the other, and tinges it to a very beautiful yellow; the dragons blood tinges to a red in different degrees, according to the heat of the marble.

If theſe gums have been uſed to poliſhed marble, there is no farther caution neceſſary, than the cleaning them off from the ſurface with a little ſpirit of wine: but the way to make them ſink deeper into the *ſtone*, is to take off the poliſh by rubbing the ſurface with pumice, or the like, and then the gums ſink much farther, and the colours appear very beautiful when the marble is poliſhed again.

Though theſe gums act alone, yet they will ſucceed much better if diſſolved in ſpirit of wine, and applied with a pencil; for by this means they ſink deeper in, and the figures traced out will keep their determinate form and outlines, theſe ſolutions fixing immediately, without ſpreading any way. It is alſo remarkable, that the ſolution of dragons blood hardens the marble, and renders it leſs ſoluble in acids than before; ſo that if a piece, ſtained in part with this ſolution, be afterwards rubbed over with an acid diſſolvent, and its ſurface eaten away to ſome depth, the parts which are coloured will all ſtand out above the reſt.

A tincture of Braſil wood in ſpirit of wine tinges marble red, and if the heat given to the marble be greater, it becomes purple; but both theſe colours fade a little in keeping. A tincture of cochineal gives a purpliſh red, and the more the marble is heated, the farther the colour penetrates, and the deeper it is. In oil of turpentine the colour of cochineal penetrates much deeper into the marble, but it has a browniſh caſt. Alkanet root, by means of ſpirit of wine, gives alſo a red colour, which, if the heat be too great, changes to brown; and this, and moſt other of the like matters, tinge the marble, in tincture with ſpirit, to a ſlight depth; and in oil of turpentine they ſink much deeper, but then the oil leaves a greaſy look upon the marble.

If verdigreaſe be boiled a conſiderable time in white wax, it tinges marble, when rubbed hot upon it, to a beautiful green, little inferior to that of the coarſer emeralds, and the colour ſpreads itſelf very equally, and penetrates to a third of an inch deep; if the marble be made too hot, the colour becomes that of the jade *ſtone*. Alkanet boiled in white wax gives a fleſh colour, which penetrates very deep; and the roucou boiled in wax makes a permanent yellow, which alſo ſinks very deep. The beſt way of heating marble for this purpoſe, is to lay the piece, intended to be ſtained, upon a bed of ſand, a fifth of an inch deep, upon an iron plate; this is to be ſet over the fire, and when of a proper degree of heat, the colour is to be applied. The juſt degree can only be found by experience, and it varies indeed in almoſt every colour; but in general, the finer colours require the marble to be of ſuch a heat, that the hand can juſt bear to be laid upon it, and the others require a ſomething greater degree than this.

Black is, of all colours, the moſt difficult to give in this manner to marble; and perhaps indeed it is impoſſible to give that colour in any degree of perfection, and that for this plain reaſon, that all theſe colours only fill the interſtices between the granules of the marble, thoſe granules themſelves remaining unaltered: thus, in the other colours, the whiteneſs of the granules is only a heightning to the tinge, making it brighter, and a little paler; but the whiteneſs can never fail to appear diſtinguiſhably as ſuch in black, and by that means deſtroy that colour.

Next to black, blue ſeems the moſt difficult, of all the colours, to give to marble. Mr. Du Fay, however, having found by Mr. Geoffroy's experiments, that oil of thyme, by long ſtanding with ſpirit of ſal armoniac, acquired a blue colour, tried this mixture, and found it ſucceed very beautifully. But this is one of thoſe colours which require the marble to have but a very ſmall degree of heat, ſince a greater would evaporate them before the colour had time to penetrate. The colours of the gums may be laid on when the marble is cold, and on heating it afterwards they will ſink into it.

There is another very elegant ſort of workmanſhip to be employed on marble, that is, the tracing figures in relief in it; and this is done much more eaſily than might be imagined, there being nothing more required to it, than the ſaving the parts which are to be left in relief, by covering them with a varniſh, and eating away the reſt by means of an acid. For this purpoſe let the deſigned figures be traced in chalk upon the marble, and cover them with a bed of varniſh, made by diſſolving a piece of common red ſealing-wax in ſpirit of wine; then pour on the marble a mixture of equal parts of ſpirit of ſalt and diſtilled vinegar, and this will eat down all the ground, and leave the figures ſtanding, as if engraved with immenſe trouble. The adding the colours, before deſcribed, to theſe marbles afterward, in a regular manner, will give them a ſurpriſing beauty. Mem. Acad. Par. 1728.

Electrical attraction of STONES. Many *ſtones* have been obſerved by Dr. Liſter to have a ſort of *electrical attraction* to vegetable reſins.

This author obſerves, that having placed ſome foſſils in a cabinet made of Barbadoes cedar, and examining them at ſome diſtance of time, he found them all covered with a liquid reſin like Venice turpentine. Many of the *ſtones* were wrapt up in papers, yet theſe, as well as the reſt, were covered with this reſin; though, upon the moſt diligent ſearch, there could not be found any exſudation on any part of the cabinet. The iron ores were moſt of all covered with reſin, all the kinds of the hæmatites being thick coated with it; and among the aſtroitæ ſome were thinly covered, and others perfectly free from it.

It was not owing to the texture and denſity of the *ſtones*, that they either eſcaped this, or had it, but thoſe of the moſt open grain, and thoſe of the cloſeſt, were indifferently covered with it. It is certain from this ſingular obſervation, that the whole body of the turpentine of the cedar wood was carried up into the air, and floating in it was again condenſed, on the coming into contact with certain *ſtones*, tho' not with others.

There are ſeveral vegetable ſubſtances, which in this manner emit their whole body into the air: of the number of theſe is camphor; but the *ſtone*, that will again condenſate this into camphor, is not known. Philoſoph. Tranſact. N° 110.

Formation of STONES. See LITHOGENESIA.

Medical STONES, a term uſed by ſome to expreſs thoſe particular *ſtones*, which for their real or imaginary virtues have, at one time or other, been made ingredients in medicinal preparations.

The opinions of the antients, in regard to the virtues of gems and precious *ſtones*, were very whimſical; they ſuppoſed that they had certain ſympathetic properties, and that the wearing them on the finger, or carrying them in the pocket, would cure diſeaſes, render the Gods propitious to their prayers, or ſave them from thunder. Theſe have been deſervedly laughed out of the world in our more enlightened times; but it has remained a queſtion, and does ſo even to this time, whether or not ſome of the gems have real medical virtues, naturally reſulting from their parts, and conſtituent matter. It appears from the preſent ſtate of the gems, that they were once fluid bodies, or, at leaſt, made up in part of ſuch ſubſtances as were once fluid; and as in this ſtate they were capable of receiving metalline admixtures, it is poſſible they may derive certain virtues from thoſe admixtures; and ſome concurrent circumſtances in that mixture may have exalted the virtues of the bodies received, beyond what they could naturally and ſingly have excited.

The diaphaneiety, the external figure, and the internal ſtructure of gems, all argue ſtrongly for their having once been in a fluid ſtate; and their colours, which ſeem to be evidently adventitious, and imparted either by ſome coloured mineral juice, or ſome tinged exhalation, could have ſo deeply affected the denſe texture of theſe *ſtones*, as to paſs through all their parts in no other manner, than when that *ſtone* was in *ſolutis principiis*, or in a fluid ſtate.

There are ſometimes found extraneous matters lodged in the bodies of the gems themſelves, which could only have been enveloped in them in this manner while they were ſoft; and even in moſt of them, the art of the chemiſt is able to diſcover real particles of metals, which muſt have been mixed in their ſubſtance at ſuch a time, and to which they may very probably be indebted for real virtues.

Rubies, when too ſmall to be of value as gems, are in ſome places, where they make a ſort of ſand in the rivers, worked to ſome advantage as ores of gold. The amethyſt evidently contains iron, and the emerald copper; why ſhould it then be ſuppoſed impoſſible, that the virtues of theſe metals may be found in the gems which contain themſelves, and that in ſo pure and fine a ſtate, as no chemical proceſs can afford them in? The weight of many of the coloured gems is much greater than could be expected in *ſtones* of that hardneſs and conſiſtence, and is plainly owing to the admixtures of the metalline particles of the various ſorts they contain.

Mr. Boyle's opinion of the origin of the real virtues of the gems, is, that while the petreſcent matter was yet in a fluid ſtate, the mineral matter was received into, and intimately mixed with it, ſo as that the whole became but one *ſtone*; and that the virtues are always ſuch, as may be derived from the impregnating metal or mineral, and are various in degree, according to the various ſtates of the metal, and its quantity received into the compoſition.

If this ſyſtem holds good as to the gems, it will be much more naturally applicable to the ſemipellucid *ſtones*; many of which have gravities ſo great, as plainly to denote the metalline or mineral matter that makes a part of them. The metalline ſubſtances, that may be ſeparated out of theſe *ſtones*, give great proof of the truth of this ſyſtem: thus the hæmatites contain a very large quantity of iron, and the lapis lazuli, and turquoiſe *ſtone*, contain very large quantities of copper; and many of the jaſpers hold no inconſiderable portion of the ſame metal. *Boyle* of the Origin and Virtues of Gems.

STONE *for building*. Care muſt be taken to dig *ſtone* at the proper ſeaſon; for that *ſtone* which, taken out of the quarry at one time, would ſoon moulder away, will at another ſeaſon endure the weather for many years, if not ages. *Boyle*'s Works Abr. Vol. I. p. 111.

Bolonian STONE. See LAPIS *Bononienſis*.

Chalk STONES. See CHALK.

Chick STONE. See CICERUM *lapis*.

Copperas STONE. See LAPIS *atramentarius*.

Eft STONES. See EFT.

Figured STONES. See FIGURED *ſtones*.

Fleſh STONE. See SARCITES.

Free STONE. See FREE *ſtone*.

Gypſine STONE. See GYPSINE.

Horn STONE. See LAPIS *corneus*.

Moor STONE. See MOOR.

Oil of STONES. See OIL *of ſtones*.

Shoad STONES, among the miners of Cornwall. See the article SHOAD *ſtones*.

Staining of STONES. See STAINING.

STONE, in commerce. The *ſtone troy*, in Scotland, contains ſixteen pounds, the pound being two marks, or ſixteen ounces. Tr. Pract. Geom. p. 153. See POUND.

STONE-*braſh*, in agriculture, is a light lean ſoil, full of larger and ſmaller maſſes of rubble *ſtones*.

Theſe are to be tilled according to the condition in which they are found, for if they are graſſy they fallow them pretty late; but if they have no graſs upon them, they fold them in winter, when the ſheep's dung, with the help of ſome hay-ſeed, will furniſh them with graſs: or elſe, early in the ſpring they lay upon them old thatch or ſtraw, or the ſtrawy part of old dunghills, earth out of ditches, or the like, which will all, more or leſs, help forward a coat of graſs upon the land; for it is a rule in regard to theſe lands, that they muſt have a covering of graſs before they are fallowed, elſe they will yield but a poor crop. *Plot*'s Oxfordſhire, p. 247. See STONY *land*, infra.

STONE-*chatter*, in zoology, the name of a ſmall bird of the *œnanthe*, or fallow-finch kind, called by ſome authors *rubetra* and *muſcicapia*, and in ſome places the *ſtone-ſmich*, and the *moor-titling*.

It is about the ſize of the common linnet. Its beak is longiſh, ſtrait, and ſharp, and is black, as is alſo its mouth within. Its head is large, and in the male is black almoſt all over, as is alſo the upper part of the throat; but in the female theſe parts are variegated with black and brown. The neck is black, and marked on each ſide with a white ſpot, the two ſeen together looking ſomewhat like a white ring. The middle of its back is alſo black, but the extremities of the feathers are yellowiſh. It has a white ſpot juſt above the rump. Its breaſt is of a ſomewhat reddiſh yellow, and its belly white, with a faint caſt of red. In the female, the feathers of the back and neck are of a ſomewhat greeniſh tawny, with black middles; the upper part of the throat is grey, and the breaſt red. It is common on heaths, and makes a very loud, and often repeated noiſe. *Ray*'s Ornitholog. p. 169.

STONE-*curlew*, in zoology, the Engliſh name for the *œdicnemus*, a bird of the colour of the curlew. See the article ŒDICNEMUS.

STONE-*phoſphorus*. See LITHOPHOSPHORUS.

STONE-*plant*. See LITHOPHYTON.

STONE-*ſmich*, a common Engliſh name for that ſpecies of œnanthe, which we more frequently call the *ſtone-chatter*. See the article STONE-*chatter*.

STONE-*ſucker*, in zoology. See PETROMYZON.

STONY *land*. The farmers expreſs by this term two ſorts of land, the one full of large flints and pebbles, and the other full of fragments of free *ſtone*, or other coarſe *ſtones*.

Theſe lands in many places yield good crops, and the general rule is, that in ſtiff and cold lands the *ſtones* ſhould be as carefully picked out as may be, but in light and dry grounds they ſhould be left. In Oxfordſhire they have great quantities of a lean earth, and a ſmall rubble-*ſtone*, or a ſower ſort of land mixed with it; this is ſometimes very full of weeds, and ſometimes very clear of them: if they are weedy they fallow them late, but if they be ſeary, as they expreſs it, that is, if they have no ſwerd upon them, they either fold them in winter, and add ſome hay-ſeed to the ſheep's dung, to bring up graſs, or elſe they lay old thatch or ſtraw, and dung upon it; for they reckon, that if theſe lands have no ſwerd upon them before they are fallowed, they will by no means be brought to bear a good crop, but a great deal of May-weed, and other unprofitable herbs. In September, November, and December, they fallow as the ſwerd directs them: if this is done in either of the two laſt months, they call it a winter fallowing, and never ſtir it again till they plow it, and ſow it with barley; and theſe lands are reckoned to do better than if finely tilled. They will bear wheat and meſlin in a kindly year, and large crops of barley, if they are well managed, and kept in good heart.

They always fallow theſe lands every other year, unleſs they ſow peaſe upon them; ſometimes they ſow them with lentils; and when they are quite worn out, they lay them down for clover, or rey-graſs. *Mortimer*'s Huſbandry, p. 71.

STOOL (*Cycl.*)—STOOL, in mining, is uſed when the miners leave digging deeper, and work in the ends forward. The end before them is called the *ſtool*. *Houghton*'s Compl. Miner in the Explan. of the Terms.

Bloody STOOLS, in medicine. The ſpirit of vitriol, mixed with the patient's drink, has often been found beneficial in cures of *bloody ſtools*.

Retention of the firſt STOOLS, in infants. See INFANT.

STOP, in the manege, is a pauſe, or diſcontinuation of going. In order to *ſtop* a horſe, the rider ſhould, in the firſt place, bring to the calves of his legs, to animate the horſe, then bending his body backwards, raiſe the bridle-hand, without moving the elbow; then vigorouſly extend the hams, and reſt upon the ſtirrups, to make him form the times or motions of his *ſtop*, in falcading with his haunches three or four times. You ſhould not form the *ſtops* of your horſe ſhort and precipitate, leſt you ſpoil his hams and mouth. After *ſtopping*, a horſe ſhould be made to make two or three corvets.

The oppoſite term to *ſtop* is *parting*. In former times, the *ſtop* of a horſe was called *parade*. See the articles RAISE and NAILS.

Half a STOP, is a *ſtop* not finiſhed by a *peſate*; ſo that the horſe, after falcading three or four times upon the haunches, reſumes and continues his gallop, without making *peſates*, or *corvets*. See the articles PESATE, CORVET, &c.

STOP, at ſea, a word uſed by him that holds the half-minute glaſs, in heaving the log; for immediately when the glaſs is out, he calls *ſtop* to them that let run the line. See the article STOPPING.

STOPPAROLA, in zoology, the name of a bird of the lark kind, deſcribed by Aldrovandus, and ſuppoſed by Mr. Ray to be the ſame with the *ſpipoletta*, or the *tordino* of the Venetians. See the article SPIPOLETTA.

STOPPER, in a ſhip, a piece of rope having a wale-knot at one end, with a lannier ſpliced into it, and at the other end made faſt in the place where it is to be uſed. Its uſe is to ſtop the main-halliards, or the cable. The *ſtopper* for the halliards is faſtened at the main-knight, and it ſerves, when they are hoiſing the main-yard, to ſtop it, that it don't run out too faſt. They bind the wale-knot about the cable with the lanniers, and that ſtops it, ſo that it cannot ſlip away. This *ſtopper* is faſtened to the bottom of the bits by the deck. The word is, *lay on the ſtoppers*; and a ſhip is ſaid to ride by the *ſtoppers*, when the cable is faſtened, or tied only by them, and not bitted; but this is not ſafe riding in a ſtreſs of weather.

STOPPING (*Cycl.*)—STOPPPING *a leak*, at ſea. See LEAK.

STOPPING *a ſhip*, at ſea. When a ſhip comes to an anchor, and the cable is veered out by degrees till the ſhip is found to ride well, and then ſtopped, it is called *ſtopping the ſhip*.

STORAX (*Cycl.*)—The writers of the middle ages have greatly perplexed the hiſtory of this drug in general.

The true ſtate of the caſe is this; all authors, of all times, have deſcribed at leaſt two kinds of *ſtorax*, a dry and a liquid kind. The Arabians and Greeks have both joined to call the dry kind *calamita*; but neither the origin of that epithet, nor its true ſignification, have been conſidered as they ought.

The *ſtorax ſicca*, or *calamita* of the Arabians, was the worſt of all the kinds of *ſtorax*; it was only the refuſe, after making the artificial liquid kind.

They ſometimes boiled the fruit of this tree, and ſometimes its bark, and out of both extracted a liquid *ſtorax*; and the remainder of both was ſaved under the name of *dry*, or *calamite ſtorax*. It is no wonder, therefore, that the *calamite ſtorax* of the Arabians was the worſt of all the kinds; and as ſuch the term is always to be underſtood, when met with in the works of the Arabians.

On the other hand, when the Greeks would expreſs the very beſt and fineſt *ſtorax*, they always do it by the term *calamite ſtorax*. The two kinds of *ſtorax* they mention, are the reddiſh and the black. The latter was foul, and much leſs in eſteem. The former was the fine pure *ſtorax*, naturally exſudating from the tree. This they ſometimes called *calamite*, becauſe in the form of pieces of reed.

The common opinion, in regard to this word, is, that it was an epithet given to the fineſt *ſtorax*, from its being put into reeds to be brought over with ſafety: but this was not the caſe. The fineſt of all *ſtorax*, was that which voluntarily exſudated from the tender twigs, and young ſhoots of the tree: this ſometimes coated over the whole twigs for an inch or two in length, and reſembled a reed, or other hollow cylindric body, drawn on over the twig. This was the origin of the name *calamite*, or reed-like *ſtorax*, given to this which was of the red *ſtorax* kind, but finer than that of the trunk or larger branches, and approaching to a yellowiſh hue.

Pliny gives even a ſtricter account of the name than this: he ſays, and that from the authority of authors of repute, that the *ſtorax*-tree being very ſweet taſted, and very ſoft in the young wood, worms were very apt to get into the ſhoots; and that when they did ſo, they would eat away all the woody matter, and leave only the bark. The *ſtorax*, extravaſated by theſe punctures, uſed to coat over theſe tubes, and they then exactly reſembled pieces of reed artificially covered with ſome gum.

According to this account, the name *calamita* was extremely appoſite to that *ſtorax*, and it had as much title to the epithet, in all appearance, as the *adarce calamites*, which always gathered about reeds, and was therefore ſometimes ſimply called *calamites*. See ADARCE.

STOREA, among the Romans, a kind of baſket made of ropes or ruſhes, for gathering flowers or garden-fruits. *Pitiſc.* Lex. Ant. in voc.

STOREA was likewiſe a kind of defence, made of large cables faſhioned into a ſort of nettings; which was ſo ſtrong, that no weapon, though thrown out of an engine, could penetrate it. See *Pitiſc.* in voc. and *Cæſ.* Bell. Civ. II. 9.

STORM-*fink*, in zoology, the name of a ſmall bird deſcribed by Hoier, and ſaid to be ſeen principally at ſea, where it is looked on as a foreteller of bad weather.

It is a little larger than the common ſparrow, and is all over of a greyiſh colour. It is very remarkable for its ſkimming very ſwiftly along the ſurface of the water. When large flocks of theſe appear, the mariners know they are to expect a *ſtorm*, and prepare for it. *Ray*'s Ornithol. p. 306.

STORYNE, the name of an inſtrument uſed by the antients for drawing blood from the noſe; but we are not perfectly informed of its ſhape or ſtructure.

STOVE (*Cycl.*)—STOVES, in gardening, are buildings erected for the preſervation of tender exotic plants, which, without that aſſiſtance, will not bear the cold of our winter, becauſe they require an artificial warmth.

Stoves are of two kinds, diſtinguiſhed by the names of the *dry*, and the *bark ſtove*.

The dry *ſtove* has the flues, in which the ſmoak is carried, either laid under the pavement of the floor, or erected in the back part of the houſe over each other, and returned ſix or