

and we often found more or less of them in their Lungs, according as they were oppressed.

We have seen some sick Persons, whose Breasts have been so oppressed, that they died all on a sudden; in the mean while we found no Serosity, neither in their Breasts, nor in their Lungs: But the *Pericardium* was entirely fasten'd to the Lungs, and the Lungs were glued to the *Pleura* and *Diaphragm*; and all the Parts were so mixed and blended together and confounded, that one could scarce distinguish the one from the other: Now as the Lungs were squeez'd together in the midst of this Mass, they were depriv'd of their Motion, and the sick Person was choak'd for want of Breath. The close Adhesion and Confusion of these Parts one with another, proceeded from this, that being ulcerated as they were, they must needs stick to each other.

The ordinary or common Scorbutic Persons have the Glands of their Mesentery much obstructed and swell'd; those we treat of, had theirs partly corrupted, and Imposthumes in the Substance of it.

In the Liver of some few, the Matter or Corruption was harden'd, and as it were petrified; their Spleen was three times bigger than it should be, and fell to pieces as if it had been compos'd of coagulated Blood: and sometimes the Kidneys and the Breast were full of Imposthumes.

There were some Bodies or Cadavers of those of Fifteen, in which if we squeez'd betwixt two Fingers the End of the Ribs, which began to be separated from the Gristles, there came abundance of corrupted Matter, which was the spongy Part of the Bone; so that after the squeezing of it together, there remain'd nothing of the Rib, but two bony Plates.

We have seen some who had no other Token of the Scurvy, but some slight Ulcerations in the Gums: They had afterwards some small, red, hard Tumours on their Hands, their Insteps, and in some other Parts of the Body. After that, there appeared large Imposthumes on their Groin, and under their Arm-pits, attended with several blue Spots over all their Body, which were the certain Forerunners of Death. We found that the Glandules under their Arm-pits were very big, and surrounded with Matter or Corruption; as well as the Muscles of their Arms and Thighs, whose Intervals were all filled with them.

We observ'd some whose Arms, Legs, and Thighs were of a reddish Black, and as it were burnt; which proceeded from that black and coagulated Blood, which we always found under the Skin of those Persons. We also found their Muscles swell'd, and as hard as Wood; which proceeded from the Blood, which was fix'd in the Body of the Muscles, which were sometimes so full of it, that their Legs remained bent without being able to extend or stretch them out.



We observed that the blue, red, yellow, and black Spots, which appear in their Bodies who have the common Scurvy, proceed purely from extravasated Blood under the Skin. As long as the Blood kept its red Colour, the Spot was red; if the Blood is black or coagulated, the Spot is also black; when there is some Bile mix'd with it, the Spot is of a yellowish Black; in short, according as the Blood is mixed with the Humours of different Colours, so also the Spots appear of a different Colour.

We sometimes saw on the Bodies of these Persons certain small Tumours, which grew bigger every Day: We applied emollient Ointments to soften them; and those Tumours, on their breaking, form'd a Scorbutic Ulcer, which proceeded from the Blood with which the Tumour was filled; for as often as we took off the Plaister, we still found under it a great deal of coagulated Blood; we put on a fresh Plaister, and some time after we still found under it coagulated Blood: We continued dressing of them after this manner, and by thus taking away the Blood, we entirely dried up the Tumour, and the Person was cured. Some old Persons had such large Bleedings at the Nose and Mouth, that they died of it; it being impossible to stop it, because the *Lympha* of these Persons was so sharp and corrosive, that it corroded and eat through the Coats of the Veins. And this kind of Hæmorrhage was so much the harder to stop, because the Blood of old Persons is more fluid and watery than that of young Persons, who are seldom subject to this Accident.

Old Persons, as well Women as Men, were troubled with such mighty Fluxes, that the weakest of them died under them; but if they had Strength enough to withstand them, they were soon cured.

There were some of these sick Persons, who were so costive in their Body, that they never could go to Stool, without taking some Glisters.

Several of them had such large Swellings over all their Bodies, their Hands, Arms, and Feet, that they seem'd to have been blown up. We cured several of them by proper Medicines, Glisters, and sweetning Juleps.

A Youth of ten Years old, had his Gums much swelled and ulcerated; his Teeth were eaten up to the Roots of them, and his Breath was intolerably stinking. The Chirurgion was oblig'd to pull out all his Teeth, for the better dressing his Mouth; tho' they would have fallen out of themselves: His Gums were heal'd, but there arose a Tumour on the Side of his Tongue as big as a Walnut. In the middle of this Tumour there was a bluish Hole, which degenerated into an Ulcer, which eat up half the Tumour, the other half remained whole and entire. Some small time after, there appear'd another Tumour in the Cheek, which was very hard: It was blue in the middle, and turn'd to an Ulcer also as the first. This Youth died all on a sudden, when it was



was least expected, and all the inward Parts of his Body were corrupted.

All they who died suddenly, without having any visible Cause of their Death, had the Auricles of their Heart as big as one's Fist, and full of coagulated Blood, which by putting a Stop to the Circulation of the Blood, brought an inevitable Death on them.

There came in the Cheeks of several a small white Ulcer, which was hard all round; unless we took care to stop it presently, and to take it off with the Spirit of Vitriol, it grew presently livid or blue, black and stinking, and eat up Part of the Cheek, so that one might see the Teeth through it.

We have seen several from the Age of eighteen to the Age of thirty, who were without Pain, cast down, stupid, and without any Motion. They had their Mouths open, their Eyes sunk in, their Looks frightful, and appear'd rather like Statues than Men.

All these Persons had no apparent Sicknes, only their Gums were ulcerated; their Skin was smooth and fair, without any Spots or Hardness: Yet we found their Muscles were gangren'd, and all wet with a black corrupted Blood; and in handling of them, they fell into pieces in our Hands.

There was a Man who had a Carbuncle on his Instep, his Lips and his Nostrils were chopp'd, and a stinking Water flow'd gently from his Nostrils. This Man linger'd out a long time in a dying Condition.

A young Man, who as to all outward Appearance seem'd not to be very ill, died suddenly. We found his *Pericardium* was so eaten up, that there remain'd but a little of it, and his Heart was ulcerated all about very deeply.

Scorbutic Persons are commonly better in the Summer than they are in the Winter, which may proceed from their great Transpiration. On the other side, these were indifferently well from the Month of *April* to the beginning of *June*, the Spots, Hardness, and other Accidents of the Scurvy then disappearing; but on the coming of the great Heats, all those Accidents return'd. They who were so well as to be in a readiness to quit the Hospital, relaps'd again; their Legs and Thighs grew all black, and Death often put a Period to their Miseries. This Disorder might arrive from this, that there was such a great Quantity of corrosive *Lympha* in them, that it was in a manner impossible for it to be carried off by Transpiration, so that by stagnating in their Bodies it grew hot, fermented, sour, and putrified; from thence arose those Corrosions, Ulcers, and great Imposthumes, Corruptions, and other Accidents, which we spoke of before.

All these eat very heartily to the last Moment of their Life; this proceeded from a sharp Humour, with which their Stomach always abounded, which created in them a kind of *Fames canina*.



Nothing is so apt to corrupt the Blood as long Want; the Use of ill Food is still worse; Cold stops the Circulation of the Blood, and makes the Blood remain too long in the Parts, where it sours and soon corrupts; Sadness and Grief (which these were subject to) is worse than all the rest; and what all these may do when they meet all together in one Person, we may easily judge. They produced there *Lympha's* of different Colours, with which the Belly, the Breast, and several other Parts of their Bodies were fill'd. Those *Lympha's* were so caustic, that having put our Hands into their *Cadavers*, the Skin of them came off, and our Faces were thereby ulcered; so that we were obliged to rise in the Night to wash our Face with fresh Water, to take off the Heat and Inflammation of it.

But that which was very surprizing in this great Disease was, that the Brains of these poor Creatures were always very sound and entire.

*An Account of  
a Calenture,  
by Dr. W.  
Oliver, n. 290.  
p. 1562.*

XV. In the Month of *August* 1693, I was called upon about four o'Clock in the Morning, to see a Sailor on board the *Albemarle* Man of War, in a violent *Calenture*. He was between 30 and 40 Years of Age, brown hair'd, pretty tall, but thin, and had not much Flesh about his Bones. When I saw him first, I found him in the Hands of three or four of his Comrades, who were hardly able to manage him, because of his Strugglings and constant Endeavours to get from them. I observ'd he very often cry'd out, he would go into the green Fields; his Looks were as furious and wild as those of a Lion, and every now and then he would heartily curse those that held him. I examin'd his Pulse, and felt a disorderly Motion of the Blood in the Artery, and a burning fiery Heat all over his Body, but cou'd perceive no Distinction or Vibration of Pulse at all. The Surgeon of the Ship had, before I came, attempted to bleed him; but though the Vein of the Arm was fairly open'd, yet cou'd he not procure an Ounce of Blood from thence. Upon that I order'd him to open the frontal Vein, which succeeded no better, for that soon stopp'd too. This put me upon trying a third time, what Effects the opening the Jugular Vein might have. From this Vein, though our Orifice was pretty large, we had about two Ounces of florid thick Blood, and then it quite stopp'd there too. I then order'd the Surgeon to unbind his Arm, and try whether he could make him bleed again at that Orifice, which I remember he did in a small Quantity, and then it stopp'd as before. However, having three Orifices open at that time, we drew Blood sometimes from one, and sometimes the other, where we saw it run most freely. After several Essays of this kind, I always observed, as the Vessels emptied, he bled more freely, and at last as fast as I desired.

I was all along of Opinion, we ought to continue his bleeding 'till we saw some visible Alterations, and considerable Abatements of his Symptoms, which happen'd in about half an Hour's time after I saw him,



him, and then I felt his Pulse again, which now began to beat distinctly, but very quick. Not long after this, for he bled well enough now, I observ'd his Strugglings were not so strong, his Ravings and crying after green Fields left off, his wild Looks much abated, and not only his Pulse had recovered its due and regular Vibrations, but his Heats were moderated too, and the Fury of his Spirits laid to that Degree, that he that just now was as furious as a Lion, was grown so tame, that one Man was able easily to manage him. In this half Hour, as near as we can guess, we took from him about fifty Ounces of Blood from the three Orifices mention'd; so I order'd him to his Hammock, as soon as we had secured the Orifices from bleeding again, and directed the Surgeon to give him an Ounce of Diacodium in a Draught of Barley Water, as he went into it: Upon this he slept 'till about Noon, when he awaked with no other Complaint, but of Weakness from his loss of Blood, and a Soreness all over his Body, occasion'd, I presume, from his violent Convulsions and Endeavours to get loose.

This was the only Calenture I saw all the while I was in the Fleet for near three Years, two Summers of which I serv'd in the *Mediterranean*, and this happen'd in the *Bay of Biscay*, in the Latitude of 47, in the Month of *August*. They are, I hear, more frequent in warmer Climates, tho' very often undiscover'd.

The Reason I imagine to be this: When they are seiz'd with this violent Heat and Disorder, which for the most part happens in the Night, they steal privately over-board into the Sea, imagining they are going into the green Fields: And this I take to be the Reason we see so few; tho' I have heard frequently in the *Mediterranean* in Summer time, and very hot Weather, of Seamen lost in the Night, which the Sailors took for granted were gone off upon such like Occasions unobserv'd. And I remember this Person was actually going over-board, when one of his Brethren, who suspected his Design, as he told me, caught hold of him just as he was going to leap off, call'd for Help, and secur'd him.

This Distemper, I am of opinion, is what we call a *Phrenitis*, occasion'd by a more than ordinary Effervescence and Heat of the Blood, which distracting and confounding, if not inflaming the Animal Spirits, is the Cause of all those irregular Motions, violent Explosions and Convulsions. Hence 'tis the Animal Ideas are confus'd, the Imagination deprav'd, and all the rational Functions disorder'd. From these Orgasms in the Animal Spirits, we may, I fancy, give some Account of the want of Pulse too, their constant and impetuous Motions thro' the Fibres, not admitting any distinct Arterial Vibrations. And perhaps Phlebotomy did not succeed at first, because the Orifices contracting presently, prevented its Effusion, and probably the Thickness of the Blood concurr'd not a little in this Phænomenon. His calling out for the green Fields, the true Criterion of this Disease, I take to be



be from the violent Heat he was then in, which made him fancy green Fields and open Air to cool himself in at that time, the Ship being too warm for him under these Circumstances for want of Air. And lastly, Calentures happen oftner by Night than by Day, because our Ships are more closely shut up by Night, and are less airy than they are in the Day-time.

*A Remarkable Case of the Hydrophobia, by Mr. De la Prime, n. 277. p. 1074.*

XVI.] In 1695, my Brother had a pretty Greyhound Bitch that had Whelps; soon after a mad Dog bit this Bitch unknown to the Family, upon which about 3 Weeks after she ran mad, and they were forced to kill her; but saving her Whelps, because that no Sign of Madness appear'd in them, in about 3 Weeks more they all pull'd out one another's Throats except one, which escaping, my Brother's Men valued and nourish'd, made much of it, and stroak'd it. At length, perceiving that it could not lap, nor swallow any liquid thing, they put their Fingers in its Mouth, and felt its Tongue and Throat; but finding nothing wrong therein as far as they could discover, they let it alone a Day or two longer, and then it ran mad and died.

They being thus dead, were soon forgot, until that about 3 Weeks after, my Brother's Servant, a most strong laborious Man, that had frequently put his Fingers into the Whelp's Mouth, began to be troubled now and then with an exceeding acute Pain in the Head, sometimes once, sometimes twice a Day, so very vehement that he was forc'd to hold his Head with both his Hands, to hinder it from riving in two, which Fits commonly held him about an Hour at a time; in which his Throat would contract, as he said, and his Pulse tremble, and his Eyes behold every thing of a fiery red Colour. Thus was he tormented for a whole Week together, but being of a strong Constitution, and returning to his Labour in every Interval, he sweat and wrought it off, without any Physic.

But it went worse with one of his Fellow-Servants, a young Apprentice of about 14 Years of Age, who had made as much of the Whelp as he, but was not of so strong a Constitution; he was seiz'd also with a Pain in his Head, was somewhat Feverish, sometimes better, sometimes worse, cough'd much, had a good Stomach, eat heartily, but could drink nothing. I know not what I ail, says he, I cannot swallow any Beer, &c. and so laugh'd at it. When he went out of doors, tho' there was but a little North Wind, yet he always ran as if it had been for his Life; when they ask'd him why he did so, he told them he could not tell, but that the Wind would needs stop his Breath. A Day or two after this he was worse, and vomited a strange nasty sort of Matter, like black Blood, which stunk like Sallet Oil, but much stronger; which he did several times: after which he would be pretty well, and walk about, but most commonly ran as fast as ever he could, first out of one Corner, then into another, then up stairs, then down again, as if it was for his Life. But upon the  
third



third Day of his Confinement within doors, he grew perfectly mad, would start, and leap, and twist his Hands and Arms together, point at People, and laugh and talk any thing that came into his Mind. In some of his Fits he was so strong, that he was too hard for four young Men to hold him down in the Chair where he sat; but as soon as they were over, he was lightsome, and laugh'd, and talk'd, but all his Discourse was of fighting, and how if that they would but let him alone, he would leap upon them, and bite, and tear them to Pieces: And when one said unto him, that he was sure that he would not hurt him, he'd been always his Friend; he answer'd sharply, that Friends and Foes were all alike to him, he'd tear them all in Pieces, &c. About an Hour after his Fit came again, which soon made him speechless, seiz'd wholly upon his Brain, and then he died just before the Physician came.

2.] The Symptoms from the Bite of a Mad Dog are so surprizing and terrible, that it is hardly possible to describe the Agony of a Patient in this unhappy Condition. I have lately had the Opportunity to see two Instances of this Case.

*An Account of  
Three Cases of  
the Hydro-  
phobia, by  
Dr. R. Mead.  
n. 323. p.*

The first was of a Lad of about the Age of Nine Years, a sturdy and bold Boy. A mad Bitch of the Mungrel kind was hunted in the Street, he struck at her with a Stick, and she flying in his Face, bit him in the right Cheek, which was torn with a large Wound to the middle of the Nose. This was on the 20th of April last. A Surgeon cured the Wound in about 14 Days time, by applying for the first three Days, *Theriac. Andromach.* in *Sp. Vin.* and afterwards dressing it with *Liniment. Arcæi* and *Balsam. Terebinthin.* No other Care was taken, only a *Bolus* of *Theriac. Andromach.* was given him every Night while under Cure, and quickly after he was bit, he was persuaded to eat the whole Liver of the Bitch fry'd.

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He continued very brisk and well to the 22d of May; upon that Day he seem'd dull and sick, would eat no Dinner, except a little boil'd Spinnage, walk'd out in the Afternoon, and in the Evening complain'd of his Stomach and Head; his Mother gave him a small Glas of Brandy, for he would drink nothing else. In the Night he was very bad, startled often, and scream'd out as in an Agony, especially when desired to drink; and complain'd miserably whenever he made Urine, saying it hurt him. The next Morning he vomited up the Herbs he had eat the Day before, unalter'd. I was sent for that Day in the Afternoon, and found him in a perfect Agony, all in a sweat, trembling, tossing himself up and down, talking continually, looking very wild; his Pulse low, and sometimes quicker, then slower: His Urine made the Night before as well colour'd as ordinary. I desired him to drink; he took a little in his Mouth, but as it was going down, he threw it out with Violence, saying it hurt him; and praying



praying that he might take no more. We over persuaded him to hold a little in his Mouth and swallow it by degrees and gently; he did so with a little more ease, but was glad when 'twas over. We bid him suck the Drink thro' a Quill; he try'd, but could not get it down by continual Gulps, but stopp'd as soon as a very little was pass'd, still crying out that it hurt him to swallow it.

I presently declared the Case to be desperate. However for the Satisfaction of the Relations, Blistering Plaisters were apply'd to the Back, and on each Side of the Neck; and a Diuretic *Bolus* of *Sal Succin. Camphor.* and *Conserv. Lujul.* was given every six Hours; for he seem'd from the first of his Complaint to have a difficulty of Urine.

The next Day, the 24th at Noon, I found him much worse, he had raved all Night; could not bear the Sight of any thing white, and said, that if all the Women in the Room who had white Aprons would go out, he should be well presently. He said he would drink if we would give it him in a black Cup; but when brought, made many Excuses and could not, tho' at the same time he complain'd he was dry, and pleas'd himself with talking of full Pots. He eat some Bread and Butter heartily, but vomited it up quickly, together with a frothy Slime. We dipped him in a Tub of warm Water; he said he was not afraid of Water, and was quiet in it for a little while, but soon fell into a Convulsion Fit, which oblig'd us to take him out. I observ'd his Eyes to grow more staring, and the Pupil to be prodigiously enlarged. He was thrown continually with such Violence from Place to Place, that it was very hard to keep him in Bed; and quite tired and spent, fell into cold Sweats, and died this Day at Four in the Afternoon.

The next Day I obtain'd leave to open the Body. We examin'd the Brain, Throat, Breast and Stomach, but met with no extraordinary Appearance any where, excepting that there was a great Quantity of greenish viscid Bile in the Stomach.

The other Patient was a very lusty vigorous Man of 45 Years. He had ten Weeks before been bit in one of the Fore-fingers near the Nail, by a little Naked Dog of the *Guinea* Breed. On the 8th of *November*, in the Morning, he complain'd of a great Sickness at his Stomach, and vomited green and yellow Choler. The next Morning he took a Dose of *Rad. Ipecacuanb.* Whilst he was vomiting, he complain'd of a Difficulty of swallowing; and when press'd to drink to work off the Medicine, contriv'd himself a way of sucking the Gruel given him thro' a Piece of a Tobacco pipe, but could not get down above one Pint; and tho' he afterwards often try'd this Trick, yet it did not succeed.

On the 10th he had eight Ounces of Blood taken away at the Arm, and took a *Bolus* of *Theriac. Andromach.* with *Lap. Contrayerv.*

I came



I came to him on the 11th; found him ty'd in his Bed, raving Mad, biting and spitting at the By-standers, crying out Murder, making an odd Noise as if he cough'd up something from the Throat: this Motion I had also took notice of in the Boy, and I suppose this is what some Authors have call'd *Barking*.

He said he would drink if we would unbind him, and give him Water; but as soon as it came to his Mouth, he threw away the Cup with the greatest Fury imaginable, and grew so unruly, that he was with much ado ty'd down again.

I observed that he had a Palsy of his right Arm, for he mov'd this only by the help of the other; and those who attended him, had taken notice that this Symptom began the Day before, and that at the same time he had endeavour'd to read, but could not, complaining of a Mist before his Eyes.

As he seem'd afraid of every body, so he shewed the greatest Enmity to those, for whom at other times he used to have the most Love and Respect.

I ordered a Surgeon to take away 20 Ounces of Blood at his Arm: And observ'd it to be very thick and black. He was very tame after this for a few Minutes, but fell again into his outrageous Fit, in which he soon laid himself down quite spent, and died.

I could not get leave to open the Body.

Since these Accidents, I have had an Account sent me by a Surgeon — *Of the Bite of a Mad Fox.* from *Stamford* in *Lincolnshire*, of a young Man of about 18 Years, who died *Hydrophobous* by the Bite of a mad *Fox*, that had been bit by a mad Dog. The Symptoms discovered themselves three Months after the Wound, which was upon the back of the Hand, and being healed by the Application of *Theriaca Andromach.* had left a small black Scab behind.

Three Days before his Death he was seized with a Fever, for which he was blooded, vomited and blistered; he bit to Pieces the Glass in which Drink was given him. When dissected, the *Fauces* were found very much inflamed; the left Lobe of the Lungs black, with the Vesicles full of black Blood; the Surface in some Places, which the Blackness had not cover'd, appearing blistered, as if raised by *Cantharides*. The Liver was hard, and of a yellow bilious Colour.

During the whole Violence of the Distemper, the *Penis* was observed to be continually erected, and as hard as a Bone. This Symptom is particularly taken notice of by *Cælius Aurelianus*.

The Surgeon who opened the Body, with his Knife slightly wounded his Fore-finger, and was surpriz'd to find that it festered, and gave him much more Pain than a greater Cut had at other times done. This I the rather take notice of, because something of the same nature happen'd to the Surgeon who dissected my Patient. His Hand the following Night was taken with an *Erysipelas*, attended with great



Tension and Pain: This was owing to a little Wound made in one of his Fingers a Day or two before, from which, in turning over the Parts, he had rubb'd off the Plaister; and it went not off without the continued Application of cooling and discutient Medicines.

From all these Histories, it may not perhaps be wrong to conclude, that the \* *Hydrophobia*, (a Name not very proper for the Distemper) is the Effect of a particular kind of an Inflammation in the Blood, accompany'd with so great a Tension and Driness of the Nervous Membranes, and such an Elasticity and Force of the Fluid with which they are filled, that the most common Representations are made to the Mind with too great Effect, and the usual Impressions of Objects upon the Organs cannot be suffered: Hence proceed the Timorousness, unaccountable Anxiety and Inquietude, which are always the Fore-runners of the Dread of Liquids; as also did the Pain in making Water, and the strange Aversion observed in the Boy at the sight of any thing *White*; the *Retina* being really hurt and grieved by the striking of the Rays of Light upon it. Nor is it hard to conceive that when the *Salival* Liquor is hot, and the Throat inflam'd and dry, the swallowing of Drink should cause an intolerable Agony; no more than it is that, when things are wrought up to this wretched Condition, the dismal Tragedy should not last above three or four Days at most, in which the Patient is perfectly fatigued and torn to Death by the Violence of his Actions and Efforts.

*The History of  
the Inoculation  
of the  
Small-Pox.  
Extracted  
from a Letter  
of Dr. E. Timoni,  
n. 339.  
p. 72.*

XVII. 1.] The Writer of this Discourse observes, that the *Circassians*, *Georgians*, and other *Asiaticks*, have introduc'd this Practice of procuring the *Small-Pox*, by a sort of Inoculation, for about the Space of forty Years, among the *Turks* and others at *Constantinople*.

That altho' at first the more prudent were very cautious in the Use of this Practice; yet the happy Success it has been found to have in thousands of Subjects for these eight Years past, has now put it out of all suspicion and doubt; since the Operation having been perform'd on Persons of all Ages, Sexes, and different Temperaments, and even in the worst Constitution of the Air, yet none have been found to die of the *Small-Pox*; when at the same time it was very mortal when it seized the Patient the common way, of which half the affected dy'd. This he attests upon his own Observation.

Next he observes, they that have this Inoculation, practis'd upon them, are subject to very slight symptoms, some being scarce sensible they are ill or sick; and that it never leaves any Scars or Pits in the Face.

\* Vide *Essays on Poisons*.



The Method of the Operation is thus. Choice being made of a proper Contagion, the Matter of the Pustules is to be communicated to the Person propos'd to take the Infection; whence it has, metaphorically, the Name of Incision or Inoculation. For this purpose they make choice of some Boy, or young Lad, of a sound healthy Temperament, that is seiz'd with the common *Small-Pox*, (of the distinct, not Flux fort). On the twelfth or thirteenth Day from the Beginning of his Sickness, they with a Needle prick the Tubercles (chiefly those on the Shins and Hams) and press out the Matter coming from them into some convenient Vessel of Glass, or the like, to receive it; it is convenient to wash and clean the Vessel first with warm Water: A convenient quantity of this Matter being thus collected, is to be stopp'd close, and kept warm in the Bosom of the Person that carries it, and, as soon as may be, brought to the Place of the expecting future Patient.

The Patient therefore being in a warm Chamber, the Operator is to make several little Wounds with a Needle, in one, two or more Places of the Skin, 'till some Drops of Blood follow, and immediately drop out some Drops of the Matter in the Glass, and mix it well with the Blood issuing out; one Drop of the Matter is sufficient for each Place prick'd. These Punctures are made indifferently in any of the fleshy Parts, but succeed best in the Muscles of the Arm or *Radius*. The Needle is to be a three-edg'd Surgeon's Needle; it may likewise be perform'd with a Lancet: The Custom is to run the Needle transverse, and rip up the Skin a little, that there may be a convenient dividing of the Part, and the mixing of the Matter with the Blood more easily perform'd; which is done, either with a blunt Stile, or an Ear-picker. The Wound is cover'd with half a Walnut-shell, or the like Concave Vessel, and bound over, that the Matter be not rubb'd off by the Garments, which is all removed in a few Hours. The Patient is to take care of his Diet. In this Place the Custom is to abstain wholly from Flesh and Broth for 20 or 25 Days.

This Operation is perform'd, either in the Beginning of the Winter or in the Spring.

Some, for Caution, order the Matter to be brought from the Sick by a third Person, lest any Infection should be convey'd by the Cloaths of the Operator; but this is not material.

As to the Process of this Matter, in respect of the *Idiosyncrasie*; the *Small-Pox* begins to appear sooner in some than in others, in some with greater, in others with lesser Symptoms; but with happy Success in all. In this Place the Efflorescence commonly begins at the End of the seventh Day, which seems to favour the Doctrine of *Crisis*.

It was observ'd, in a Year when the common *Small-Pox* was very mortal, that those by Incision were also attended with greater Symptoms. Of 50 Persons, who had the Incision made upon them almost in the same Day, four were found in whom the Eruption was too sudden,



sudden, the Tubercles more, and Symptoms worse. There was some Suspicion that these four had caught the common *Small-Pox* before the Incision was made; but there was not one but recovered after the Incision: In those four the *Small-Pox* came near the confluent sort. At other times the inoculated are distinct, few and scatter'd; commonly 10 or 20 break out; here and there one has but 2 or 3, few have 100. There are some in whom no Pustule rises, but the Places where the Incision was made, swell up into purulent Tubercles; yet these have never had the *Small-Pox* afterwards in their whole Lives; tho' they have cohabited with Persons having it.

It is observable that a no small Quantity of Matter runs for several Days, from the Place of the Incision.

The Pocks arising from this Operation are dry'd up in a short time, and fall off, partly in thin Skins, and partly contrary to the common Sort, vanish by an insensible Wasting.

The Matter is hardly a thick *Pus*, as in the common, but a thinner kind of *Sanies*; whence they rarely pit, except at the Place of the Incision, where the Cicatrices left are not to be worn out by time, and whose Matter comes near the nature of *Pus*.

If an Aposteme break out in any (which Infants are most subject to) yet there is nothing to be fear'd, for it is safely heal'd by Suppuration. If any other Symptom happens, 'tis easily cur'd by the common Remedies.

They scarce ever make use of the Matter of the Infitious Pox, for a new Incision. If this Inoculation be made on Persons who have before had the *Small-Pox*, they find no Alteration, and the Places prick'd presently dry up; except in an ill Habit of Body, where possibly a slight Inflammation and Exulceration may happen for a few Days.

To this time I have known but one Boy, on whom the Operation was perform'd, and yet he had not the *Small-Pox*, but without any Mischief; and some Months after catching the common Sort, he did very well. It is to be observ'd, that the Places of the Incision did not swell. I suspect the Child prevented the Insertion of the Matter, for he struggled very much under the Operation.

The Matter to be inserted will keep in the Glass very well for 12 Hours.

It is now eight Years since I have been an Eye-Witness of these Operations, and I have never observ'd any mischievous Accidents from this Incision hitherto; and altho' such Reports have been sometimes spread among the Vulgar, yet having gone on purpose to the Houses whence such Rumours have arisen, I have found the whole to be absolutely false.

There was, in a certain Family, a Boy of 3 Years old, afflicted with the *Falling-Sickness*, the *King's-Evil*, an *Hereditary-Pox*, and a long *Marasmus*. The Parents were desirous to have the Incision made upon him; the *Small-Pox* were thrown off with ease; about the 40th Day he died  
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of his *Marasme*. In another Family, a Girl of three Years old was troubled with the like Fits, strumous, attended with an *Hereditary Lues*, and labouring under a colliquative Looseness for three Months. The Operation was perform'd on this Child; she came off very well of the *Small-Pox*, which was all over the 15th Day; on the 32d she died of her Looseness, which had never left her the whole time.

I never maintain'd the Inoculation as a *Panacæa*, or Cure for all Diseases; nor do I think it proper to be attempted on Persons like to die.

The rest of Dr. *Timoni's* Letter contains his Reasons for this Method of Practice; which being the *Ætiological* Part, is translated from his own Words, as follows.

“ That the Infection of the Small-Pox may be propagated by the *Infusion* of *Pus*, no body will be surpris'd at, who has consider'd the Doctrine of *Fermentation*. Nor is the Manner of Inoculation more obscure than *Baking* or *Brewing*, in which the Bodies to be fermented swell when mixed with the Ferment, owing to that intestine Motion which is thereby communicated to them. If any one should ask me how it comes to pass, that the same Small-Pox which are otherwise dangerous, and frequently mortal, by Inoculation are render'd void of all Danger; I answer, that the common Small-Pox are either occasioned by some particular bad Disposition of the Air, or propagated by Infection, from the Effluvia of the Person labouring in that Disease. The first Case happens but to few Individuals, and then only when a remarkable bad Habit of Body concurs, or at least the pocky Seeds lying concealed in the Habit are very much exalted: But the second is the most common of the two. In the first Case the malignant aerial Particles, in the second the virulent infectious Corpuscles, probably of a saline-sulphureous Nature, but endued with a specifick Putrefaction or Rancidity, as soon as they are received into the Body by Respiration, communicate a violent Contagion to the Spirits, whence the Mass of Blood and Lymph are consequently infected. That the *Spirits* are first seized with the Infection is agreeable to Reason, both because the contagious Particles have immediate Entrance into the Fountains of the Spirits, *viz.* the Heart and Brain, and upon account of the Analogy there is betwixt these Effluvia and the Spirits themselves, being both of a spirituous, aerial Texture. The sudden and violent *Infection* of the *Spirits* may likewise be deduced, from so numerous and such bad Symptoms of the nervous System, which for the most part accompany a bad kind of Small-Pox; and especially from those *Epileptick* Convulsions which happen to Infants, the very moment they are seized with the variolous Contagion, a long while before they are taken with the Fever. That the Mass of *Blood* again is infected, appears not only from the Fever, but from the breaking out of the purulent Pustules. And that the *Lymph* is likewise vitiated, is plain from the Swelling of the Glands in the Throat, from the Spitting, and frequently a plentiful Salivation. Amongst these Symptoms the Circulation must necessarily



necessarily be disturb'd ; but especially the Particles of the Blood, from the undue Influence of the animal Spirits, must be very much disturbed. But in the common Small-Pox I have observed Death to happen chiefly in two Ways.

The first is when few of the Small-Pox appearing, and proceeding slowly to a Suppuration, other untoward Symptoms come on ; the second is when too great a Crop of Pustules brings on a cadaverous Putrefaction. In the first Case the Small-Pox are commonly called *Malignant* : But the Cause is either too great a Thinness and Solution of the Mass of Blood, or too great a Coagulation of it and Inclination to Grumousness. For if the explosive Impetus of the Spirits is too much increased, the Particles of the Mass of Blood will be too much rubbed against one another, and thereby be too attenuated, and render'd too subtile. The Blood in this State will elude Nature's Force, and as it will deposit none of its feculent Parts in the secretory *Glands* and Strainers, it will not allow these Filtrations and Secretions to go on, which are requisite for the Well-being of the animal Oeconomy. For the Figure of the Particles of the Blood must be disproportion'd to the Configuration of the Pores in the small Tubes and secretory Vessels, upon account of their too great Subtilty ; because they would be purified by Filtration, if they kept their natural Figure and Bulk. And hence a *Concoction* is said to be brought about by Incrassation. Besides this, the Celerity of the Blood being increased, hinders it from leaving its Fæces in the secretory Vessels. Thus a Torrent running with great Force and Rapidity, hinders the rapid Waters from dropping their Sediment ; because the *centripetal* Force of the Earth that is mixed with the Water, is overcome by the stronger Force of the watery Globules still driving it forwards, and jumbling it with themselves. For a Force, for Example, that is equal to one, cannot describe a perpendicular Line, when a Force equal to two is pushing it horizontally. In the same manner, if the Wind blows very hard, the Rain seldom falls. In the same geometrical Proportion, (speaking at least probably) the Particles of the Blood, having their Motion increased by the ungoverned Spirits, are driven quickly through the secretory Tubes without leaving any Fæces behind them. These Conjectures are probable from the Celerity of the *Pulse*, the intense Fever, and Crudity of the Urine, without any Sweat. On the contrary, it sometimes happens, that by the sharp and cutting Particles of the poisonous Ferment, the Spring of the animal Spirits is broken, corroded, or at least relaxed ; and thus the Motion of the Spirits becoming languid, the Particles of the Blood and Lymph are render'd torpid and slow. While therefore they are retarded in the Labyrinths of the Tubes, some of them are complicated confusedly together, others of them piled as it were upon one another ; and from the different Contact of their Surfaces with one another, they must necessarily deviate from their natural Configuration, and their Angles acquire new Dimensions. Thus by a different Disproportion from that above explained, between  
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the Figures of the Particles and the Cavities of the Tubes, but attended with a no less disastrous Event, Nature is again disturbed in her nicest Operations. These again are probable from the slow creeping Pulse, and want of Fever, sometimes observed in the most malignant Small-Pox, the Pustules appearing slowly, and few in Number. Further, from the irregular and tumultuous Motion of the Spirits, there must arise at the same time an unequal Impulse of the Blood in different Parts, and of the Veins and Arteries. For whether there are little *Fibrils* (as some will have it) found in the Blood, or there are Particles of the *Chyle* designed for particular Uses, not yet well assimilated, very probably their Motion will be disturb'd. For it is necessary that they should move naturally according to their Length; but by the *unequal* Pressure they lose their rectilinear Figure, and are contorted into Wreaths and Semicircles. After they are thus contorted, and convolved with one another, being still urged by the Circulation, they are formed into *Grumes*, or little Lumps. But if after all, these *Fibrillæ* are not allowed, certainly of whatever Figure the Particles of the Blood are, by this Inequality of Motion they must necessarily be drove out of their natural Situation. These Particles then thus entangled with one another, deprived of their Vehicle the Serum, which is squeezed from them, become heavier as they form larger Concretions, and therefore overcome the impelling Force of the Blood. They must stop here and there, and *stagnate*, according as they happen first to cohere on this or that Place. Hence the livid *Spots*, and (which I have often observed in the Small-Pox attended with *Purples*) a frequent making of very limpid *Water* in great Quantity. This is the History of the Dissolution and Coagulation of the Blood. Hence it is no wonder that some die in the Small-Pox with *Purples*, Convulsions, Faintings, Watchings, Hæmorrhages, Delirium, violent Vomitings, Dysenteries, &c. although they have but a moderate Crop of Pustules. For the variolous Ferment very frequently is the Cause of the Small-Pox becoming mortal; so that although it may not be apt to produce a great deal of thick Pus, yet it may communicate the bad Effects above-mention'd to the Spirits, Fluids and Solids, either in the Manner already explained, or somewhat akin to it, and so occasion Death; and this for the most part before the eleventh Day of the Disease. Let us come now to the second Manner of the Small-Pox proving mortal. For sometimes they have the same fatal Fermentation, though the Symptoms are very different, from the Body's being overwhelmed, as it were, with cadaverous Pus. But it is probable that Pus is generated from a Mixture of acid-saline Particles with the sulphureous and oily Particles of the Mass of Blood become thin and rancid. This Conjecture is supported by innumerable chemical Experiments, which plainly demonstrate, that by pouring any Acid to a Solution of any of the fat Sulphurs made by Alkalies, there is immediately produced a Mass of a whitish Colour. The *variolous Ferment* then being sucked in in Respiration, by means of its proper acrid and perhaps putrefactive Disposition,



position, may produce such Contractions between the acid-saline and oily-sulphureous Particles of the Blood, that not only the *Seeds* of the Small-Pox, which are in every Individual (though in small Quantity) from the Womb, are agitated, impregnated, and converted into a *purulent* Putrefaction, but likewise the whole Mass of Blood contracts a certain Acrimony, and by a kind of corruptive Motion becomes putrid and cadaverous. Thus, a Fire being kindled as it were, it happens that the fermenting Particles rage more than is necessary, for throwing off the *Seeds* of the Disease by Despumation. The Motion therefore is not *Depuratory*, serving to separate the heterogeneous Particles from the rest, but destructive and corrupting by the Ferment's overcoming and vitiating the whole Mass; the corrupt and rebellious Particles having gained the Victory, and obliged all the rest to come over to their Side. This we may observe very evidently in different kinds of *Liquors*, in which a Fermentation being sometimes raised, there succeeds a corruptive Motion, which spoils them entirely. Hence we see some, though they are free from the above-mention'd Symptoms, are suffocated in an immense Ocean of Pus, so to speak; and the Danger from this is protracted 'till the two and twentieth Day of the Disease. In the last place we are to consider, that the Solids and nobler Viscera in these Cases are very much affected, and strangely *convulsed*; and by their various Distortions the Cavities of their Tubes, as well as their whole Functions, must necessarily be depraved. Thus then the containing, and contained Parts, and those which give the Impulse to both, by means of which three the whole animal Machine is regulated, are for the most part involved in one and the same Fate; and will any body be surpris'd, that a Group of mortal Symptoms should arise therefrom? It may further be observed, that many who have got over the *Plague*, have been taken with the Small-Pox a Year afterwards, and had the same kind of *Buboes* which they had before in the *Plague*. Is not this a Sign of very great *Malignity*? Let us next examine the Method of *Inoculation*. And here every body must see, that in this Way of receiving the Infection the Case is quite different from what it is in the other. For in the first place it is plain that the *Spirits* are not infected; besides, neither the *Lymph* nor *Blood* is impregnated with the Contagion, nor is there any Hurt communicated to the Solids. Hence the Symptoms are all gentle, none of the worst Kind, and in Children no *Epileptick* Convulsions. For the Ferment of this Contagion is not spirituous, airy, and acute, but gross, slow, and blunt. But the more subtle that Poisons are, so much the more dangerous. Being so much disproportion'd then, there can be no Struggle between this Ferment and the animal *Spirits*. The variolous Pus being immediately mixed with the Mass of Blood is diluted in it as in a Sea, involved, absorbed, and blunted in it; whereby it is render'd mild, and more tractable in its Nature. These contagious Particles having enter'd the Blood, presently find out the native congenial *variolous Seeds* there, and ferment together with them; but being combined



bined and entangled with one another, they are no longer capable of raising further Disturbances, hunting after the Life, or ransacking the Treasures of the Spirits; for they destroy one another's Force, become harmless, grosser, and more blunt than before. Sliding then immediately upon the slippery, watery Particles, which serve as a Vehicle for them by the Motion of the Blood, from the Centre towards the Circumference, they are carried, as in a Stream, towards the Surface of the Body, and washed quite away. Do not we plainly see, that in the *Inoculated* Small-Pox there is not *Pus* generated, but a sanious, that is, a more *diluted* and *watery* Kind of Matter? And does it not appear from this Phænomenon, that the acid-saline Particles of the contagious Ferment do not change the oily Particles scatter'd up and down the Blood into a cadaverous Virulence, but being rather diluted and saturated with more mild and light watery Particles, they are conveyed out of the Body? And from their leaving no Pits or Cicatrices behind them, is it not evident that the acrid, pointed, pungent, and corrosive Particles of the saline Ferment, are at once blunted by the balsamick Globules of the Blood, deprived of their Spiculæ, and being render'd more smooth, expelled out of the Body? While in the mean time the Texture of the Mass of Blood is preserved entire, and its Consistence unalter'd. Here you see no Dissolution of the Blood, no corrupting or destructive Motion of it. For in *Inoculation* the Blood only ferments so much as is sufficient for separating the impure from the pure, and throwing it off by Despumation. In this Motion of Fermentation the Spirits, Lymph, and solid Parts of the Body, are sometimes affected only gently with a kind of Undulation; and if any of the contagious Particles happen to reach them, certainly (which is couched under the Metaphor of Inoculation) they must first be deprived of their mild native Acrimony, and become as it were tame, and smooth, or dulcified.

2.] This Medical Operation which I am going to explain, was not first discovered by the Improvers of Physick; but by a rude, uncultivated People. It is not known who was the first Inventor of it; but it is certain, that it was first in vogue in *Thessaly* in *Greece*; and hence proceeding gradually through the neighbouring Countries and States, it at last arrived at the City of *Byzantium*, where it made very little Noise for some Years at first, and was seldom put in Practice, and only amongst the lower People. But the Small-Pox becoming lately very epidemical, this Method began to come more into Practice; but still was never adopted by People of Rank or Fashion, 'till a certain *Greek* Nobleman, of the ancient Race of the *Caryophilli*, in the Year 1701, towards the End of Winter, asked me seriously what I thought of Inoculation, and whether I would advise him to try it upon four of his Children: for at that time they raged mortally all over the Country. I told him I knew not what to say of an Affair I was so ignorant of, being entirely unacquainted with this new Method; and at the same

— On the  
same; by Dr.  
J. Pylarinus.  
n. 347. p. 393.



*Of the Inoculation of the Small-Pox.*

time desired leave to talk to some Operator about it. Three Days afterwards when I went to him again, and the Discourse was renewed about the same Subject, presently there came a *Greek* Woman into the Room, who explained the whole *Operation* at large, and very distinctly, both as to the Manner of doing it, the Place, Time, and every other Circumstance; though she understood nothing of the true Cause, how the Small-Pox is produced by *Inoculation*. To all this she added Experience, and innumerable Instances of its good Success, some of which I had affirmed to me by People of great Veracity. Having considered well the Affair, I found it by no means repugnant to Reason and Nature; but especially influenced by the Instances that were given, I told my Friend, who asked my Advice again a few Days afterwards, that I thought it would be right to try the Experiment; though I could not help hesitating a little about it. Taking hold of this however, as having given my Assent, and being sufficiently instructed in the proper Regimen during the whole Course of the Disease, he boldly set about the Inoculation, by means of the *Greek* Woman, of his four Children: the three youngest of which (between five and seven Years of Age) were very little sick; and a few Pustules appearing after a Week, the Fever went quite off, and they were free of all Danger. But the Eldest, who was about Eighteen, was much more severely handled; for being taken with a continual and malignant Fever, attended with very bad Symptoms, and more Pustules than the others, though not a great Load of them, he hardly got over the Disease after a Fortnight; which I attribute to his *Atrabiliarian* Constitution, unwholesome Humours, and their neglecting to prepare his Body beforehand. The happy Success of this Operation induced many of the Families of the Nobles to follow the Example. So that now without any manner of Hesitation, every one is willing to try Inoculation, except a few who are fearful. Only the *Turks*, who submit themselves entirely to the Decrees of *Fate*, and are less tractable, have hitherto neglected it.

This Operation is quite natural. The Small-Pox is produced by *Inoculation*, or *Transplanting*, metaphorically so called; which is nothing else than translating the morbidick *Ferment* or *Pus*, taken from the Small-Pox, into a sound Body, by a small Wound made for the Purpose.

The physical Manner of producing it proceeds thus: The Pus being introduced into the Wound, puts on the Nature of a true Ferment; hence, by means of the Circulation being conveyed through proper Vessels and Canals to the Mass of Blood, it immediately infects those Particles of it which have a variolous Tendency, and by communicating the Contagion, it excites, agitates, and impregnates the Seeds of Fermentation which lie concealed in them, and puts them in Motion; whence an universal Ebullition, or *Fermentation*, is produced; by the Force of which the impure and heterogeneous Particles being separated, are critically



cally propelled towards the Skin: Nature in the mean while checking the whole Process by means of this Operation.

But to proceed to the Operation itself, and the Manner of performing it; I shall faithfully describe the Method in which that Woman above-mentioned safely operated, as also the Order, and all the other Circumstances; from which a certain regular Method for the Operation may be deduced. And although I was not an Eye-witness to all I shall relate, I had a great many of the Circumstances from the Mouth of the Inoculatrix, more from Persons of very great Veracity; and the most and best of all I had occasion to observe myself.

In the first place then a proper *Time* is to be pitched upon for Inoculation; which according to the Woman was the *Winter*, and she never inoculated except in that Season. But I should likewise judge the Spring to be proper enough, upon account of the Air being then very temperate.

Secondly, she is very nice in her Choice of the *Pus*; for she will by no means take it promiscuously from every Subject; but when the Disease is epidemical, she takes the *Pus* from ripe Pustules of some Girl of a good Habit, and a favourable kind of Pock, pricking it with a Pin and squeezing it gently out, and putting it into a little Shell or glass Vessel very clean, and not too cold. This little Vessel well covered over with Cloth, she puts into the Bosom of her Servant to be kept warm, and as quickly as possible proceeds to the Operation. She rejects the *Pus* of those who have been inoculated, as ineffectual; which however I should take to be of a milder Nature, and at the same time of a sufficient Strength. But this Affair ought to be determined by Experience.

Thirdly, she advises that the *Air* of the *Room* where the Patient lies be kept as temperate as possible.

Fourthly, proceeding to the Operation, she pricks the *middle* of the *Forehead*, and the *Temples* at the Root of the Hairs; as also the *Chin* and both the *Cheeks*, with a steel or golden Needle, not thrusting it in straight, but obliquely, and separating the Skin a little with the sharp Point from the Flesh below. Then with the same Needle she introduces the *Pus* into the little Orifices, and ties a Bandage over the Parts. In the same manner she pricks the Wrists and Metatarfus, introduces the *Pus*, and ties a Bandage gently about them, advising the Patient by all means not to scratch the Parts or wet them. I should rather chuse to prick Parts that are more fleshy, because they are less liable to Inflammation and Pain, and free of the Tendons.

All the other Methods of *Inoculation* are rejected for this, as being absurd, unusual, unsuccessful, and even dangerous.

In the mean time the Patient must lie moderately a-bed, and not too much.

Fifthly, she enjoins a proper Regimen in the six Non-naturals, especially in eating. For she not only rigorously restricts them from *Wine*



and *Meat*, but likewise from *Broth* 'till the *fortieth* Day: and several who have neglected this Injunction have suffered for it, by a new Crop of Pustules breaking out about their Eyes, and other Symptoms not a little dangerous.

The *Inoculation* being thus properly performed, the Symptoms of the *Small-Pox* do not appear in all after the same Space of Time; for the *Ferment* acts variously in various Subjects, bringing on the Symptoms sooner or later according to the Age, Constitution, and Strength of the Patient: although the *Small-Pox* themselves almost always begin to appear the *seventh* Day, which is truly *critical*. Nor are there wanting Instances (though it but seldom happens) where the Pustules have begun to break out the *first* Day.

The *Symptoms* vary according to the different Constitutions, Conditions of the Fluids, and particular Disposition of Nature in the Patient; *viz.* more gentle, or violent according to these Circumstances; but commonly they are not unlike those of the natural *Small-Pox*, only for the most part more mild: and a great many feel hardly any Alteration or Hurt from them.

The *Eruption* is almost always of the *distinct* kind, and the *Pustules* not numerous; but, frequently twenty or thirty, rarely a hundred, and very seldom two hundred.

I must observe in the *first* place, that some have been content with making only a little Wound in the Arm in inoculating, and have got off with a very few Pustules, and been secured from the Disease for the future.

*Secondly*, it has sometimes happened, that no Pustules have appeared after the Inoculation, either because there was no variolous Disposition pre-existing in the Body, or from the infectious Quality of the Ferment being weakened: But afterwards the Disease happening to be epidemical, they who had been inoculated were taken with the *Small-pox* promiscuously with the others.

*Thirdly*, the little Punctures or Wounds where the *Pus* is introduced always use to rise into Pustules; but in some they grow into purulent Tubercles, without any Pustules appearing; and in others they degenerate into large Boils which throw out a great Quantity of *Pus*. Sometimes again these Parts, especially the Hands and Feet, swell and are very painful, and after discharging a good deal of *Pus* they subside, and then swell afresh. In some People, though very rarely, there are *Abscesses* formed after some time near the Glands and Emunctories, which suppurate very gradually; thus Nature varies in different Habits of Body.

*Lastly*, there have hardly ever any pernicious Effects been hitherto observed to arise from Inoculation, although it has been practised in every Age, Sex, and Constitution. And indeed if it is but properly gone about, and in Bodies fitly prepared for undergoing the Operation, it is absolutely safe. For the *Small-Pox* produced in this Way are of a milder



a milder Disposition, than those that go about epidemically; because they are promoted by a Ferment or Contagion void of all Malignity. That Ebullition, by which the Mass of Blood is agitated, and the whole Work perfected, performs its Office gently without Violence, being restricted within proper Bounds by Nature. Besides, you can chuse a proper Time and Season for inoculating, and prepare the Body properly for receiving the Infection; which certainly ought to be of the greatest Consequence towards producing a happy Event of the Disease.

XVIII. This Disease began to show itself first in *Copenhagen* about the Beginning of *July*, 1711. It increas'd 'till the Beginning of *September*; after which it diminished by little and little to the End of the Year, at which time it totally ceased.

*Remarks on the Plague at Copenhagen in 1711, communicated by Mr. J. Chamberlayne, n. 337. p. 279.*

It appears, that before this Distemper there were about Sixty Thousand Souls in *Copenhagen*: From whence they infer, that there is Born every Year about Two Thousand, and that there dies nearly the same Number; which being multiplied by Thirty makes Sixty Thousand.

In the six Months which this Distemper continued, it is thought it carried off about 25000 Souls. It is true, the publick Lists reckon but 22535; but it is agreed by all, that in the last Week of *August*, and the two first Weeks of *September*, each of which carried off above 2300 Souls, there died a great many, of which there was no Notice taken.

Almost the very same happened two Years before at *Dantzick*; where, before the Plague broke out, there died weekly from 45 to 50; but the Number of the Dead increased by degrees to the Beginning of *September*; so that in the first Week of that Month there died 2205 Souls, in the second Week 2070, and in the third 2075. After which the Mortality decreased to the End of the Year.

It is observable, that there were some Houses which escaped the Infection; but that there were few where it did not carry off more than one or two Persons; and that there were many in which it did not leave a Soul alive.

And that generally speaking, this Distemper was most fatal to the meaner sort of People; there scarce dying any Person of Note; but, on the contrary, a great Number of the Poor. Which may be attributed to several Causes.

The first, and most general of which, is their nasty manner of living. The second is, that this sort of People live very close together, and as it were heaped one upon another; so that sometimes there are four Families in one Room. The third is, the foolish Curiosity they have of seeing the dead Bodies. And fourthly, a great many of them are so bigotted to the *Turkish* Notion of Predestination, that they say, if it pleases God that I should die of this Disease, I shall not escape it; and if it be his Pleasure that I shall live, I can't die: And upon this Notion they



go abroad every-where, and so catch the Infection. There are some of 'em also, which make no scruple of lying in the same Beds where others have died.

The three Sorts of Trades, of which there died most, were Coffin-makers (which took measure of the dead Bodies) Surgeons, and Shoemakers.

The Care that was taken, and the Medicines that were used, did great Service. I was told that *Tberiac* did little good; and they observ'd the same also at *Dantzick*.

*Of the Antiquity of the Venereal Disease, by Mr. W. Beckett. n. 355. p. 839.*

XIX. It has been the general Opinion that the Venereal Disease was not known, at least in *Europe*, 'till about the Year 1494. Notwithstanding which, I shall make it evident that it was frequent amongst us some hundred of Years before that Date. In doing this, I shall not quote any ancient Authorities from *Hippocrates, Galen, Celsus, Avicen, &c.* or the *Holy Scriptures*; That has been sufficiently done already by several who have wrote of the Antiquity of this Disease, and particularly by *Dr. Patin*: But if we look only into our own Antiquities, and the ancient *English* Writers in Physic and Chirurgery, we may be furnished with Instances of the Frequency of this Distemper among us, long before ever our modern Authors dreamt it had its Appearance in *Europe*.

As to the first Degree then of this Disease, I shall prove from authentick Evidences that it was anciently call'd the **Brenning** or **Burning**; and that this Word has been successively continu'd for many hundreds of Years, to signify the same Disease we now call a *Clap*; and that it was not discontinu'd 'till that Appellation first began to have its Rise. The most likely Method to accomplish my Design will be first to examine those Records that relate to the *Stews*, which were by Authority allowed to be kept on the *Bank-side* in *Southwark*, under the Jurisdiction of the Bishop of *Winchester*, and which were suppressed the 37th of *Henry VIII*. For it's impossible but, if there were any such Distemper in being at that Time, it must be pretty common among those leud Women who had a License for entertaining their Paramours, notwithstanding any Rules or Orders which might be establish'd to prevent its Increase: But if we shall find that there were Orders establish'd to prevent the spreading of such a Disease, that Persons might be secure from any contagious Malady after their Entertainment at those Houses (which were anciently eighteen in Number, but in the Reign of *Henry VII*. reduced to twelve) we may then securely depend upon it, that it was the Frequency of the Disease that put those, that had the Authority, under a necessity of making such Rules and Orders. For the same Powers that granted a Liberty for keeping open such leud Houses, must find it their Interest to secure, as much as possible, all Persons from receiving any Injury there; lest the frequency of such Misfortunes should deter others from frequenting them, and so the original Design of their Institution cease,



cease, from the entire sinking of the Revenues. Now I find, that, as early as the Year 1162, divers Constitutions relating to the Lordship of *Winchester*, (being also confirmed by the King) were to be kept for ever, according to the old Customs that had been time out of Mind. Among which these were some, *viz.* No *Stew-holder* to take more for a Woman's Chamber in the Week than 14 *d.* Not to keep open his Doors upon Holy-Days. No single Woman to be kept against her Will, that would leave her Sin. No single Woman to take Money to lie with any Man, except she lie with him all Night 'till the Morning. No *Stew-holder* to keep any Woman that hath the perilous Infirmity of **Burning**. These and many more Orders were to be strictly observed, or the Offenders to be severely punished. Now we are assured there is no other Disease that can be communicated by carnal Conversation with Women, but that which is Venereal, by reason that only is contagious; and it's evident the **Burning** was certainly so: For, had it been nothing else but some simple Ulceration, Heat, or Inflammation, there would have been no Contagion; and that affecting only the Woman, could not be communicated by any Venereal Congress, and so not infer a Necessity of her being comprehended under the restraining Article. These Orders likewise prove the Disease was much more ancient than the Date above-mention'd; because they were only a Renewal of such as had been before established time out of mind.

But to confirm this farther, I find that in the Custody of the Bishop of *Winchester*, whose Palace was situated on the *Bank-side*, near the *Stews*, was a Book written upon Vellum, the Title of which runs thus; **Here begynne the Ordinaees, Rules, and Custumes, as well for the Salvation of Mannes Lif, as for to aschewe many Myschies and Inconveniencs that dayle be lik there for to fall oute, to be rightfully kept, and due Execution of them to be don unto any Person within the same.** One of the Articles begins thus; *De his qui custodiunt Mulieres habentes Nephendam infirmitatem.* It goes on, *Item,* **That no Stew-holder keep noo Woman wpythin his Hous that hath any Sycknesse of BRENNING, but that she be putte out upon the pepne of make it a fyne unto the Lord of a hundred Shyllyngs.** This is taken from the Original Manuscript which was preserved in the Bishop's Court, supposed to be written about the Year 1430. From these Orders we may observe the Frequency of the Distemper at that Time; which, with other Inconveniencies, was **dayle lik there for to fall oute**: And the Greatness of the Penalty, as the Value of the Money then was, that is laid on it, proves it was no trifling or insignificant Thing.

But the bare Proof of there having been anciently such a Disease as was called the **Burning**, may be thought to be insufficient, unless we were perfectly assured what it was, and how it was in those Times described: I shall therefore do it from an unquestionable Authority, which is that of *John Arden*, Esquire; who was one of the Surgeons to  
our



our King *Richard II.* and likewise to King *Henry IV.* In a curious Manuscript of his upon Vellum, he defines it to be a certain inward Heat and Excoriation of the *Urethra*; which Description gives us a perfect Idea of what we now call a *Clap*: For frequent Dissections of those that laboured under that Disease, have made it evident, that their *Urethra* is excoriated by the Virulency of the Matter they receive from the infected Woman; and this Excoriation or Ulceration is not confined to the *Ostiola* or Mouths of the *Glandulæ Mucosæ*, as has been lately thought, but may equally alike attack any Part of the *Urethra* not beyond the Reach of the impelled malignant Matter. The Heat before described, which these Persons are sensible of, as well now as formerly, is a Consequent of the excoriated *Urethra*; for the Salts contained in the Urine must necessarily prick and irritate the nervous *Fibrillæ*, and excite a Heat in those Parts of the *Urethra* which are divested of their natural Membrane: which Heat will always be observed to be more or less, as the Salts are diluted with a greater or less Quantity of Urine; a thing I have often observed in Persons that have laboured under this Infirmity in hot Weather, when the perspirable Matter being thrown off in great Quantities, the Salts bear a greater Proportion to the Quantity of Urine, and thereby make its Discharge at that time so much the more painful and troublesome.

Thus we see this very early and plain Description of this Disease among us, to be entirely conformable to the latest and most exact Anatomical Discoveries. Here is no Tone of the *Testicles* depraved, according to *Trajanus Petronius*; no Exulceration of the *Parastatæ*, according to *Rondeletius*; no Ulceration of the *Seminal Vessels*, according to *Platerus*; no Seat of the Disease in the *Vesiculæ Seminales* or *Prostatæ*, according to *Bartholin*; nor in those Parts and the *Testicles* at the same time, according to *Wharton* and others, who have falsely fixed the Seat of this Disease, and whose Notions, in this respect, are now justly exploded; but a simple and true Description of it, and its Situation about an hundred and fifty Years before any of those Gentlemen obliged the World with their Labours.

Having sufficiently made it appear, that the **Burning** was a Disease very early among us, and given the Description of it, I shall say something of the ancient Method that was made use of to cure it. We are not to expect the Measures our Predecessors, in those early Times, made use of, should be calculated for the removing any Malignity in the Mass of Blood, or other Juices, according to the Practice in Venereal Cases at this Time; because they looked upon the Disease to be entirely local, and the whole of the Cure to depend upon the Removal of the Symptoms: Hence 'twas they recommended such Remedies as were accommodated to the taking off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*. The Process for accomplishing of this, I shall set down from the before-mentioned *John Arden*, who wrote about the Year 1380. His Words are as follow: *Contra Incendium. Item*  
*contra*



*contra incendium Virgæ Virilis interius ex calore & excoriatione, fiat talis Syringa (i. e. injectio) lenitiva. Accipe Lac mulieris masculum nutrientis, & parum zucarium, Oleum violæ & ptisanæ, quibus commixtis per Syringam infundatur, & si prædictis admiscueris lac Amigdalarum melior erit medicina.* There is no doubt but this Remedy, being used to our Patients at this Time, would infallibly take off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*, by which means what issued from thence would be entirely stopp'd; and this was all they expected from their Medicines; forasmuch as they were entirely unacquainted with the Nature of the Distemper; and did not in the least imagine, but if the Symptoms that first attack'd the Part were removed, the Patient was entirely cured.

I shall now, as a farther Confirmation of what I have advanced, proceed to prove, that by this **Brenning** or **Burning** is meant the Venereal Disease; by demonstrating that succeeding Historians, Physical and Chirurgical Writers, and others, have all along with us in *England* used the very same Word to signify the Venereal Malady. In an old Manuscript I have by me, written about the Year 1390, is a Receipt for **Brenning of the Ppntyl, pat Men clepe pe Apegalle**; **Galle** being an old *English* Word for a running Sore. They who know the *Ety-mology* of the word *Apron*, cannot be ignorant of this. And in another Manuscript, written about 50 Years after, is a Receipt for **Burning** in that Part by a Woman. *Simon Fish*, a zealous Promoter of the Reformation in the Reign of *Henry VIII.* in his Supplication of Beggars, presented to the King in 1530, says as follows; *These be they* (speaking of the *Romish Priests*) *that corrupt the whole Generation of Mankind in your Realm, that catch the Pockes of one Woman, and bear them to another; that be Burnt with one Woman, and bear it to another.* But to make this Matter still more evident, I am to observe, that *Andrew Board*, a Doctor in Physick, and *Romish Priest*, in the Reign of *Henry VIII.* in a Book he wrote, entitled, *The Breviary of Health*, printed in 1546, speaks very particularly of this sort of Burning; one of his Chapters beginneth thus, **The 19<sup>th</sup> Chapter doth shew of BURNING of an Harlotte**; where his Notion of communicating the *Burning* is very particular. The same Author adds, that if a Man be **Burnt** with an *Harlot*, and do meddle with another Woman within a Day, he shall **Burn** the Woman that he shall meddle withal; and as an immediate Remedy against the **Burning**, he recommends the washing the *Pudenda* two or three times with white Wine, or else with Sack and Water; but if the Matter have continued long, to go to an expert Chirurgeon to have Help. In his 82d Chapter, he speaks of two sorts of Burning, the one by Fire, and the other by a Woman through carnal Copulation, and refers the Person that is **Burnt** of a *Harlot* to another Chapter of his for Advice, what to do, **if he get a Doxer or two**, so called from its Protuberancy or bunching out: For I find about that Time the word



*Bubo* was mostly made use of, to signify that sort of Swelling which usually happens in Pestilential Diseases.

From hence it appears, the *Burning*, by its Consequents, was *Venereal*, since every Day's Experience makes it evident, that the ill Treatment of the first Symptoms of the Disease, either by astringent Medicines, or the removing them by cooling and healing the excoriated Parts, will generally be attended with such Swellings in the Groin, which we rarely observe to happen from any other Cause whatsoever.

I shall give a few more Instances of this Disease call'd the *Burning*. In a Manuscript I have of the Vocation of *John Bale* to the Bishoprick of *Ossory* in *Ireland*, written by himself, he speaks of Dr. *Hugh Weston* (who was Dean of *Windsor* in 1556, but deprived by Cardinal *Pole* for Adultery) as follows: "At this Day is lecherous *Weston*, who is more practised in the Art of **Brech-Burning** than all the *Whores* of the *Stews*." And again, speaking of the same Person, he says, "He not long ago **hent** a *Beggar* in *St. Botolph's* Parish." The Author says of him elsewhere, "He had been sore bitten with a *Winchester-Goose*, and was not yet healed thereof:" Which was a common Phrase for the Pox at that Time, because the *Stews* were under the Jurisdiction of the B<sup>p</sup> of *Winchester*. *Mich. Wood*, in his *Epistle* before *Step. Gardiner's* *Oration de vera Obedientia*, printed at *Rhoan*, 1553, gives another Evidence of the **Burning**. And *William Bullein*, a Physician in the Reign of Queen *Elizabeth*, in a Book he publish'd, call'd *The Bulwark of Defence*, &c. printed in 1562, bringing in *Sickness* demanding of *Health* what he should do with a Disease call'd the *French Pockes*, *Health* answers, "He would not that any should fish for this Disease, or to be bold when he is bitten to thynke thereby to be helped, but rather to eschewe the Cause of thys Infyrmity, and filthy rotten **Burning** of *Harlots*."

From these Instances it sufficiently appears, That the first Degree of the Venereal Disease was anciently known among us under the Title of **Burning**. And I can make it appear from my Collections, that the Disease, when it came to be confirm'd, was no Novelty here in those early Times.

#### XX. Account of Books omitted.

- n. 320. p. 324. 1. An Account of *Animal Secretion*, the Quantity of Blood in the Human Body, and of Muscular Motion; by *James Keill*, M. D. 8vo.
- n. 273. p. 918. 2. *D. Dominici Sanguineti Appuli Dissertationes Iatrophysicæ*. Neapoli, 1699.
- n. 273. p. 914. 3. *Jac. Gaveti* Academ. *Monspel.* Alumni *Avenionensis* Doct. Med. & apud *Camberienses* Practici, *Nova Febris Idæa*, seu *Conjecturæ Physicæ circa Febris Naturam*. *Genevæ* 1700. 8vo.
- n. 283. p. 1312. 4. An Abstract of Dr. *R. Mead's* *Mechanical Account of Poisons*; by Mr. *Sam. Morland*.
- n. 337. p. 101. 5. An Abridgment of a Book, intituled, *A Description of the Plague at Dantzick in 1709*. Written in *High-Dutch*; by Dr. *John Christoph. Gottwald*. Translated by Dr. *C. J. Sprengell*, M. D. CHAP.



C H A P. VII.

*The Bones, Joints, and Muscles.*

I. **A**T Bolton (eight Miles from Manchester) lives one Nathanael Hulme, about seventeen Years of Age, who had the Small-Pox when he was about eight Years old; soon after which he had a great Itch, almost to the degree of a Leprosy, with which his Finger-nails and Thumb-nails began to grow thick, and by degrees harden'd into Horns; which grew in seven or eight Months to the Length of an Inch, and some almost two Inches, and some much longer. It began in the Fore-finger of the Left-hand, and so proceeded to all the rest of that Hand, which had as many Horns as Fingers and a Thumb. All which Horns about the End of twelve Months fell off by degrees; that which grew first falling off first, without any Pain, unless when cut off, as they were at first, there appearing great Quicks (as they call them) or Roots under the Nails. By degrees they came on the Thumb, and then on the Fingers of the Right-hand; which grew to the same Length in about a Year's time, and then fell off, he having shed them five or six several times. One of the Horns that grew on the Ring-finger of the Left-hand was a quarter long. They are at present all come off his Left-hand, but are growing again; that on his little Finger is two Inches long.

*An Account of Horn-like Excrescences on the Fingers; by Dr. R. Wroe. n. 297. p. 1899.*

This Account I took of him above two Years since in 1702; and have seen him frequently since, and lately, and the Horns still grow and fall off as usual.

At present [October 1704.] all the Fingers of both Hands are arm'd with Horns, as are also all his Toes, which he keeps cut that he may be able to wear Shoes. I saw him a few Days since, and think he cannot live long, being miserably overspread with his Leprosy.

One of the Horns above-mention'd is in the Repository of the Society.

II. The Circumference of Scull, according to its Length, is 26 Inches, and according to its Breadth 23 Inches.

*Of Human Bones of an Extraordinary Size, by Mr. W. Cheselden. n. 333. p. 436.*

The greatest Diameter of each *Os Innominatum* is 12 Inches.

The left *Os Femoris* is 24 Inches long, having only one (and that the great) *Trochanter*.

The right *Os Femoris* is 23 Inches long, having three *Trochanter* Processes.

Each *Tibia* is 21 Inches long.

If all the Parts bore a due Proportion, this Man must have been eight Foot high.

These Bones were found near an Urn, inscrib'd *Marcus Antoninus*, in the place of the Roman Camp near St. Alban's in Hertfordshire.



Of a Callus  
supplying the  
Loss of part of  
the Os Fe-  
moris; by  
Mr. B. Sher-  
man. n. 323.  
p. 451.

III. 1.] A Compound Fracture happen'd on the Thigh of a young Man about seventeen: I was oblig'd to take out the whole Substance of the *Os Femoris* for about two Inches; and yet, by keeping a due Extension, Nature in four Months time supply'd such a *Callus*, that the Part is not a quarter of an Inch shorter than the other Side; and the Person is as strong as ever, and walks without any Lameness.

Of a Callus  
supplying the  
Loss of part of  
the Os Hume-  
ri; by Mr.  
J. Fawler.  
n. 312.  
p. 2466.

2.] *John Marsh* of *Denton* in *Kent* (about 16 Years old) was troubled with a Tumour on his Arm in the End of a Continual Fever, which seem'd to be a Critical Discharge of the Humour of the Fever on his Arm: He was managed by a Surgeon of that Place for two Years for this Tumour, and there being no Appearance of a Cure, he was sent to me. At first dressing, I found two *Sinuus Ulcers* in his right Arm, one upwards about the *Deltoid* Muscle, and the other on the under part of his Arm, within an Inch and a half of the Juncture of the *Cubitus*; the *Sinus* above passing upwards within an Inch and a half of the Juncture, and downwards to the *Cubitus*. The *Sinus* of the lower Part pass'd downwards to the *Cubitus*, and upwards about an Inch and a half. When both these *Sinus's* were laid open, the Bone soon show'd itself carious and loose, so that I easily took it out, (*Fig. 179.*) and it was about five Inches long.

Fig. 179.

Three Weeks after, there came off another Spelt of the Bone of the inner Side (*Fig. 180.*) about two Inches long, having the Channel of the Marrow. These Ulcers with much Care and Diligence were cured very well in nine Months: And the Place of the Bone is so well supplied with a strong *Callus*, that he is not only very strong, but can lift 50 Pound Weight with that Arm.

Fig. 180.

An Observa-  
tion on a Fra-  
cture of the  
Neck of the  
Thigh-bone;  
by Dr. J. Dou-  
glas. n. 349.  
p. 501.

IV. The Fracture of the *Os Femoris* near its Neck, is often mistaken for a Luxation of the Head of the same Bone, the globular Head being still retain'd close in the *Acetabulum Coxendicis*.

An old Woman turn'd of fourscore, fell from her Chair, and suffer'd a Fracture in the upper part of the Thigh-bone. The Fracture was not only oblique, near the Neck of the Bone; but each *Trochanter* (*i. e.* the two *Processes* near its *Cervix*) were likewise broke short off; and were drawn up almost as high as the Head of the Bone itself, by the strong Contraction of the *Glutæi* and other Muscles. The Woman liv'd three Weeks after it, and though it was never reduc'd, yet she complain'd of very little or no Pain.

Amongst all the *Writers* in Surgery and Anatomy, I know but three who were appriz'd of this Mistake, Mr. *Ambrose Parey*, Dr. *Ruysch*, and Mr. *Chefelden*: But if we consider the Depth of the Articulation, the wonderful Strength of the Muscles that surround it, the many strong Ligaments that bind the Head within the Socket, the Smallness of the Neck of the Bone, its porous and spongy Substance, which makes it much weaker than the rest, and last of all the disadvantageous oblique Position of this Neck, which exposes it the more to outward Accidents; it will plainly



plainly appear that a Fracture can much more easily happen, than a Dislocation in that Part from an external Cause.

V. Mr. *Vandenbeyde*, a Surgeon of *Ostend*, procur'd me the Sight of the largest Tumour I ever yet saw. The Tumour is of a schirrous Nature, springing from the Thigh-bone, somewhat tending to that of a Cancerous. It first took its Rise about two Years ago, in a Child of ten Years old, just above the *Patella*, without any evident Cause; and hath, notwithstanding all possible Care, expanded itself so, that it now occupies the whole Thigh to the very Groin, and has extended itself to above a *Dutch Yard* in Circumference. It increases very much daily, and must soon exhaust the Patient's Strength. The Surgeon intends to open him after he is dead, and to send an Account to Dr. *Ruysch*.

Of a large Tumour on the Thigh, by Mr. C. Amijand. n. 317. p. 172.

VI. 1.] The Wife of *Thomas Steven* of *Maidenhead* in the County of *Berks* (aged about 62 Years) was seized with a Fever about the latter End of *November* 1697. Her Physician used various Remedies to remove her Fever, which in about fourteen Days terminated in a Tumour and Numbness in her left Foot, both which did by degrees creep up her Leg, and half way up her Thigh. A Fomentation was order'd by her Physician made of *Centaur. Absinth. Hyperic. &c.* boil'd in a strong *Lixivium*; and after fomenting, he order'd them to anoint her Foot and Leg with *Ol. Terebinth.* wherein *Galbanum* was dissolved. This Method they had used daily for a Month before I saw her, which was on *Jan. 3, 1678.* I then found her in the following Condition; (*viz.*) Her Foot and Leg cold, insensible, wither'd, hard as if dry'd in a Chimney, and a dark rawney Colour. Her Knee was swell'd, and had several large black Spots upon it, which pitted when press'd with my Finger. There were several Discolourations in the Skin, half way up her Thigh. She complain'd of great Pains, especially at Nights, in her Knee and Thigh, yet could not feel me when I touch'd those Parts. Her Fever was now increased again, and she was delirious sometimes. She begg'd heartily of me for Help; but I could propose nothing but the taking off her Thigh, which she would not consent to. I was not sorry for her not admitting of that Operation, because I could not expect any Success in the performing it, by reason of her Age, Weakness, &c. So I took leave of her, supposing I should never see her more. I advis'd her Friends to continue the use of the Fomentation, which they did almost Night and Day. About a Month after, coming to *Maidenhead*, I was surpriz'd to find this Woman alive. There was now a Discharge of black foetid Matter, at a small Orifice about the middle of the Inside of her Thigh, which Orifice I enlarged to make a better Discharge for the Matter. I likewise cut into a Tumour that appear'd upon her Knee, but found nothing in it but Wind. I then took my leave of her, (as before) advising to continue fomenting daily. About a Month or 5 Weeks afterwards, I came to *Maidenhead* again, and found her

Of a strange Gangrene in the Thigh, &c. by Mr. Calep. n. 313. p. 41.



her alive; and to my Admiration found, that Nature had made a perfect Separation of the mortify'd Flesh from the sound, quite round the Thigh, the Bone of the Thigh lying wholly bare above the breadth of 4 Fingers, and deprived of its *Periosteum*. The Flesh above was fresh and florid, and had good white Matter upon it. I persuaded her to let me take off her Thigh, which I did about two Fingers breadth in the sound Flesh, (because the Flesh ran tapering down to the Bone), by which I made the Stump pretty even. The Bleeding was little, by reason that the Veins and Arteries (which were eaten asunder by the mortifying Matter) Nature had closed again. I dress'd the Stump with *Pulv. Restring.* mix'd with *Album. Ovor.* spread upon Pledgets, and dipp'd in *Ol. Terebinth.* hot. The next Dressings I used Digestives, and perform'd the rest of the Cure according to the Rules of Art. The Woman is alive to this Day. I would have preferred this Leg to have dissected it, but the Friends of the Woman deceived me.

— On the same, by Mr. W. Cowper. *ibid.* p. 43.

2.] About the Beginning of *October*, 1707, I happened to be at *Maidenhead*, where I saw the Woman whose Case is here related; she appear'd to be very decrepid, and would have shewn me the Stump of her Thigh bare, but the Coldness of the Weather, she said, would make it uneasy to her. I felt it thro' her Cloaths, and the End of the Stump seem'd to be not above four or five Inches below the Trunk of her Body.

\* Vid supra, p. 337.

Since I have so frequently found the large Trunks of the Arteries of the Thighs and Legs of aged People petrified, as I have mention'd in the *Transactions*\*, and most commonly in those who have had Gangreens in the Legs, &c. I am apt to suspect the like happen'd in the Crural Artery of this Woman; which, like a Ligature, did at length put a total Stop to the Influent Blood below that Stricture.

*Observations on the Fibres of the Muscles, &c. by Mr. Leeuwenhoeck.* n. 339. p. 55.

VII. 1.] I have made some Observations on the Membranes with which the *Fibrillæ* of the Muscles appear to be encompassed, both in the Flesh of a Whale, Cod-fish, Salmon and Smelt; and also in that from an Ox to a Mouse; in all which the Appearance was the same.

The Flesh of the Whale, was a small Piece cut off near the Tail of the Fish, which I desired a Sea-Captain to bring me, that I might observe how the Flesh in that Part was joined to the Tendons in so large an Animal. Viewing this thro' the Microscope, I judged the Fibres thereof to be four times as large as those I had formerly observ'd in another Piece of Whale's Flesh, taken from another Part of the Fish; which made me consider, whether the Flesh of that Part might not be, by Nature, furnished with larger Fibres for its greater Strength.

Cutting the said Flesh-parts length-wise, and a-cross the Fibres, I discovered more plainly than before, that each Particle or Flesh-fibre was enwrapp'd in a fine thin Membrane.

To have a better Idea of these Flesh-fibres of a Whale, I cut a thin Slice of it a-cross, which I laid on a wetted Piece of Glass, that the Flesh

which



which was very dry and shrunk, might, by the Moisture be swelled, and thereby distended to the natural Size it had when on the Body of the Fish itself. In this State, placed before the Microscope, it appear'd as in *Fig. 181.* in which the Parts were so close together, that their encompassing Membranes, represented by the black Lines, were but just discernable, some whereof appear'd larger than others: these, if attentively viewed, seem'd plainly to be divided into Multitudes of others, cut also transverse, the Bigness of which was no larger than a common Sand to the naked Eye. These were so close crowded together, that their Figure was very irregular, as well as their Sizes different; for tho' each seem'd encompassed with six others, yet some of them were twice as large as the other.

Having formerly mention'd the Slenderness of these *Fibrillæ* in the Flesh of a Whale, and judging these, as I said before, to be four times as large, I took a thin Slice of the formerly mention'd Whale-flesh (which I had still kept by me) and after having made it thoroughly wet, I viewed it with the same Microscope, as I had done this of the Tail. This appear'd as is represented *Fig. 182.* Letting the Moisture dry away from these Slices, so stuck on the Glass, the Particles became much smaller, and the Membranes with which each was encompassed, became very visible; that is, those which were not shrunk away; which was a very entertaining Object: and as often as I made new Cuts, a new Object presented itself.

A small Particle of this Flesh I caused to be drawn, as in *Fig. 183.* These Particles seem'd to touch and be joined to others; but now being dried, they shrunk in from the Membranes round about them; for the Membranes could not shrink, because they were all joined to one another.

Along these Flesh-fibres there run some such thick Membranes, that they equal the Thickness of a Hair or more, which are scarce distant the breadth of a Sand from each other; from these larger Membranes other Parts are spread, dividing each Fibre into numerous *Fibrillæ*; so that it may be said, each Flesh-fibre, no bigger than a Hair, is a little Muscle encompassed in its peculiar Coat or Membrane. Whereas the Designer had not the same Apprehension of the Size of these Fibres, as I and some other Persons had; I made him draw a little Piece as large as it appear'd to my Apprehension, as in *Fig. 184.* whence appears the Difference of one Man's Sight from another.

I have also often seen some few of these Fibres, tho' joined to others, yet but one Fourth of their Bigness to which they were joined.

When I again moisten'd those represented in the 183<sup>d</sup> and 184<sup>th</sup> *Figures*, (dry'd up and shrunk) they would be again so swelled and distended, as to fill up the Spaces between the Membranes, and reassume the Shape they had before they were dried. Among several little Pieces of Flesh placed before another Microscope, and moisten'd as before, there was one, whose Particles were not separated upon drying, which I supposed to be, from the splitting and tearing asunder of a large Membrane that run thro' the middle of it, as may be seen in *Fig. 185.* where between *S T* and *V*, the dried Particles remain unseparated; these being cut a little thicker, appeared



appeared also of a darker Hue, and if they had been sliced yet thicker, would have appear'd of a dark red. By *SW* is represented the thick Membrane dividing this Piece, which was about the Bigness of a Hair; this at *T* sent out a Branch, and near *W* is split into two: I apprehend that a great Number of Blood-vessels are spread over this Membrane, which by their Smallness are not visible; for it is by these the Nourishment is convey'd. Between *RS* and *QW*, the exceeding fine Membranes torn from the great are visible.

Is it not amazing that in such vast Animals as a Whale, such exceeding small *Fibrillæ* should be found? Nay, such they are in small Animals; and that the whole 185<sup>th</sup> Figure is not so large as a coarse Grain of Sand?

This Whale was so large, that the upper Part of its Body yielded 60 Quarteels of Blubber or Fat, which allowing 30 *Rotterdam* Stopes (making each about 3 *English* Quarts) to one Quarteel, it will nearly amount to 24000 Pound weight; beside, there is a very great deal of Fat about the Entrails.

Fig. 186.

Then I caused a very little Piece, consisting only of five *Fibrillæ*, to be drawn lengthwise, as they were seen thro' the Microscope, as (in *Fig. 186.*) in which Figure at *A*, and a little at that Place, it is divided into two *Fibrillæ*. Between *C* and *F*, are to be seen the little Membranes which encompass the *Fibrillæ*, which are here torn asunder.

I have frequently observed these Flesh-fibres lengthways, to be as it were corrugated or wrinkled, which I imagined to be the Representation of their Rest or unbent Posture; and yet more, when the Part to which they belong is bowed together, or brought nearer; but when the Muscle is extended, and its Antagonist acts, there is not the least Wrinkle observable in these *Fibrillæ*.

Fig. 187.

However, all the little Inequalities in these *Fibrillæ* must not be taken for those Corrugations, since many of them are only the Particles torn off from the Membranes which encompass the *Fibrillæ*.

*Fig. 187.* Represents four little Fibres of a Piece of Whale's Flesh I had procured two Years since; this I caused to be drawn, to shew the Difference. By the two Figures 186 and 187, it is visible that the Diameters of the Fibres are as big again in one, as in the other; therefore the Fibres must be four times as big in *Fig. 186*, as in *Fig. 187*. Now each Flesh-fibre being composed of a great many smaller *Fibrillæ*, we may imagine each of these in-lying Fibres do likewise consist of others of the like nature.

I have a-fresh viewed several small Fibres of Ox-Flesh, and observed, that each of the *Fibrillæ* in them was encompassed with a thin Membrane. But I cannot shew these Membranes so clearly to other Persons in Cows-Flesh, as in Whales-Flesh, because the Parts of the former are of a much more compact and close Texture than that of the Whale, from whence they do not shrink so much in drying.

I am of Opinion, that what I have said of the Membranes (encompassing the Fibres and *Fibrillæ*) of the Flesh in a Whale, will likewise hold true in other kinds of Flesh; yea even down to that of a Rat or a Mouse; concerning which I shall prosecute my Observations.



2.] Mr. Muys, of *Franequer*, has made several Discoveries in the Mechanism and Texture of the Muscles of Animals; of which these are some. He has observed, that the fleshy Fibres of the Muscles are composed of other small Fibres, which he calls *Fibrillæ*; that these *Fibrillæ* are of the Size of a slender Hair, and that 500 or 600 of them may be counted in one fleshy Fibre, whose Diameter is no more than the 24<sup>th</sup> Part of an Inch. That each of these *Fibrillæ* also is made up of more than 300 little transparent *Tubuli*, but so slender, that if a Blood Globule (which according to Mr. *Leeuwenboeck*, is but the 1,000,000<sup>th</sup> Part of a Grain of Sand) were divided into 24 Parts, one of these could hardly pass thro' these small Pipes.

*Observations on the Texture of the Muscles by Mr. Muys. Extracted from the Journal Litteraire, for 1714. ibid. p. 59.*

He has shewn, that tho' the fleshy Fibres of the Muscles, are joined to the Tendons, and tendinous Membrane of a Muscle; yet these tendinous Fibres are not a Continuation of the fleshy ones, as most Anatomists suppose; which he proves thus: If by means of a wooden Knife, or only by pulling it, you separate the fleshy Fibres from the Tendon, the End of the Tendon to which they were joined, will remain smooth and even, and not rugged.

Having made several Injections of warm Water into the crural Artery of a Lamb of a Year old, all the fleshy Fibres lost all their Redness, and became entirely white. The Fibres being whiten'd by this Injection, he injected a coloured Liquor by the same Artery; and then not only the small Arteries appeared filled with this tinged Liquor, but he found also that the Liquor pass thro' each Fibre, either in a serpentine manner, or undulating, or framing several Angles, or joined by a great Number of *Anastomoses*.

He observed also, that many small Branches of the Arteries, which before could not be seen, appeared visibly, spread all round the little *Fibrillæ*, and tinged with the same Colour.

Having remarked, that the Parts of the fleshy Fibres, which were near the Extremities of the Arteries, appeared tinged with the Liquor; he examined them with a Microscope, and found the little *Fibrillæ* filled and tinged with the same Liquor; and yet there was not the least Appearance of the Liquor in the *Interstices* between the *Fibrillæ*.

Having made Injections by the crural Artery, of another coloured Liquor, in the Muscles, whiten'd, as before, with Water, he saw not only the Fibres in some of the Muscles, and the most part of them in the others filled with this Matter; but having examined them with a good Microscope, he found the *Fibrillæ*, and even the least *Tubuli* which compose them, filled and tinged with the same Matter; and nevertheless the small Ramifications of the Nerves appeared perfectly white.

It results from these Observations,

1st, That the little Tubes, which make a *Fibrilla*, are really hollow, and that the Extremities of the Capillary Arteries open into them, and empty there a Part of their Liquor, which is re-conveyed by the Veins to the Heart.



2d, That the Blood Globules must be divided into an almost infinite Degree of Smallness, before they can enter and pass these *Tubuli*. That the Blood Globules may be so divided, and when so divided pass thro' the small *Tubuli*, is evident from the Redness of the Fibres and *Fibrillæ* of Animals, which have a red Flesh; which will be no Surprize to them who have read Mr. *Leeuwenhoeck's* Letter 42, where he says, that these Globules do divide themselves after this manner, to pass thro' the last Extremities of the Capillary Arteries of the Brain; nor to those who know, that the Globules are extremely soft and easily separable, as Mr. *Muys* has evinc'd by Arguments grounded on very curious Observations.

Mr. *Muys* has also made several Discoveries of the Course and Ramifications of the *Nerves* in the Muscles.

He has also found out a way to separate the *Salts* in Human *Blood*, without any *Cymical* Analysis, and without making them undergo any Change, and to form them into *Crystals*, visible without a Microscope; as he has shewn to his Students in Physic.

#### VIII. Account of Books omitted.

n. 291. p.  
1597.

1. Epistola D. *Guilbelmi Musgrave*, S. R. S. in quâ Ratio redditur Libri nuper Editi, cui Titulus, *De Artbritide Symptomaticâ Dissertatio*. Auctore *Guilbelmo Musgrave*, M. D. Coll. Med. Lond. & R. S. Socio, 8vo.

n. 310. p.  
2435.

2. Epistola, in quâ Ratio redditur Libri nuper Editi, cui Titulus, *De Artbritide Anomalâ sive Internâ*, Dissertatio. Auctore *Guilbelmo Musgrave*, M. D. Coll. Med. Lond. & R. S. Socio, 8vo.

### CHAP. VIII.

#### Pharmacy. Chemistry.

A Problem  
for finding the  
true Doses of  
Vomiting  
and Purging  
Medicines.  
Propos'd  
March 1704  
by Dr. W.  
Cockburn, n.  
293. p. 1752.

I. 1.] EXPERIENCE informs us how different the Operations of Medicines are, according to the Variety of Temperaments, Ages, and the different States of the same Age. But the Operations of Emeticks and Purgatives are more conspicuous: So that the same which purges grown People but very mildly, is too much for Children: And Catharticks which to Day are but a just Dose, to Morrow may be too little or too much for us. Nay, those which differ only in Temper may exhibit all this Variety.

Since then there is such an unconquerable Difficulty in assigning the due Dose of evacuating Medicines; a Method were to be wish'd for, by which we might administer the same without this Uncertainty.



The Author has investigated this Method by demonstrative Arguments, and has committed the same sealed up to the Care of our President.

Yet he intreats all Physicians to inquire what may be this or a like Method, that we may be directed herein without Error; and he will wait for their Solutions 'till the Calends of *March*, 1705-6. which then he will publish with his own.

2.] To determine the more justly what are the different Doses of Emetic and Purging Medicines, according to the Variety of Temperaments and Ages, we must first suppose, that no such Medicines can operate, before they arrive at the Mass of Blood, and are intimately mixed with it. For it is plain, that 'till they excite a Nausea, no sensible Effect is produced by them for a long time after they come there. Secondly, their more general Effect is, some Alteration of the Temperament of the Blood, and of the other circulating Juices.

— Solv'd by  
the same, n.  
302. p. 2119.

From these two Postulates we conclude, that, when the Crasis of the Blood is the same, the Doses of the Medicines to produce some certain Effect ought to be proportional to the quantity of Blood. For if some certain Dose is required to alter to a certain Degree the Crasis of one Pound of Blood, for Instance; then a double Dose is required to alter two Pounds to the same Degree, a Treble for three Pounds, and so on. And universally, if the Quantity of Blood  $b$  require the Dose  $d$ , the Quantity of Blood  $m b$  will require the Dose  $m d$ ; for it is  $b : d :: m b : m d$ .

*Coroll.* Since the Quantity of Blood, and the other circulating Humours, may be rightly estimated from the Weight of the Animal, (for the Parts which we call solid are only the Canals containing those Humours), it follows thence, that the Quantities of Doses, when other Things are like, are proportional to the Weight. Therefore the Dose of a Medicine to be given to a new-born Infant, is to a Dose of the same for a full aged Man, as the Weight of the Infant to that of the Man. For Example, 30 Grains of *Pilulæ Rudii* are commonly given to a Man at one Dose, and the usual Weight of a Man is 160 Pounds, and of Infants 12 Pounds. Wherefore as 160 the Weight of a Man to 12 the Weight of an Infant, so are 30 Grains the Dose of Man, to  $2\frac{1}{4}$  Grains the Dose of an Infant. And as the Infant grows bigger, the Doses of Medicines are always to be increased in the same Ratio. Afterwards the Doses to be given continue the same to the Age of 50; after which Time the Quantity of Blood and the Strength continually decrease, in which Proportion also the Doses of Medicines are to be lessened.

By this way of reasoning we have suppos'd, that all Men are endued with the same Temperament, and also that the Increase and Order of the Secretions are the same when the Number of Years is equal; for this is the simplest way of considering this Matter. But as the Temperaments or Constitutions of Men are very different, according to the different



Crafsis of the Blood and circulating Humours, the Quantities of Doses must not always be proportional to the Weight of the Body. This different Temperament of the Blood consists in a certain Disposition of the Parts to cohere together, by which the Blood becomes more or less fluid. From whence it proceeds, that the Operation of Medicines upon the Blood is different, according to the different Degrees of its Coherence. For let us suppose there are two Men having an equal Quantity of Blood, the Degrees of the Coherence of which are different. It is plain that Medicines will more easily mingle with the Blood of the more lax Texture, than with that of a more firm Coherence. And the Aptness which the Parts of Medicines have of mixing with the Particles of the Blood, is always as its Fluidity directly, or reciprocally as the Tenacity of the Blood, and the Efficacy of the Medicine upon the Blood will also be in the same Ratio. Therefore, that a Medicine may operate equally upon Men of this different Temperament, Doses must be given that are proportional to the Tenacity of the Blood; supposing that the Blood circulates in both with equal Velocity. But if the Velocity of the Blood be different, the Operations of Medicines, that is, the Quantity of the Secretions produced by them, will be as the Velocity of the Blood. For the Secretions in any Gland in a given Time are always as the Quantity of Blood which is brought to that Gland in that Time, which is as its Velocity. Also the Velocity of the Blood, when other Things are alike, is always as its Fluidity, or reciprocally as its Degree of Coherence. If therefore the Velocity of the Blood were only to be consider'd, in this Case the Quantity of the Doses for producing the same Effect will be directly as the Degree of Coherence in the Particles of the Blood.

*Prop. I. In two Men having an equal Quantity of Blood, but which differs in the Degree of Coherence, the Doses of Vomiting and Purging Medicines, which are necessary for producing the same Effect, are in a duplicate Ratio of the Degrees of Coherence of the Blood.*

For when the Blood moves with the same Velocity, the Quantity of the Dose must be as the Degree of Coherence; and if the Degree of Coherence is the same, the Quantity of the Dose is reciprocally as the Velocity; so that when neither the Coherence nor the Velocity are the same, the Quantity of the Dose must be in a Ratio compounded of the direct Ratio of the Degrees of Coherence in the Blood, and the reciprocal Ratio of the Velocity. But the reciprocal Ratio of the Velocity is the same as the direct Ratio of the Tenacity or Degrees of Coherence. Therefore the Quantity of the Dose is in a Ratio compounded of the Degrees of Coherence; and the Degrees of Coherence, that is, the Doses to be given are in a duplicate Ratio of the same.  
Q. E. D.

*Prop. II. The Quantity of Doses to be given to Men of a different Quantity of Blood, which also is endued with different Degrees of Coherence,*



*is in a Ratio compounded of the Ratio of the Weight of the Men, and the duplicate Ratio of the Degrees of Coherence.*

For when the Degrees of Coherence are the same, the Quantity of the Doses is as the Weight of the Men. And when the Weight of the Men is the same, the Quantity of the Doses is in a duplicate Ratio of the Degrees of Coherence. Therefore when neither of them is the same, the Quantity of a Dose is in a Ratio compounded of the Ratio of the Weight of the Men, and a duplicate Ratio of the Degrees of Coherence. *Q. E. D.*

*Coroll.* Hence when we know the Quantity and Quality of the Blood in any Man, it will be no difficult thing to determine the Doses that are necessary to purge or vomit him. This Quality or Temper of the Blood is easily found by a skilful Physician from his Pulse, Urine, and other Secretions. So that by observing what Doses will purge a Man of a given Constitution, a Physician with very little trouble may prescribe the Doses that are proper for any Constitution or Temperament.

*Schol.* What has been hitherto demonstrated in general, would likewise follow from the common Hypothesis of Physicians, about Purging and Vomiting. For the Disposition which the Ventricle and Intestines have to Stimulation, is as the Degrees afore-mention'd of the Quantity and Coherence in the Blood. So that even from that Supposition this Truth would be very manifest, though it has not the Simplicity of a Postulate, and for that Reason is not apply'd.

3.] By my Solution of the Problem for determining the due Doses of purging and vomiting Medicines, in all their Cases, it is manifest in general, that these Medicines operate either upon the account of their being mixed with the Blood, or by their stimulating the Stomach and Guts. 2. That this their Operation is more or less, according to the Quantity and Thickness of Blood, *b. e.* a greater Quantity, and the thickest Blood, require the greatest Doses. And, 3. That when the Quantities of Blood are the same, the Doses of Purging and Vomiting Medicines are in a duplicate Proportion of the Blood's Thickness. As also, that in every Case these Doses must be in a Proportion compounded of the Quantity of Blood and those Squares of its Thickness.

Now since the Operations of Purgative and Vomitive Medicines depend so much on the Quantity and Viscidity of the Blood, which have not been duly consider'd before; it is no wonder that the Practice of Physic in these Evacuations has been so uncertain, and that the most expert Physicians, from their most accurate Observations, could never determine the true Doses of Medicines, which alter so much according to the various Subjects they work upon; they not being acquainted with the true Method of determining either the Quantity of the Blood, or the Degrees of its Thickness.

Because Experience is equally the Foundation and Touchstone of all Reasoning in Physic, we will here submit our Solution to common Observations,

*—The Practice of those Medicines; with Tables of the various Doses, &c. by the same. n. 314. p. 46.*

*The Doses of these Medicines why so hard to be found.*



servations, and try whether every thing proposed in it, does not exactly answer Matters of Fact, and the visible Operations of Nature.

The different Effects of these Medicines upon the account of their Forms.

First then, it plainly follows, that these Medicines always purge best and most constantly in a liquid Form; because they are more easily convey'd into the Blood, and can stimulate more Parts, and that upon the account of this their Fluidity; whatever may be the way that Purges and Vomits work, or whatsoever their Nature may be. This explains very easily a very common Observation, hitherto very difficult to Physicians, about the different Operation of the same Medicine in different Forms: viz. Why the Infusion of a due Quantity of a purging Medicine produces its Effects sooner and more constantly than a like Quantity of the same Medicine in a Powder, though still more constantly in a Powder than a Bolus; though still sooner and more constantly in a dry Bolus, than if it be given in Pills made into that Form with Gums that do not purge; and this Difference in purging shall even be notable, according to the Dissolubility of the Gums.

From whence it follows, that the Evacuation made by such Medicines is in Proportion to the Quantity of those Medicines that happens to be dissolv'd, and not to the Quantity administer'd,

Secondly, That purging by Draughts is the most excellent Form, and will always have the most constant Effect.

Their Effects different, because of the different Thickness of Blood.

The next Consideration is, That a certain Quantity of any purging Medicine affects us after a different Manner, according to the different Quantity and Constitution of the Blood, or its Thickness; and it was shewn in the Solution, that if its Thickness were the same, the Dose should always be as its Quantity; but the Blood differing likewise in Thickness, the Doses of Purging and Vomiting Medicines must be augmented on account of its Thickness. This is confirm'd by daily Experience; where we find, that People sick with a manifest Thickness of Blood, as in Dropsies, the Jaundice, &c. take far greater Doses than they did at any other time when they were not sick, or in that Manner.

By a further Disquisition into this Matter, we find that the Doses must not only be greater where the Thickness of Blood is greater, but that they must be increas'd in a duplicate Proportion of their Viscidity. This is evident by the Tables in *Cassia*. viz.  $9 : 83 :: 4 : 33, 1 \text{ } \vartheta, 13 \frac{1}{3} \text{ gr.}$  and therefore *alternando*  $9 : 4 :: 83 : 33, 1 \text{ } \vartheta, 13 \frac{1}{3} \text{ gr.}$  Therefore the Doses are as the Squares of the Constitutions. So likewise  $9 : 83 :: 16 : 143, 13 \frac{1}{3} \text{ gr.}$  and *alternando*  $9 : 16 :: 83 : 143, 13 \frac{1}{3} \text{ gr.}$  b. e. the Doses are as the Squares of the Constitutions.

The same is true in any other Constitution besides the mean: For Example, in the lowest and highest  $4 : 16 :: 213 \frac{1}{3} \text{ gr.} : 853 \frac{1}{3}$ . So that by this means we are not only led directly to a right Use of these Medicines, and are able to find the true Cause why the ordinary Doses produce so very different Effects in different Constitutions; but likewise, *The Quantity of Blood in any Person being given, together with the ordinary and extraordinary Effect of a Dose of a purging Medicine, the Change of that Person's Constitution, and the Nature of that Change, may be determin'd.*

A Problem.



It cannot but be a great Satisfaction to the Mind, to find a Doctrine founded on a few simple Experiences leading us into the Cause of many more that are very complex, difficult, and obscure; which is sufficient to prove its Conformity to Nature. But my present Endeavour being to rectify the common Practice of these Medicines by this Doctrine, I shall frame, by this Method, Tables of the Purging and Vomiting Medicines in present Use; better adapted to Experience than are hitherto to be found.

*This Doctrine true, because conformable to Nature.*

The Method of framing such Tables, is by setting off the practicable Constitutions in the different Ages that I have observ'd to take notable Quantities of Purging and Vomiting Medicines; so that by comparing these Constitutions with the Ages, we have the different Doses in all those Cases, which is all that is required for a better Practice; though a more proper Occasion may produce a more nice and exact Division of Constitutions, very much to the Advantage of the Practice of Physick in all Diseases.

*How the Tables made.*

The Ages wherein these different Doses are taken, I find to be four; when a Man is about 16 or 20 Years of Age, and weighs about 12 Stone, he then takes the common Dose; one of nine Years takes three quarters of that, one of six the half, and one of three Years a quarter.

Moreover it having been shewn, that the notable healthy Constitutions are but three, as also the notable Pulses of each of these; let then these Constitutions be as 2, 3, 4. That of the most fluid Blood, as the first Number, and so on; in that Case, the Dose of any Person will be found by multiplying the common Dose for his Age into the Square of his Constitution, and dividing by the Square of the middle Constitution. For Instance: If  $\mathfrak{zj}$ . *Cassia* is the common Dose, or the Dose of the middle Constitution,  $\mathfrak{ziii}$ .  $\mathfrak{ss}$ . and  $gr. 13 \frac{1}{2}$  is the Dose of the first Constitution, and  $\mathfrak{xxiv}$   $gr. 13 \frac{1}{2}$  that of the grossest or last Constitution; and so proportionably for every Medicine in all the Ages, as appears by the Tables.

*† Oecon. anim. p. 51. Biblioth. Anatom. p. 1124. Tom. 2.*

This Method seems to answer so exactly, that there is not any thing necessary besides, except a Person is more loose or costive than ordinary (which may be known from the Patient) or otherways it is to be reputed the same, as if he had taken an equivalent Quantity of a Medicine proper to produce these Effects. Any Physician, who has consider'd this Case in some People after Fluxing, will allow the Justness of this Exception.

*One Exception.*

As Vomiting Medicines have the same common Doses with those that Purge, they admit also of the like divided Doses; which, therefore, may be found by the same Tables. Only, as People that are more costive than ordinary, require a proportionable greater Dose of a Purging Medicine; so they require their Dose of a Vomiting Medicine to be considerably less, as is very well known in hot Countries.

*The Doses of Vomiting Medicines.*

It must be observ'd, that in the Tables, *Age* stands instead of *Quantity of Blood*; because they increase pretty equally, and it makes the Practice more easy to such as are not accusom'd to Weights and Numbers. And,

The more Skilful are desired to observe, that in the mean Ages, multiplied into the mean Constitutions, give Doses more nicely.



	Medicines.	Ages.	Constitutions			Doses.						
			3	3	Gr.	3	3	Gr.				
Medicines whose common Dose is ʒj.	Cassia, Catholicon, Diacarth. Elect. lenitiv. Succus rad. Irid. — Fumariæ. Syrup. de Rhamno. — de Pomis magistr. — Rosar. cum Helleb. Tamarind. Sal cathart. amar. — Mirabile. Man. ʒij. Emetica Vin. emet. seu Bened. Succ. Asari. Senecionis.	16	2	3	1	13 1/3	9	2	2	0	6 2/3	
	3		8	0	0	3		0	0			
	4		14	0	13 1/3	4		10	2	0		
	6	2	1	2	6 2/3	3	2	0	0	13 1/3		
		3	4	0	0		3	2	0		0	
		4	7	0	6 2/3		4	3	1		13 1/3	
	16	2	1	2	6 2/3	9	2	0	2	13 1/3		
		3	4	0	0		3	2	0	0		
		4	7	0	6 2/3		4	3	1	13 1/3		
	Common Dose ʒβ.	Confect. Hammech. Elect. Caryocostin. Diaphænicon. E succo Rosarum. Emet. Syrupus emeticus.	9	2	1	1	0	6	2	0	2	13 1/3
		3		3	0	0	3		2	0	0	
		4		5	1	0	4		3	1	13 1/3	
	3	2	0	1	6 2/3	3	2	0	1	6 2/3		
		3	1	0	0		3	1	0	0		
		4	1	2	6 2/3		4	1	2	6 2/3		
Common Dose ʒj.	Agaric. Aloe. Carthamus. Ebuli sem. — Cortex. Hermodact. Mechoacan. Pil. Aggregat. — Coch. maj. — Fetid. — sine Quibus. Pulv. Diasennæ. Rhabarb. Soldanel. Senna. Turbitb.	16	2	0	1	6 2/3	9	2	0	1	0	
	3		1	0	0	3		0	2	5		
	4		1	2	6 2/3	4		1	1	0		
	6	2	0	0	13 1/3	3	2	0	0	6 2/3		
		3	0	1	10		3	3	0	0	15	
		4	0	2	13 1/3		4	0	1	6 2/3		
	16	2	0	0	13 1/3	9	2	0	0	6 2/3		
		3	0	1	10		3	0	0	15		
		4	0	2	13 1/3		4	0	1	6 2/3		
	Common Dose ʒβ.	Falappa. Julijugland. Lap. Lazuli. — Armen. Opoponax. Pil. Coch. min. — de Gut. Gamandra. — Rudii. Pul. Warvicens. Sagapen. Emet. Rad. Ipecacuana.	9	2	0	0	10	6	2	0	0	6 2/3
		3		0	1	2 1/2	3		0	0	15	
		4		0	2	0	4		0	1	6 2/3	
	3	2	0	0	3 1/3	3	2	0	0	3 1/3		
		3	0	0	7 1/2		3	3	0	0	7 1/2	
		4	0	0	13 1/3		4	0	0	13 1/3		



Medicines.	Ages.	Constitutions	Doses.			Medicines.	Ages.	Constitutions	Doses.													
			3	3	Gr.				3	3	Gr.											
<p><i>Common Dose is</i>  <i>Resina Jalap-                  pæ. Extr.                  rhabarbari.                  Pil. de Her-                  modactylis ℥ij.                  Pulv.                  Cornach. ℥ij.                  Emet. Gilla                  vitrioli.</i></p>	16	}	2	0	0	8	<p><i>Common Dose                  Gr. 3.</i></p>	<p><i>Emet. Hep.                  Antimon.                  Vitr. Antimon.                  Merc. vitæ                  Tart. emet.                  Merc. præc.                  per se.                  —Solar.                  —ruber.                  Hercules                  Bovij.</i></p>	<p>2 3 4</p>	<p>0 0 0</p>	<p>0 0 0</p>	<p>1 <math>\frac{1}{3}</math> 3 5 <math>\frac{1}{3}</math></p>										
			3	0	1	0							9	}	2	0	0	1 $\frac{1}{3}$				
			4	0	1	15 $\frac{1}{2}$													6	}	2	0
	2	0	0	6 $\frac{2}{3}$	3	}							2	0	0	1						
	3	0	0	15													16	}	2	0	0	2 $\frac{1}{4}$
	4	0	1	6 $\frac{2}{3}$																		
	2	0	0	4 $\frac{4}{5}$	16	}							2	0	0	2 $\frac{2}{3}$						
	3	0	0	10													3	}	2	0	0	1 $\frac{1}{2}$
	4	0	0	17																		
	2	0	0	2 $\frac{2}{5}$	3	}							2	0	0	1 $\frac{1}{3}$						
	3	0	0	5													16	}	2	0	0	1 $\frac{1}{3}$
	4	0	0	8 $\frac{8}{9}$																		
2	0	0	2 $\frac{1}{3}$	16	}	2	0	0	1 $\frac{1}{3}$													
3	0	0	6							3	}	2	0	0	1 $\frac{1}{3}$							
4	0	0	10 $\frac{2}{3}$													3	}	3	0	0	1 $\frac{1}{3}$	
<p><i>Common Dose                  Gr. 6.</i></p>	9	}	2	0	0	2	<p><i>Colocynthidis                  Euphorbium                  Esulæ Cortex.                  Elaterium                  Gum Guttæ                  Gran. Gnid.                  Ricini sem.                  Scammon.                  Tr. Alband.                  Emet.                  Croc. Rulandi                  Turbith mine-                  rale.</i></p>	<p>2 3 4</p>	<p>0 0 0</p>	<p>0 0 0</p>	<p>0 1 <math>\frac{1}{2}</math> 2 <math>\frac{2}{3}</math></p>											
			3	0	0	4						6	}	2	0	0	0					
			4	0	0	8												3	}	2	0	0
	2	0	0	1	3	}						2	0	0	0							
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	4	0	0	1 $\frac{1}{2}$																		3
	2	0	0	0	3	}						2	0	0	0							
	3	0	0	1 $\frac{1}{2}$												3	}	2	0	0	0	
	4	0	0	2 $\frac{2}{3}$																		3



*Authors Copy, but do not Observe.*

The Doses of the foregoing Tables, arising from Calculation, agree perfectly well with the common Observation of the best Authors; tho' their Observation is very general and ill made, if we except the very first Steps. For instance, Authors of all Countries, *English, Dutch, German, Italian and French*, reckon the Doses after the same manner; whereas, if they had been observ'd, they must have been different as are the Constitutions of Men in the different Countries.

The Defect of their Observation is manifest by the disproportion'd Doses of some Medicines, their high Doses being sometimes double and sometimes triple, and more of their low Doses, which is not conform to Nature; for, let the low Dose be what it will, the high Dose of one Medicine must always bear the same Proportion to the high Dose of another, as did their low Doses, *viz.* even in Manna, they reckon it from  $\text{ʒj.}$  commonly to  $\text{ʒiii.}$  and  $\text{ʒiv.}$  If it is said that the first Dose is the lowest Dose that is taken by a Man of a due Age, it is neither true in fact, nor conform to their own way of reckoning: For Instance, Rhubarb is said to be taken from  $\text{ʒj.}$  to  $\text{ʒij.}$  No body will say that this is the lowest Dose taken by a Man of a due Age as formerly, because it is not in fact true; nor that the high natural Dose is  $\text{ʒʒ.}$  for if  $\text{ʒj.}$  of Manna and  $\text{ʒj.}$  of Rhubarb are the respective low Doses, then  $\text{ʒiv.}$  and  $\text{ʒij.}$  cannot be the respective high Doses. As to what concerns some extraordinary Doses given by themselves, and far exceeding the ordinary Dose, it is easily accounted for by the Solution. There are many Examples of this Nature: Turbith, *viz.* is commonly reckon'd among them from  $\text{ʒj.}$  to  $\text{ʒij.}$  yet *Margravius*, and good Authors, have given it to  $\text{ʒiv.}$  So *Colocynthis* from *gr. vi.* to *gr. xij.* and *Fulgin. Fernel. Duncan.* say they have given it to  $\text{ʒʒ.}$

*They have only given the Doses for Men at full Age.*

Authors have been far from being exact; for they have only dos'd these Medicines for People of full Age; but have left the Doses of the different Ages in Silence: nor have they told us at what time a Man takes his highest Dose, or how that alters in the Growth and Decline of Age, which is still a very great Difficulty for the most experienc'd Physicians to manage.

*Their Way of determining Doses false.*

Their general Method is founded in a Mistake; their lowest Dose being really the common Dose taken by the Generality of Men, which produces a multitude of Errors in the Practice. This is manifest in their dosing every Medicine.

*This shewn particularly.*

The mention'd Case is more manifest by these Tables, and it is two to one but that a Physician over-purges or under-purges any Person in Health; and if more Cases in Sicknes are suppos'd, the Odds will increase proportionably. Experience confirms this exactly: For if the middle Dose is given to one of the lowest Constitution, and the middle Dose is to purge 7 or 8 times; in that Case, the Person of the lowest Constitution is purg'd near twice as much as he ought to be; and if given



given to one of the highest Constitution, he is purg'd but half of what he should be. But if the Dose of the highest Constitution is given to one of the middle Constitution, he is purg'd twice as much as he ought to be; and if given to one of the lowest, he is purg'd four times as much, or about thirty times, as we find true by daily Experience. But if the Quantity of Blood, the Age, or Sickness contribute to the Error, it may prove fatal. If this Consideration were illustrated by a proper Number of Examples, we should find some hundreds of other-ways unavoidable Mistakes now prevented by the Practice of these Tables.

Lastly, We may easily account, by these Tables, for the Doses of Children, over-purging some People of good Health, and of a due Age; a *Phænomenon* so surprizing, that the Smallness of the Dose is commonly thought a good Excuse for the Mistake.

II. Monsieur *Bolduc* acquainted the Assembly of the Academy (of Sciences in *France*) that he had examin'd the Principles of Purgatives, and began with *Ipecacuanha*, which he said he had endeavour'd to sweeten and qualify, by trying to take away its too great *Emetic* Power. He asserted, that how violent soever *Ipecacuanha* be, yet it is not so dangerous as *Scammony* or *Coloquintida*, which always leave Gripes, and sometimes *Dysenteries*; whereas *Ipecacuanha* leaves only a gentle Astriction after it. He said next, that, having observ'd that the *Emetic* Force of this Root consists in its *Resinous* Parts, he had found out a way to take them from it, and to leave only the *Saline* Parts; that he made use of Spirit of Wine to extract the one, and of Rain-water distilled to draw off the other; that he had afterwards given, with very good Success in *Dysenteries*, this *Ipecacuanha* so despoiled of its *Resinous* Parts. From *Ipecacuanha* he pass'd to *Hellebore*, which is another violent *Emetic*; which he distinguish'd into two sorts, the Black and the White. He said, that ours was not different from that of the Ancients; that the White caus'd mortal Convulsions, for which reason it was not used, and that he had never made any Attempts with it. As for the black *Hellebore*, it is to be observed, that that which comes by the way of *England* is much weaker than that which grows on the Mountains of *Switzerland*; which may well have been the Reason that Physicians have neglected this Remedy. He said, that having put it in a Retort in a Reverberatory Fire, he at first drew off an acid Spirit, next an oily-acid Spirit; thirdly, a violent *Alkali* Spirit came over mix'd with Oil of *Tartar*; and lastly, a foetid Oil. That from the *Caput mortuum* he had, by a *Lixivium*, a fix'd Salt, which fermented with Acids, such as all other Plants give: Besides these Operations, he drew an *Extract* of this Root with Spirit of Wine to get the *Resinous* Parts, and with distilled Rain-water for the *Saline*. He got but very few of the former,

*Of the Principles of Purgatives, &c. by Monsr. Bolduc. n. 278. p. 1099.*



but a great deal of the other ; so that he found that Spirit of Wine was uselefs in this Case. Comparing then the Effects of these Purgatives, he said that the purely *Resinous* purge little, and with much Irritation ; that the purely *Saline* purge only by Urine, but that both join'd together purge very well. That it is for this reason that *Physicians* make use of Salt of *Tartar*, to correct the bad Effects of *Resinous* Purgatives ; but if this Precaution were used, to make the Extract with *Aqueous* Dissolvents instead of the *Sulphureous*, there would be no need of that Corrective.

Of the Root  
Pareira Bra-  
va ; by Dr.  
Helvetius.  
n. 346. p. 365.

III. The *Pareira Brava* is a Root which comes to us from *Brazil* by the way of *Lisbon*, but which the War has render'd pretty scarce ; however, it is to be found among the good Druggists, and is sold at *Paris* for 40 *Livres* the Pound : 'tis call'd in *Brazil* the Universal Medicine, and is made use of there in all kind of Distempers. A Capuchin Monk, who came from thence, told me that he could not give it a greater Character than by assuring me, that in all their Voyages they carried the Gospel in one Pocket, and the *Pareira Brava* in the other.

This Root is good to restore the Digestions, to the end, that in the first Passages there may not be form'd so much Phlegm and acid Crudities ; and it is also necessary to hinder the Serosity of the Blood from spreading itself too much upon the Parts. Now as Experience shows us that the *Pareira Brava* does abundantly provoke Urine, it will follow from thence, that it will discharge by the Kidneys the corrosive Acidity of the Mass of Blood ; it is also good to break and thin the pituitous and viscid Humours ; and it cures the Suppressions of Urine occasion'd by Obstructions in the Kidneys.

One may conclude from hence, that the Salts of the *Pareira Brava*, which are moderately Volatile, are proper to dissolve or separate the too thick and too close Texture of the Sulphur of the *Lympha*. This Medicine has a light or gentle Bitterness, which corrects the Acids of the Stomach, and renders them more pure and fine.

Hence the Chyle becomes better digested and more balsamic, and fitted to assimilate itself with the Blood, and to preserve therein that degree of Division and Fluidity, which is necessary for it.

The Method of using this Root with Success, is to reduce it to an impalpable Powder, and to infuse thereof the Weight of a Demi-gros in a Pint of boiling Water, and let it lie in it all Night, and next Morning boil it one moment. Then pour the Liquor off gently from the Powder, and take of it a Demi-setier in two Cups with a little Sugar as hot as Tea, putting into each Cup 5 Grains of the said Root reduced to an impalpable Powder, which you must stir with a Spoon, that none of it may remain at the bottom. You may repeat the same

Dose



Dose about four Hours after Dinner, but you must not eat any thing within an Hour after you have taken it.

This Medicine does not oblige Persons to alter the ordinary Course of their Living; and one may continue the Use of it several Months together, in which time also it may be discontinu'd two or three Days together at a time: but it is proper to take some gentle Purge every Fortnight or three Weeks during the Use of the said Medicine.

The following Preparation was used by *Monsieur Duyvenboorde*, Embassador Extraordinary from the *States-General*, who communicated this Account to the *Society*.

Take 11 Grains of this Root, and put it into a Pewter Tea-Pot filled with boiling Water, and so let it infuse all Night over warm Ashes, or a very small Fire; and in the Morning boil it again, but very gently, 'till you use it: you must drink it as you do Tea, and the Liquor which comes from that Infusion must not exceed the Quantity of 5 small Dishes of Tea.

*The Preparation of the Root.*

IV. A Gentlewoman of 54 Years old, who for a long time had been tormented with frequent Fits of the Stone, and usually brought off many, with the Gravel, &c. about a Year since grew Dropical, of which being lately cured, she fell into a total Suppression of Urine, which many Days baffled all Remedies.

*Of the Internal Use of Cantharides; by Mr. J. Yonge. n. 280. p. 1210.*

In this desperate Condition, about 4 in the Afternoon, the 5th Day of the Disease I gave her 5 *Cantharides* (without Heads, Wings, or Legs) weighing 4 Grains and a half, and with as much Camphire and a little Conserve, made them into two Pills or Bolus's.

Next Morning I found no Effect good or bad, but about Noon the Flood came, and continued about 48 Hours, bringing off in that time much more Urine than could have been expected from her in the whole time of the Obstruction.

Some Gravel, and *Sabulous* Matter came away, but no Stones, nor did there any thing happen to the Stomach, Bladder, or other Bowels, as usual, on the internal Use of those Insects; but they operated so quietly, as if nothing but two Doses of *Lapis Prunellæ* had been administer'd.

In several Cases I have often and successfully given it, and without the *Dysuria* and other painful Accidents which attend the Internal (oftentimes the External) Use of this Remedy; altho' I mix'd no *Camphire*, but wash'd it down with large Draughts of Posset, Ptisan, Emulsions, or Water-gruel; which in the Lady's Case I forbore to use, because of her dropical Disposition, and used only a Draught or two of middling Ale, impregnated with *Broom*, *Juniper-berries*, *Daucus-Seeds*, &c.

The Form, in which I used to administer it, is that of a soft Pill or Bolus, composed of 3 *Cantharides* prepar. *Troch. e Myrrha* ℞ *Sem. Ammeos* gr. vj. *Rob. Cynosb.* q. s. This in stubborn Suppressions of the *Lochia* and *Menstrua*,



*Menstrua*, in difficult Child-birth, and Retention of the *Secundine*, does Wonders; what Heat or Pain it begets in the Neck of the Bladder, is much short of what I have an hundred times seen, (and sometimes felt) to proceed from applying an *Epispastic* to the Back.

About twenty Years since, an enamoured Youth attempted to gain a Girl's Love, by giving her a Plumb-Cake, in which powder'd *Cantbarides* was mixed; she eat Part of it, and gave three others of the Family in which she lived a Share; they were soon tormented with burning in the Stomach, bloody and scalding Urine, and great Pain in the Back. I cured them all in a short time, by Powder of *Ammeos* and *Lapis Prunellæ*, and Emulsions *Aq. Sperm. R. &c.* How many *Cantbarides* each devoured in the Bread, I could guess by a Piece of it which remained, and suppose that viij or ix Grains fell to a Share.

*Olaus Borrichius*, *Act. Med. Barthol.* Vol. 4. Obs. 80. gives a Chymical and Microscopical Examen of those Flies; he saith, their Parts separated by Chemistry do not affect the Skin; that the Points of their Particles wound it; and that thro' those little Wounds the Volatile Salt insinuates: he attempts also to shew how they cause a *Dysuria*, and offend the Bladder, when applied to a Part so remote as the Back or Neck. See more from the same Hand, in the 5th Vol. Obs. 89.

*Observations  
on the Class of  
Sweet Tastes  
in Plants, with  
Remarks on  
Mr. L'Emery,  
&c. by Sir  
John Floyer.  
n. 279.  
p. 1150.*

V. By our Taste we may discern all the Chemical Principles in Plants before their Distillation; and for want of a due Observation of their Tastes, Mr. *L'Emery*, (in his Treatise of Drugs) has not fully describ'd the Chemical Principles which Plants do yield in Distillation.

All *Watery* Plants shew their Phlegm as well to the Taste as in Distillation; and in all dry *Woody* Tastes we observe, the Earth as well as we can by the Chemical Analysis.

By the Mucilage and Gumminess, or *Oily* Taste, we distinguish the Oil of Plants, as well as by Distillation.

The *Aromatical* Smell shews us the Volatility of the Oil, and Salt of Plants; and by the *Fætidness* we also know, that the Oil and Salt are in a Volatile State.

By the *Acrimony* and Pungency we know that there is a Volatile Salt in Plants; and by the *Burning* Taste we know there is a Corrosive Salt in them.

By a *Crude* rough *Acidity* we observe the Tartar, or Essential Salt of Plants; but if the Acidity be of a *Vinous* Smell, we observe that 'tis of a middle State of Digestion, and may be call'd a *Vinous* Tartar, and the *Crude* Tartar an *Acerb* Tartar; but if the Tartar had a pungent Smell, then 'tis a *Volatile* Tartar, or *Acid* *Acrid* Tartar.

I will next describe the Principles observable in Sweet Tastes, and their several Classes; but must first observe that Sweet Tastes shew their Oil by their slimy Smoothness, and their Tartar is evident in their Extracts, as in the Juice of Liquorice.



1. The *Grass Sweets*, as *Gramen caninum*, have much essential Salt and moderate Oil; *Juncus*, *equisetum*, *arundo*, *typha*, *nymphaea*, are all of the Rush kind, sweet and rough, and some of them have more Oil, others more Acid, and that the most crude have more Oil than Tartar.

2. The *Corn Sweets*, as Barley, Rye, Wheat, Oats, Rice, Millet, have much Oil and essential Salt, and a little Volatile: So Bread yields Oil, and Essential and Volatile Salt.

*Note*, That Fermentation or the Fire produces the Volatile Salt, by exalting the Tartar into a Volatile Salt; and the slimy Mealiness in Corn supplies the Oil. *Tragopogon* and *Scorzonera* are referable to the Grass, and contain much Oil, and essential Salt.

3. The *Subacid Sweets*, as *Rampions*, *campanula*, *trachelium*, contain much Oil and essential Salt, but the Acrimony in these Plants shews a Volatile Salt not described by the Chemist.

4. The *Ferns* contain Oil and Essential Salt, as *Polipody*; but the Acrid Principle is not observed by the Chemist, nor the Fragrancy in *Harts-Tongue*. *Osmunda* and the *Capillaries* have more Oil than Salt, because more mucilaginous and crude.

5. All the *Leguminous slimy Sweets* have more Oil than Tartar, but all much of both, as Broom, *Ononis*, *Aquilegia*, *Fumaria*, *Asparagus*, *rufcus*, *thalicttrum*, *polygonatum*, *Senna*, *galega*, *lathyrus*, *luteola*, *periclymenum glycyrrhiza*, *psyllium*, much Oil, and Volatile or Essential Salt.

*Beans* and *Peas* and *Lentils* have also a Volatile Salt and *lens aquatica*. *Note*, That since there is no Acrimony in these Seeds, the Volatile Salt is produced by the Fire.

The *Aromatic Legumens*, as *Meliolotus*, have an exalted Oil and Essential Salt.

*Periclymenum* is described to have only Essential Salt and Oil; but since there is an Aromatic Odour in the Flavour, and a great Acrimony, there must be some Degree of Volatile Salt in it.

*Fenugreek* and *Meadow Trefoil* have much Oil and a little Salt, and so has *Ophioglossum*, *pinguicula* & *consolida regalis*.

6. The sweet *Nuts*, as *Almonds*, have much Oil and Essential Salt; but the *Bitter* have more Salt than the sweet *Almonds*: Therefore 'tis probable that the *Tartar* abounds more in all *Bitters*, and that *Tartar* is the Effect of a higher Digestion; and the crudest Tastes, as *Styptics*, *Sweets*, and *Slimes* have least of it. So *Chestnuts* and *Beechnuts* have much Oil and little Salt. *Filberds* are described to have Essential Salt, and a little Volatile as well as Oil; but it seems no Probability that one may have it, and none in any of the other.

7. The *Sweet Acid* or *Vinous Tastes* have much Oil and Essential Salt, as *Prunes*, *Cherries*, *Strawberries*, *Rasberries*. The Variety of the Tastes of these Fruits shews the different Digestions and Mixtures, tho' the Principles are the same.



The Sweet *Viscous* Fruits, as *Sebestens*, have little Essential Salt and much Oil.

8. The sweet *Aromatic* burning Tastes contain a Volatile Salt and Oil, as *Schœnanthus*, Ginger, Zedoary, Cubebs, Cardamums, *Vanillas*, *contrayerva*, *calamus aromaticus*; but these following are mistaken by the Chemists, who say that *Costus amarus*, *dulcis*, *cyperus*, *galanga*, *Orris* have not a Volatile Oil, but Essential Salt only: for *Orris* is Acrid and Aromatic as well as the rest; and therefore there is both Volatile Salt and Oil in them, and also an Essential Salt from their Sweetness.

9. The sweet *Acrid Aromatics* of the *Fennel* Class have all a Volatile Salt and a Volatile Oil, as *Angelica*, Lovage, Parsly, *Meum*, Dill. Note, The Leaves and Roots of Fennel contain a Volatile Oil and Essential Salt, the Seed a Volatile Oil and Salt; but since the Roots and Leaves have a pungent Taste, there is also a Volatile Salt in them, tho' the Chemists do not observe it.

All the Parts of *Caraways* have the Odour of Punaises, except the Seed; from whence I may infer, that the foetid Plants have the same Principles as the Aromatics, viz. a Volatile Oil and Salt; and this is confirm'd by other *Fœtids* which have them, as *Rue* and *Assa fatida*, and *Vulvaria*. *Peucedanum* is described of a bitter acid Taste, with the Odour of Pitch, and must have a Volatile Salt, tho' *L'Emery* describes only its Essential Salt and Oil: So in *Smallage* he describes only the Essential Salt and Oil, but its Acrid Taste manifests the Volatile Salt.

10. The *Sweet Gums*, as *Manna*, *Sarcocolla*, contain much Oil and Essential Salt; tho' *Honey* and *Sugar* have more Essential Salt than Oil: by which we may observe how much Essential Salt is in all Sweets, and why they are apt to turn sour and ferment; and from such sweet Gums all sweet Plants have their Acid and Oil upon Distillation.

11. Citruls, Melons, Gourds, Cucumbers, which are *Bitter Sweets*, and very *mucilaginous*, contain much Oil and little Salt.

Since the whole Classes of sweet Plants contain an Oil and Essential Salt, some more, some less of both; the Virtues of the several sweet Tastes can never be explained by the Chemical Principles, and no new Virtues by them are discovered: therefore all the Advantage we have obtained by these Chemical Distillations is only to shew the Nature of Sweetness in general, by discovering the Principles contained in sweet Plants; and this is a greater Advantage to Natural Philosophy than to Physick, to which the Tasting of Plants is more useful.

By the Taste we distinguish the Sweets into their several Classes, and we discern Tempers and Digestion, and Mixture of their Principles, and thence easily guess at their Effects in Animals; and by the Taste we distinguish the different State of both the Oil and Acid in Plants

of



of different sweet Tastes ; whereas the Chemists observe no Difference of the Tartar Acid, whether it be Acerb, or Vinous, or Volatile ; nor of the sweet Oils from the bitter and slimy.

By the Taste we distinguish the *Acrid* and the *Acid* Salts, which mix in Distillation ; and they are not well distinguished by the Chemists.

By the Taste we discern when the *Fire* makes new Products and Mixtures, not *naturally* found in Plants ; for in Corn, Beans, Peas, Bread, Fire produces a Volatile Salt not observable in them before : And a Volatile Salt is drawn from the Lees of Wine by the Fire ; and Leaven yields also a Volatile Salt ; whereas before in Corn only an Oil and Acid were observed ; and 'tis probable that the Tartar is volatilized both by the Fermentation and the Fire.

*Coffee* is a Bean by its Taste and Cods, and acquires a Volatile Salt by roasting ; but *L'Emery* only mentions its Oil and fixed Salt upon Distillation ; but the fixed Salt is the Effect of Fire, and its Virtue depends on the Volatile.

No more Chemistry is necessary for the Discovery of the physical Virtues of Plants, than to make Decoctions of them in fair Water, and to observe the Taste and other sensible Qualities of those Decoctions, and from them to take the natural Hints for the Trial of their Virtues on animal Bodies. I will confine myself to the *Class* of *Sweet Tastes*, and give an account of several Decoctions made in all the Species of sweet Plants, and add some Tastes I had not formerly described fully, and such Reasons as induced me to place them in the Class of sweet Plants.

I know it is objected against *Decoctions*, that the Volatile Parts expire, and that the Mucilage dissolving in the Water, obscures the Taste : I therefore do confess, that Plants are best tasted in their natural State to discover all their Virtues ; but these Decoctions do help to confirm our Tastes, and discover the great Variety of Medicines which may be made from sweet Tastes. Note, that all Decoctions must be tasted cold.

1. The *Grass Sweets*, under which are contained all sorts of Grasses and Rushes, Reeds and Corn ; I refer a *Nymphæa alba* to the Rushes, both for its Figure and Taste, which is crude and styptic, with a Bitterishness in the Seed ; but the Flowers are like Lillies of a sweet Smell, and mucilaginous, sweet, styptic in Taste.

I boiled *Horse-Tail*, a handful in a Pint of Water, and I found the Decoction to taste very *styptic* with a Bitterishness, and the Decoction looked like small Beer, the Taste being like Rushes : I concluded it to be of the same Class. The styptic Virtue is useful for all Fluxes.

*Plantago aquatica* boiled in Water gave a caustic acrid Taste, joined with a crude rush Taste ; the Decoction was greenish and pale. This caustic Acrimony is useful in the Scurvy and Dropsy. It is a *Ranunculus*,



*culus*, by its *Capitula echinata*, as well as by its Acrimony.  
*Nymphæa lutea* has a sweet astringent Lustre in the Flowers, with an acrid Smell like Cresses.

A *Reed* is of a sweet-bitter and mucilaginous Taste; it absterges by the bitter without Acrimony, and cools by the mucilage subacrid Styptic, by which 'tis a Rush.

*Sagittaria* is sweet, subacrid, and styptic, by which it is a Rush.

*Alga Marina* is subacrid and sweet, and something styptic.

*Fucus* is of a sweet, saltish Taste.

The *Palm-tree* is sweet and styptic; and because of this Taste, and its *Folia arundinacea*, I refer it to the sweet Styptic; a sweet vinous Juice flows from its Bark being wounded: the immature Fruit is very styptic, but the mature sweet, viscid, vinous, and subastringent, proper for Fluxes.

Wine, Vinegar, and Sugar are made from the sweet Juice.

The inspissate Juice of the Palm-tree is the *Terra Japonica*, whose Substance is gummose, and of a bitterish styptic Taste, and also of a sweet Taste, and of a grateful Odour. Boil ℥j. of *Terra Japonica* in ℔j. of Water, and sweeten it for a Cough or Looseness.

Leaven is observed by *Ætius* to be cool by its Acidity, to be hot being putrid, and also have some Virtue from the Salt and Flower. He observes that Beer is hotter than Barley, and because of its Putrefaction 'tis of an ill Juice; and he also observes, its Windiness depends on the Air included in it; and the waterish Beer and the Acid is cooling.

All these Virtues were discover'd by the sensible Qualities of Leaven and Beer, without Chemistry. And we may observe that what we call Fermentation in them, was called by *Ætius* a Putrefaction. We have rectified the Notion, and given it a new Name; but the Ancients knew the Nature and Effects of Fermentation, as well as the Moderns; and 'tis that which gives the different States of the Principles in Plants, and the several States are best discovered by our Tastes and Senses.

I boiled *Gramen spica secalina*, and the Decoction was of a sweet, mucilaginous, and styptic Taste.

The *Roots of Grass* have something of Acrimony and Astringion, but the Decoction tastes smooth and sweetish. The green Leaves of Grass are sweet and styptic. The Decoction of the Water was of a pale Colour.

The *Seeds of Grass* are more diuretic and binding: I made a Decoction of them, which resembled Water-gruel.

*Paronychia foliis rutaceis* must be referred to the Grasses, because of its Sweetness.

2. *Quære* whether *Ranunculus* be not of the sweet Class, because the whole Plant is sweet and milky, and for that both are given to Nurses



to increase Milk. The Roots of the *Rampions* are something styptic and cooling, and proper against Inflammations.

*Scorzonera* and *Tragopogon* are referable to the Grasses, because of their geniculate Stalks, their grassy Leaves, sweet Tastes, and milky Juice; the Decoction was smooth, and of a pale Colour.

*Trachelium* is also sweet, milky, subacid, and bitterish, of the same Class.

3. The sweet, mucilaginous and crude *Lychnis*: the Decoction of *Alfina* is sweetish and mucilaginous, the Colour pale like small Beer. I could observe no Astringency in *Alfina*. I boiled ℥j. in a Pint of Water; it hath a cooling and moistening Quality like common *Lychnis*. *Dioscorides* says, *Chickweed* being bruised has the Smell of a Cucumber.

All the common *Lychnis*'s are Bitter-sweets, and them I shall refer to the Class of Bitters; though their jointed Stalks and Sweetness may justly place them here, yet their chief physical Virtue is from their Bitterness.

4. The Sweet-bitterish Styptic, and Subacid Fern.

I boiled ℥j. of Fern Roots in ℔j. of Water to half, the Taste was very styptic and bitterish, the Colour Citron.

The Mucilage and Stypticity make *Fern* an excellent Vulnerary, and Styptic in all Fluxes: the young Buds rubbed in the Fingers smell something like a Kernel, or the *Laurel* Smell.

*Dryopteris* is described astringent and sweet, acid and bitterish.

*Hemionitis* has both Astringency and Bitterness.

*Adiantum album* & *nigrum* are sweet and styptic; and since Experience shews these to be good Pectorals, the other Ferns have the same pectoral Virtue as *Vulneraries*.

*Herniaria* is described as a Styptic.

In *Adiantum* there is something odorate. *L'Emery*.

*Polypody* is bitterish, sweet and astringent, nauseous and subacid and slimy; it purges by this Taste both Choler and Flegm.

I boiled *Harts-Tongue* ℥j. in ℔j. of Water to half; it was of the Colour of small Beer; the Taste was mucilaginous, sweet, styptic, with an aromatic Flavour of Raspberries or Orris, which is its cordial Virtue, join'd with Stypticity and Mucilage, by which 'tis proper for hot Hypochondriacs.

The Roots of *Osmunda* are of a subacid and bitterish Taste, besides the Astringency, by which they open, but the Astringency much hinders that Effect.

5. The Sweet, Acid, Aromatics and Fætid; the Roots have more Sweetness and aromatic Acrimony than the Leaves, which are more crude; the Seeds have most aromatic Acrimony.

The Seeds of *Siler montanum* have an ungrateful Smell like Cummin, and a bitterish Taste.



*Peucedanum* is bitter and sweet. The green Leaves of *Coriander* are foetid like *Punaises*.

*Laserpitium* is acrid, aromatic in Smell, and of a sweet, acrid, aromatic Taste.

*Sampfire* is of an acrid, aromatic Taste; and the Smell of *Smal-lage*.

*Cummin* is acrid, aromatic, and bitterish, and of a disagreeable Smell.

*Dracunculus Hortensis* is sweet like Anise.

*Ferula* has an ungrateful aromatic Odour.

The Seed of *Meum* is bitter.

*Cachrys* is bitter, acrid, aromatic.

*Caucalis* and *Daucus* agree in Virtue and Taste.

*Saxifraga pratensis* has a great Root, sweet and acrid; the Leaves are most aromatic, and the Seeds; it resembles the Taste of Parsly.

The Leaves of *Gingidium* are of a disagreeable strong Smell, and the Roots bitter.

*Tordylium* is sweet, aromatic, *gravi odore*.

*Percepier* is like Chervil, and so is *Pecten Veneris*.

I refer the *Umbells* to the Grasses, because of their Sweetness and jointed Stalks. Our Botanists have omitted the sweet Taste in some of them, which are bitter. Most of them are of an aromatic Smell and Taste, but some are foetid, virose, and fervid in their Taste.

*Smyrnum* Root has the Smell of Myrrh, with a bitter acrid Taste; and it helps the Urine, and the Menfes like it.

The Colour of the specifick Juice is various: *Thyffelinum* and *Seseli pratense* have a Milk: The *Ferula*'s are milky, or have a Saffron Colour: Their Juices make *Sagapenum* and *Galbanum*.

The Juice of the Root of *Peucedanum* is reddish, and is called *Opoponax odore piceo vinoso*.

The Root of *Syphondilium* has a Saffron-coloured Juice, of a foetid and bitterish Taste.

'Tis observed that some Seeds grow bitter by the Fault of the Soil in which they grow. All of this Class have a volatile Oil and acrid Salt, by which they are diuretic, carminative, and pectoral also by their Sweetness; Emmenagogue, if foetid.

I boiled Parsly Roots ʒj. in lbj. of Water to half, the Taste was sweet and acrid, aromatic, the Colour pale.

The Roots of *Meum* are acrid, and smell strong; too much of it offends the Head.

*Libanotis* has the Smell and Taste of the Seed of Angelica.

*Sium* or *Apium palustre fol. oblongis* has an Odour of Bitumen on all the Plant.



*Thysselinum* is Bitter, Ingrate, and Acrid.

The Decoction of *Angelica* Roots is Bitterish, Aromatic, Acrid, and of a yellowish Colour.

*Imperatoria* Roots decocted, smelled like *Angelica*, and tasted very bitter and acrid; of a green Colour.

6. The Sweet, Acrid, Terebinthinate, and Styptic.

*Calamus*, *Nardus*, *Cyperus*, agree in their Diuretic, Carminative and Emmenagogue Virtue, and their Stypticity, &c.

*Calamus* resembles a Reed; it is an *Acorus*, the Taste resembles the Turpentine Plants, as well as its Cones.

*Juncus odoratus* is a Rush, with the Smell of a Rose; when rubbed, of a burning, acrid, aromatic, bitterish Taste.

*Cyperus* is of a pleasant Odour, like *Lign. Aloes* whilst it flowers, and of an acrid, aromatic, bitterish, Styptic Taste.

*Nardus* resembles the Flavour of *Cyperus*; 'tis bitterish, astringent, acrid and aromatic.

The Roots of *Cyperus* are used for *Nardus*.

There is some Fœtor in *Valerian*, *Asarum*, *Serpentaria*, whose Roots have a little Sweetness, with a Terebinthinate Bitter Acrid, and all of them resemble *Spikenard odoris gravitate*, and have the same diuretic, carminative, emmenagogue Virtue, and are proper for Malignant Fevers; and a little Styptic.

The red *Valerian* has a crude Taste in the Stalks and Leaves, the Flowers rubbed smell like Turpentine; the Leaves smell nauseous, fœtid; the Roots agree with *Spikenard*. *Spica Celtica* and the Flowers of *Valerian* agree well.

The Leaves of *Wild Valerian* boiled in Water yield a crude and fœtid Mucilage.

The Tincture of the Roots of *Valerian*, extracted with Spirit of Wine and Sal Armoniac, fines it much.

The Roots of *Asarum* are Geniculate as Grasses, and taste very acrid, aromatic, and bitterish; 'tis called *Sylvestris Nardus*, and for its Similitude referrible to it. The Ancients attributed the same Virtue to *Asarum* as to *Acorus*, but more intense and strong.

*Galen* observed that *Phu* was an Odorate Root, like *Nardus* in Virtue.

*Pliny* observed that *Cyperus* was a *Gladiolus bulbosa radice*, and like the Odour of *Nardus*.

The Decoction of *Asarum* was greenish, with a strong Smell of *Spikenard*, and bitterish Acrid.

The Decoction of *Valerian* Roots of the same Taste, but pale Colour, and Smell of *Spikenard*, but weaker; they seem to be of the same Class.

7. The Sweet, Fervid, Acrid, Bitterish, and Aromatic, like *Orris* in Taste.

The Roots of *Orris* are geniculate like Grass.

The



The *Florentine* Roots are bitterish and sweet, and of a burning Taste.

The *Water-Flag* is burning and styptic, but of no Smell; the Flowers of common *Orris* have an ill Smell, tho' the Roots be Aromatic. The whole Herb smells like Elder whilst 'tis fresh bruised, but when dry 'tis Odorate; it gives a Raspberry Taste to Drinks, and purges.

The great *Galangal* is aromatic, acrid, burning and bitterish; the Roots also geniculate, odorate; in Form like *Cyperus*.

The Roots of *Acorus* are geniculate, acrid, burning, bitterish and aromatic; it resembles *Orris* both in Leaves and Roots.

*Ginger* is acrid, burning, and aromatic like *Pepper*; the Leaves are like *Iris Palustris*.

*Zedoary* smells like *Camphire*, and is of a strong Taste, rather than sweet, 'tis very bitter, and less acrid; but resembles *Ginger*.

*Costus* is very burning, acrid, and aromatic, and bitterish; it agrees with the Virtue of *Orris*, both in its discussing Quality and deobstructing.

*Costus dulcis* has a sweet Taste, and acrid; but the Bitter has an ungrateful kind of Taste; but there is but one Species of *Costus*, the fresh is sweet and white, the old is bitter and blackish.

*Gladiolus* has a bulbose Root, sweet, and moderately acrid or burning; and the Leaves are like *Orris*.

*Xyris* is of an ungrateful foetid Odour, like *Climices*; in Form and Figure like *Orris*.

*Costus Arabicus* is acrid, bitter, and aromatic in Taste.

The Roots of *Contrayerva* smell like Fig-leaves, are like *Orris*-Roots in Figure; they being chewed, taste sweet, aromatic and acrid, and have also an astringent Taste.

*Cardamomum* has the Stalk and Leaves of a Reed, the Seeds in Cods of a burning, acrid, bitterish, aromatic Taste.

*Amomum* by its external Figure and Virtue agrees with *Cardamomum*; some reckon it like *Acorus*.

*Grana Paradisi* are of a foetid and aromatic Taste, betwixt *Cardamoms* and *Pepper*, and agree with the same in Virtue in Paralytic Cases.

The Grains of *Paradise* infused in Wine give the Odour of *Quinces*.  
*Salmon*.

The Roots of our *Yellow Flag* are large and reddish; our Countrymen scrape them and pound them, then mix them with Milk, and give them twice to a Dog, as an infallible Medicine against the Bite of a *Mad Dog*. A Person who took them told me they did not purge, but tasted very rough. The Decoction is of a reddish Colour, and rough.

8. *The Sweet Mucilaginous Pea-tastes, or Legumens,*

I boiled *Vicia* ʒj. in ℔j. of Water to ℔β. which tasted sweet and crude, styptic; the Colour was pale and greenish.

I boiled



I boiled *Lens Palustris* in the same manner, and found the Decoction of a turbid Colour, and reddish like Mum; it is a Legumen by this intense Colour, as well as by the Taste, which was sweetish, subacid and styptic. Note, that Snails and other Insects are usually mix'd with it.

I boiled *Lagopus* in the same Quantity as the other; the Taste of the Decoction was styptic, crude and bituminous.

The *Cortex Lentium* is styptic and binding; the Seed of it mucilaginous and loosening; and this breeds an ill, flatulent and crude Juice, obstructing the Circulation of the Blood and Spirits, injurious to the Sight and Menfes; and by their Flatulency producing turbulent Dreams.

The Leaves of *Liquorice* feel gummose, the Roots are sweet and subacerb.

*Tamarinds* are of an acid, acrid and sweet mucilaginous Taste; the Stones have the Figure of *Lupins*; the Leaves of *Tamarinds* are of an acid agreeable Taste; and they must be referred to the *Services* and *Berberries*, tho' by the Cods and Seeds I erroneously have class'd them with *Cassia* or *Lupins*.

*Fumitory* is subacid, bitterish, mucilaginous, and leguminous, tho' the Flowers be not.

*Radix Cava* has bitter-sweet Roots like Beans, and a mealy subacid Taste; the Leaves have a crude Smell like *Fumitory*, and of the same Virtue.

The *Skin* of the *Bean* is styptic, but the bitterish Part leguminous.

*Coffee* is bitterish and of the Bean kind, in which there is a Volatile Salt, which raises the Spirits, and produces the Urine and the Menfes.

*Orobis* is of an ungrateful bitterish Taste; all the bitter Legumens open Obstructions and promote Urine, as *Kidney-Beans*, &c.

I boiled *Broom* ℥j. in Water ℔j. to ℔ss. the Taste was moderately bitter, sweet, and styptic, not nauseous, and without any Heat.

I boiled of *Genista Spinosa* Roots ℥j. in ℔j. of Water to ℔ss. the Colour was like small Beer, the Taste mucilaginous, styptic; it may be proper for the Stone by those Tastes, and for Fluxes.

The Leaves of *Bruscus* have the Smell of *Broom* when bruised, and its Bitterishness, and Stypticity and Sweetness, and are subacid; and by this Taste a Legumen.

*Crato* describes *Senna* as if it had *Viscidum quid*, by which it gripes; and by the Taste he discovered the Bitterishness and Astriction. *Matthiolus* observed its viscous Taste and Bitterishness, with a virose nauseous Odour, like *Cynoglossum* or *Punica*. The *Siliquæ*, as well as the sweet Taste and Flowers, prove it a Legumen.

*Polygala* boiled with the blue Flowers gave a Colour blue like Violets, and the Taste was very mucilaginous; the Plant is aromatic, acrid.



℥j. of *Viola Tricolor*. boiled in ℔j. of Water to half, made a Decoction of a greenish Colour, like Cowslip Wine, and it tasted gratefully and mucilaginous; the Roots of *Polygala* are acrid and aromatic; it purges Bile.

The Decoction of the Root of *Periclymenum* is styptic and bitter, and of a sweet leguminous Taste.

Purple *Trefoil* is mucilaginous and styptic, by which it cools feverish Heats, and by its burning Acrimony it expels the putrid Particles in *Petechial* Fevers and Fluxes.

The Leaves of red *Trefoil* rubbed smell acid, and the Flowers rubbed smell like Woodbind. The Decoction of ℥j. in ℔j. of Water to half, gave a greenish Colour, pale; and the Taste was of a crude mucilaginous leguminous Taste, with an Acrimony, by which 'tis a great Diuretic and Ophthalmic.

The Decoction of Purple *Trefoil* has a turbid Colour, and mucilaginous Taste.

The Leaves of *Periclymenum* are acid and acrid; the Flowers more sweet, and the Style is of a Bean Taste, and the Twigs of the same.

The *Stamina* have the Taste of the Flower, and their Heads are very acrid.

*Trifolium Fruticans* is Bacciferous, with a blue Juice; and tho' it wants Cods, 'tis a Legumen, as well as *Periclymenum*, which is bacciferous.

The Flowers of *Asparagus* are *Hexapetali*, and of an herbaceous Colour; the Seed is a Pea, without a Cod, the Root is of a sweet glutinous acrid Taste; the Tops of it boiled resemble Peas-Pottage, and are evidently of a leguminous Taste.

In the *Legumens* these are irregular, in Flowers or Cods, they are notwithstanding certainly of that Class; by which we may infer, that the Taste give the most certain Character of a Class.

The *Herba Mimosa* has an herbaceous Odour, and a mucilaginous bitterish ungrateful Taste; the Root is of a Taste more grateful, without Bitterishness, but of a violent Smell like Garlick when first got, offending the Smell and Head, and is accounted a Poison. *Morison*.

*Mesue* observes that *Psyllium* has contrary Virtues: 'tis of a mucilaginous, acrid and nauseous Taste: The *Medulla* is hot and exulcerating; the *Cortex* moistening and cooling.

*Gossipium* is a Plant like *Linum*, both in Leaves, Flower and Stalk.

There is a Bitterness in *Linaria*. *Morison*. *Linaria* is by its Flower of the leguminous Class, and probably *Linum* is of the same, tho' the Flowers disagree, being like it in Leaves.

*Linseed* has the same Virtue as Fenugreek, which is a Legumen. The Leaves of Flax are gummosse and bitterish, subacrid; the Flowers are *Pentapetali*, which differ from the *Legumens*.



I boiled ℥j. of *Galega* in ℔j. of Water to the half; the Colour was pale, and the Taste nauseous, bitter, sweet and mucilaginous, and the Odour nauseous and foetid.

The fresh Leaves of *Trifolium Asphaltites* smell like Rue; when ripe, like Bitumen.

The Decoction of *Ononis* was mucilaginous, subacid, the Colour was greenish.

The Leaves of *Consolida Regalis* are of a crude Smell, the Seeds are in Cods, and taste leguminous. The whole Plant is of a disagreeable Taste.

*Glastum* and *Opbioglossum* are of the same Virtue, and *Luteola* is like them; place them here, or with the Cresses.

*Thalictrum* must be referred to the Docks both by its Taste and Virtue.

*Lignum Nephriticum* is subacid and bitterish.

VI. *Rosa Mallas* grows upon the Island *Cobrosi*, at the upper End of the *Red-Sea*, near *Cadefs*, which is three Days Journey from *Suez*: It is the Bark of a Tree (taken off every Year, and grows again) boil'd in Salt-Water 'till it comes to a Consistence like Bird-lime, then separated, and put into a Cask and brought to *Judda*, and so to *Mocha* in *June* and *July*, where it sells from 60 to 120 Dollars per Barrel, according to its Goodness. The best is what is freest from Clay and Dirt, which is commonly mix'd with it; And the way to try it is, to wash it in Salt-Water, which will cleanse it. The *Arabs* and *Turks* call it *Cotter Mija*. A Barrel is 420℔.

*The Manner of making Styrax Liquida. Communicated by Mr. J. Peltiver. n. 313. p. 44.*

VII. The using and handling of the *Indian Varnish* (or *Lacker*) so far as is necessary to apply or lay it on Subjects to be varnish'd, having produced such extraordinary Effects on Signior *Ignatio*, and more remarkably on his Maid-Servant, viz. in great Swellings of their Heads and Eyes, and in their Arms, and indeed almost their whole Body, with an intolerable Itching and Inflammation, or Heat in Pimples; is so new and extraordinary a Phænomenon in Nature, as presses us to search the Reason: and the rather, for that amongst the numerous Ingredients of the *Materia Medica*, and all other natural Substances known to us, there is not one that produces equal, or the like Alteration to what this does in Human Bodies. All our Liquors and corrosive Spirits hurt only the Parts of the Body that they immediately touch, and diffuse not their mischievous Quality over the whole Body, as this *Varnish* does, and the Hurt caused by them is very different. Poisonous Fumes or Steams from *Mercury* or *Antimony* manifest their Malignity on the *Brain* and *Nerves* with great and incurable Evils: Whereas the Effluvium and Touch of this *Varnish* offends only the external Skin of the whole Body, indeed after a very strange manner, but yet not destructive to the Part affected, which grows well again

*Of the Indian Varnish; by Dr. J. del Papa. Communicated by Dr. Sherard. n. 274. p. 947.*



of itself. There are indeed some Juices of Roots and Herbs, and other Parts of Vegetables, which touching our Flesh, some inflame it, some exulcerate it, some produce Swellings, Pustules, and Itching; but all these produce the Evil only where they touch, and spread not their invisible Venom over other Parts of the Body. I know not the Example of one thing, which either only touch'd with the Hand, or insinuating itself by its Fume or Vapour into our Body, is able to produce over almost all the Skin of the Body, Inflammations, Swellings, Itching and Pustules, as if the whole Body were stung with an infinite Number of *Wasps* or *Gad-bees*; for such exactly are the Effects caused by this Varnish.

This great Difference between this and all things else that we know, and the Ingredients of which it is made, being absolutely unknown, renders it impossible to penetrate the Cause of the above-named Effects. Yet whoever would propose some probable Thought, may say that this Varnish contains some Matter, which when hot sends into our Body a very subtile thin Vapour, which affects only the Skin, leaving the other Parts of the Body untouched; after the same manner, *Cantharides*, not only taken inwardly, but also outwardly applied to our Bodies, communicates a venomous Quality of a particular Nature, affecting only the Kidneys, Bladder, and Urinary Passages, causing there sensible Pains and Excoriations, not in the least touching the other *Viscera*. Some Physicians are of Opinion, that this particular Disagreement of *Cantharides* with the Urinary Ducts, comes from the Salt and Nitre contained in the Urine, which gives Life and Vigour to the Poison of the *Cantharides*, without which Salt the poisonous Quality of the *Cantharides* could have no Power. So after the same manner it may be said that the noxious Fumes of the *Varnish* become hurtful to the Skin, because it mixes there with some Juice it meets with in the Skin itself, especially in the *Miliary* Glands, whereof the whole Skin is full. This Thought is but an Imagination; but in Matters of this Difficulty we may well bring only probable and likely Arguments. This is certain, that this Varnish exerts all its Malignity against the Skin, the *Viscera* and Blood being untouched; besides, I observ'd that the Maid (at the same time that her whole Skin almost was hard, inflamed, swell'd, and full of Pustules) had yet no Fever, no Pain in the Head, nor any inward Sickness or Illness; and as to what Disorders she or Signior *Ignatio* felt in their Eyes, this likewise was only a Swelling affecting the Eye-lids only, which may be reckon'd but as Skins: But 'tis possible the ill Effects of the Varnish were more sensible and troublesome in that Part, because the Skin there is thinner and more delicate than on the rest of the Body. This Varnish therefore is only an Enemy to the Skin; and that this Mischief should attend it, it is not necessary that the Varnish should be heated; for although it is cold, it sends forth the ill Steam, which insinuates itself into the Body, especially when touched and handled.

I have



I have several times spread a great deal of this Varnish hot upon the naked Skin of *Poultry*, and they never received any Mischief from it, either internal or external. I have caused other Fowl to swallow Crumbs of Bread sopp'd in the Varnish, and they seem'd to like it very well. In others I have made several little Pricks in their Breasts till the Blood came out, and then anointed it all over with Varnish, which, instead of hurting them, proved a Balsam to heal them. It is possible, this Varnish, on the very thin Skin of Fowl, does not produce the same Effects as on that of Men, because they are very different from one another, in their Structure and Quality of the Humours contained in them. And to say something of its Substance; I have observed that this Varnish is in a great part compos'd of *Gummy* and *Unctuous* Matter; and since it is very light, swimming upon Brandy and Oil, and unites neither with Water nor Spirit of Wine, nor any other Liquor, but only with Oil, and burns or takes fire; for I have dipp'd Cotton in it, which has burnt all away to Ashes, though at first there was some difficulty to make it take fire; perhaps some other Matter not unctuous being mixed with it: and lastly, since, being observed with the Microscope, its Composition shews like that of Oil or Lard, or the like unctuous Matter; it is very likely from all these, that it is compos'd of the Gum or Juice of some resinous Herb or Tree, or of the Fat of some Animal, or Hog's Lard. And perhaps the Gall of some Creature may be mix'd with it, to make it the more easily receive a Smoothness and Lustre, as Limners use to put *Gall* into their Water Colours, to make them run and spread the better; and that the Mischief we find in touching and using it may proceed from hence.

I believe there is no Mercury, of what sort soever, in this Varnish; not only because it is very light, but because I have been very diligent in trying whether Gold would discover any Sign of Mercury, either in the Body of it, or the Smoke, but could never find any; and moreover, Mercury produces very different Effects in our Bodies, from those of this Varnish.

Besides, I have observed that the Varnish mix'd with Spirit of *Vitriol*, or Juice of *Lemons* or *Vinegar*, or Spirit of *Wine*, makes no Ebulition nor Change of Colour; but it readily changes Colour, when taken out of the Vessel and expos'd to the Air, becoming at first reddish, and afterwards almost quite black; the outward Skin of it, which is next to the Air, becoming very hard and black. This Skin is very thin, under which the rest of the Varnish remains soft and fluid, of the Colour and Consistence of Honey; and as often as you take off this outward black hard Skin, there will another be formed immediately like the former, and this as often as you please to repeat the Experiment. So that the whole Substance of the Varnish will in time be changed into these hard and black Skins.



It is worth observing, that this Varnish has this known Power; for having spread some of it on the naked Breasts of some Fowls, leaving it sticking there three Days, I afterwards found between the dried Varnish and the Flesh, the Place all fester'd, and full of a yellowish *Serum* or Matter, but without any farther Mischief to the Bodies of the Fowls themselves. I have attempted the same thing on Dogs and Cats, but without Success; for these Animals with their Tongues and Claws soon take off all the Varnish from their Bodies, and so receive no Hurt by it. Perhaps in Horses, and such like Beasts, the Experiment might succeed better, if the Varnish has this corrosive or caustick Quality on their Bodies that it has on Poultry.

Of Cobalt,  
and the Prepa-  
ration of  
Smalt and  
Arsenick; by  
Dr. D. Kreig.  
n. 293. p. 1754.

VIII. *Smalt* is made of *Cobalt* or *Cadmia Nativa*. The *Cadmia* is a massy, grey, shining Stone, found in a great Quantity in the Mines about *Shneebergh*, and some other Places in *Hermanduria*. It is very often mix'd with *Marchasite*, sometimes with *Silver* and *Copper Ore*; nay, the *Silver* is sometimes (tho' but seldom) pure in the Figure of Hair.

After they have pick'd out the *Cobalt*, and separated it from the common Stone, they beat it to Powder by an Engine or Machine, commonly used in Mines, call'd a Pool-work. By that Operation the Water carries away the light Stuff and Sand, leaving the heaviest behind. This Powder is afterwards put into a low and broad Furnace, made on purpose to separate the Sulphur and Arsenick; where the Powder is spread all over, and the Fire which is beneath and behind it, is forced to pass its Flame along over the Powder, and so to take along with it the Arsenick in form of a Smoke, which afterwards is received by a low Chimney, and out of that carried in a close Channel made of Brick-Wall, of about fifty or more Paces, where the Arsenick by the way sticks to the Wall, in form of a white or yellowish Powder. The same is taken out every six Months, and melted into whole Pieces.

The *Cobalt* thus roasted, and smoaking little more, being red-hot, is taken out and cooled again, and gathered for melting. Its Colour by that way of Roasting is turned a little more whitish.

When they have a mind to melt it, the Powder of the *Cobalt* is mixed with Pot-Ashes and Powder of white Flint Stones. The Proportion of them is according to the Goodness of the *Cobalt*, or as they will make the *Smalt* of a deep or paler Colour: For Example; they take one Part of Pot-Ashes, two Parts of *Cobalt*, and three or four Parts of Flint. This Mixture is put into great strong Pots, standing in a hot Furnace; six or eight Pots in one Furnace; there it stands melting for five or six Hours time, turning into a blue Glass, which afterwards is taken out with a great Iron Spoon, and put into a Vessel full of cold Water, where it cracketh and grows more tender, to be the more easily powdered again: but the empty Pot in the Furnace is filled



filled up again with the aforesaid Mixture. And so they continue Night and Day, not leaving off the Fire in the Furnace.

The blue Glass taken out of the Water is powdered again by the ordinary Engine; the finest separated by a Sieve, is put into a Mill, and grinded in Water unto the finest Powder, which by washing is still separated from the coarser. It is afterwards dried in little warm Chambers, put into Barrels, and thus sent away to several Countries.

If one of the Melting-Pots breaks, or is very much burnt, so that it must be taken out, there they find always on the Bottom two Cakes of different Stuff, not mixed with one another. The undermost is a sort of *Æs Caldarium* of (*Gleiken Spisse*) and the uppermost is of *Marchasite*.

The Grass and Fruits growing thereabout, where such a Workhouse stands, are commonly poisoned by the Arsenical Smoak, that no Cattle or Men can, without Damage, feed upon them.

Fig. 188, 189. The Furnace where the Cobalt is roasted, and the Arsenick separated. *a*, The Furnace to roast the powdered Cobalt. *b*, The Chimney accepting the arsenical Smoak. *c, c, c*, The Channel of Stones to collect the Arsenick. Fig. 188, 189.

Fig. 190. The Furnace for melting the Cobalt into a Glass, *a, a, a, a*, the Holes where stand the Melting-Pots. The great Holes, where they put in the Pots are shut up with Bricks, and little ones are left, where they take out the Glass with the Spoon, *b, b, b, b*. Fig. 190.

Fig. 191. Two Grinding-Stones to grind in Water. Fig. 191.

IX. I have observed that the Mixture of the greatest Part of the Salts in many Liquors is accompanied with a sensible Coldness of the Liquors, notwithstanding the prompt and violent Fermentations, which follow many of these Mixtures. *Observations on the Dissolutions, and Fermentations, which we may call Cold. By Mons. Geoffroy. n. 274. p. 951.*

I have distinguished these Dissolutions or Mixtures into two Classes. In the former I comprehend all the simple cold Dissolutions, that is to say, those Dissolutions which are not accompanied with any sensible Ferment. The second takes in only the cold Ferments, or Dissolutions of Salts, which are accompanied with a sensible Ferment, and a Coldness of the Liquor.

Class I. Of Simple Cold Dissolutions. I put a Pint of common Water into a Viol, and an ordinary Thermometer of eighteen Inches in the Water, and so let it lie some Time to fit itself in proportion to the Temperature of the Water. I afterwards put into the Water four Ounces of *Sal Armoniac*, and the Liquor of the Thermometer descended two Inches and nine Lines, in less than a Quarter of an Hour. *Dissolution of Salts salted in common Water.*

Observing the same Circumstances, I made the same Experiment with Salt-Petre, and the Liquor of the Thermometer descended one Inch and three Lines.

The same Experiment being made with Vitriol, the Liquor of the Thermometer descended almost an Inch. Sea-



Sea-Salt made the Liquor descend but two Lines. And all the Salts being to be put in very lightly, I thought it the hardest Matter to pour it in aright.

*Dissolution of Alkali Volatile salted in common Water.*

All the *Alkali Volatile* Salts cooled the common Water by their Mixture, causing the Liquor of the Thermometer to descend by some Lines: But I observed that they caused (to do so) more or less, according as they were more or less purified: And the Salt of Urine seem'd to do so soonest of all.

*Alkalious Lixivious Salts excepted from the general Rule, because that some of them do heat in their mixture with Water.*

As to the *Alkali Lixivious* Salts, they were so far from cooling the Water in which they were mingled, that they heated it more or less, according as they were calcined better or worse.

Upon the whole, one may observe that the Salts for heating the Water ought to be purely alkalious. For if they approach near the Nature of Nitre or Sea-Salt, they heat the Water but little or not at all, if they do not rather cool it. This is also to be done very considerably by the Salt of *Tamarisc*, extracted from the *Lixivium* of the Ashes of this Vegetable.

*Salts salted mixed with the Acids of Vegetables.*

*Sal Armoniac* mingled with the Acids of Vegetables, as distilled Vinegar, Juice of Lemons or Verjuice, gave no Mark of a Ferment, but cooled these Liquors very much.

An Ounce of *Sal Armoniac* cast into four or five Ounces of distill'd Vinegar, causes the Liquor of the Thermometer to descend two Inches three Lines.

The same Salt, mixed with the Juice of Lemons, caused the Liquor to descend two Inches. It does the same with Verjuice.

These are the Mixtures of Salts with Liquors, which seem'd most remarkable, by reason of the *Cold* which they excited.

*Salts salted, mixt with Acid Spirit.*

Class II. *Of cold Fermentations.* Salt-Petre, cast into its acid Spirit, raised some Smoke or Vapours, and caused the Liquor of the Thermometer to descend four Lines.

Salt-Petre, mixed with the Spirit of Vitriol, Smoke exhale in great Quantity, and caused the Liquor to descend from six to seven Lines. In these two Experiments I put half an Ounce of Salt upon three Ounces of Liquor.

I put half an Ounce of *Sal Armoniac* into three Ounces of Spirit of Nitre, and the Liquor of the Thermometer descended three Inches five Lines. This Mixture put forth some Vapours, which seemed more considerable than those which do ordinarily exhale from Spirit of Nitre alone.

I poured half an Ounce of *Sal Armoniac* into three Ounces of Spirit of Vitriol, which made a violent Fermentation. The Subject Matter was considerably raised, and much Vapour went out, the Liquor was very thick, and the Thermometer descended three Inches six Lines. I observed, that the Vapours which were raised by this Mixture were hot, and that they considerably raised the Liquor of the Thermometer,





Fig. 180



Fig. 179.



Fig. 181

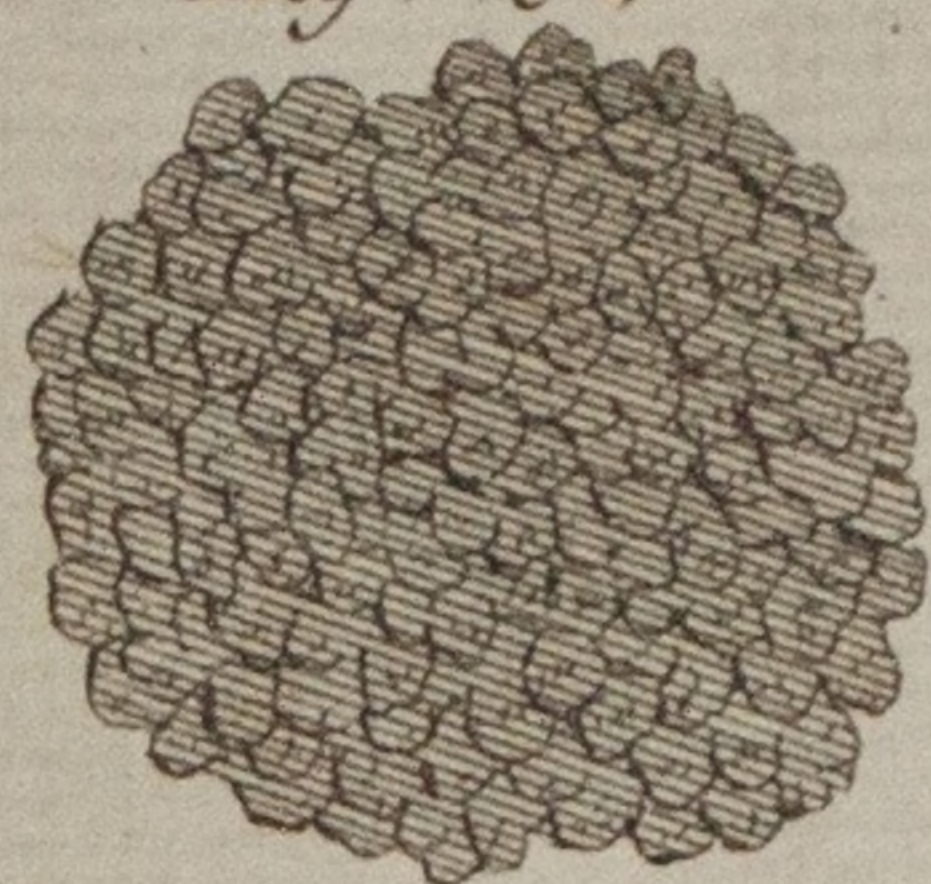


Fig. 182

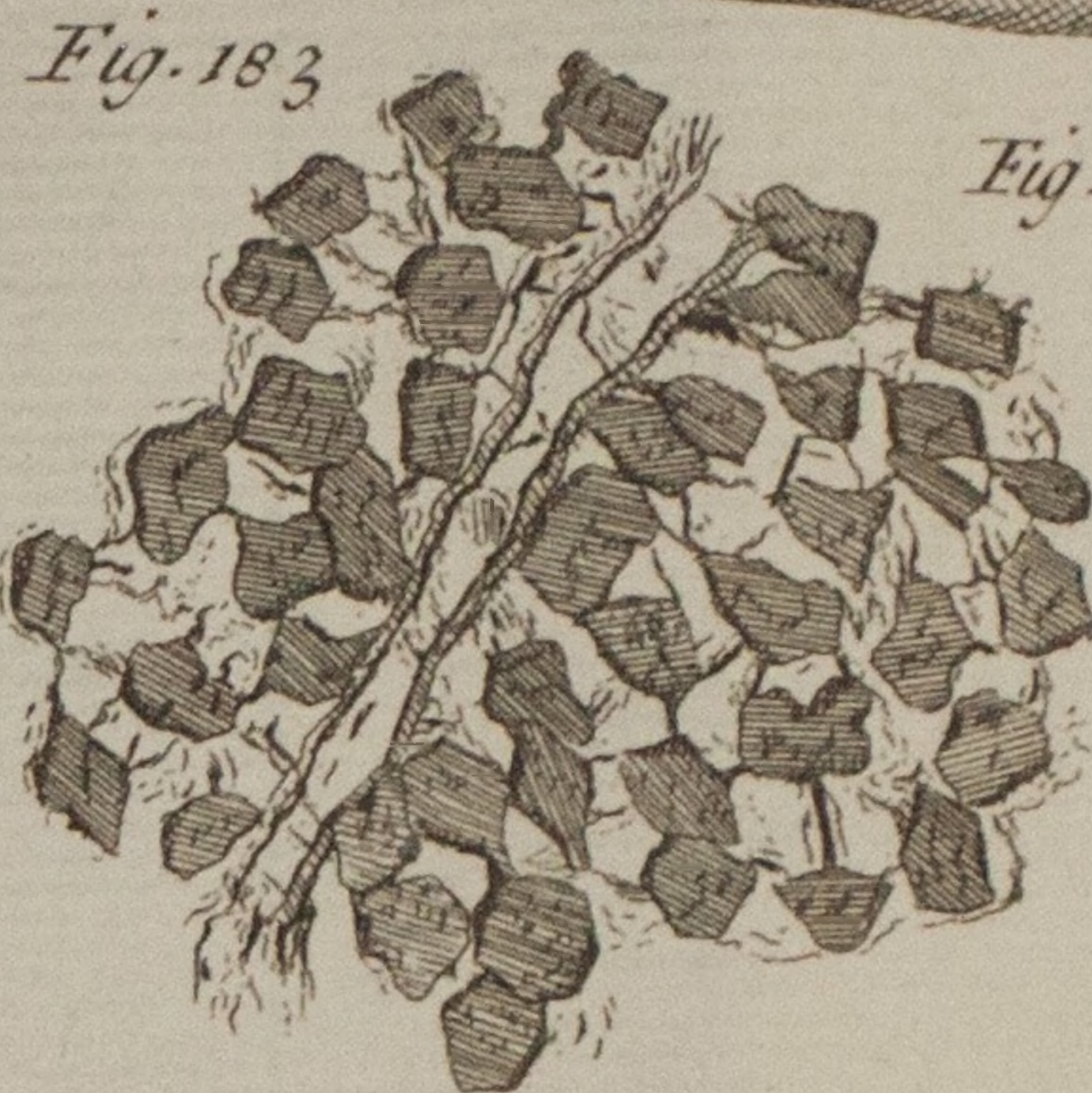


Fig. 183



Fig. 184

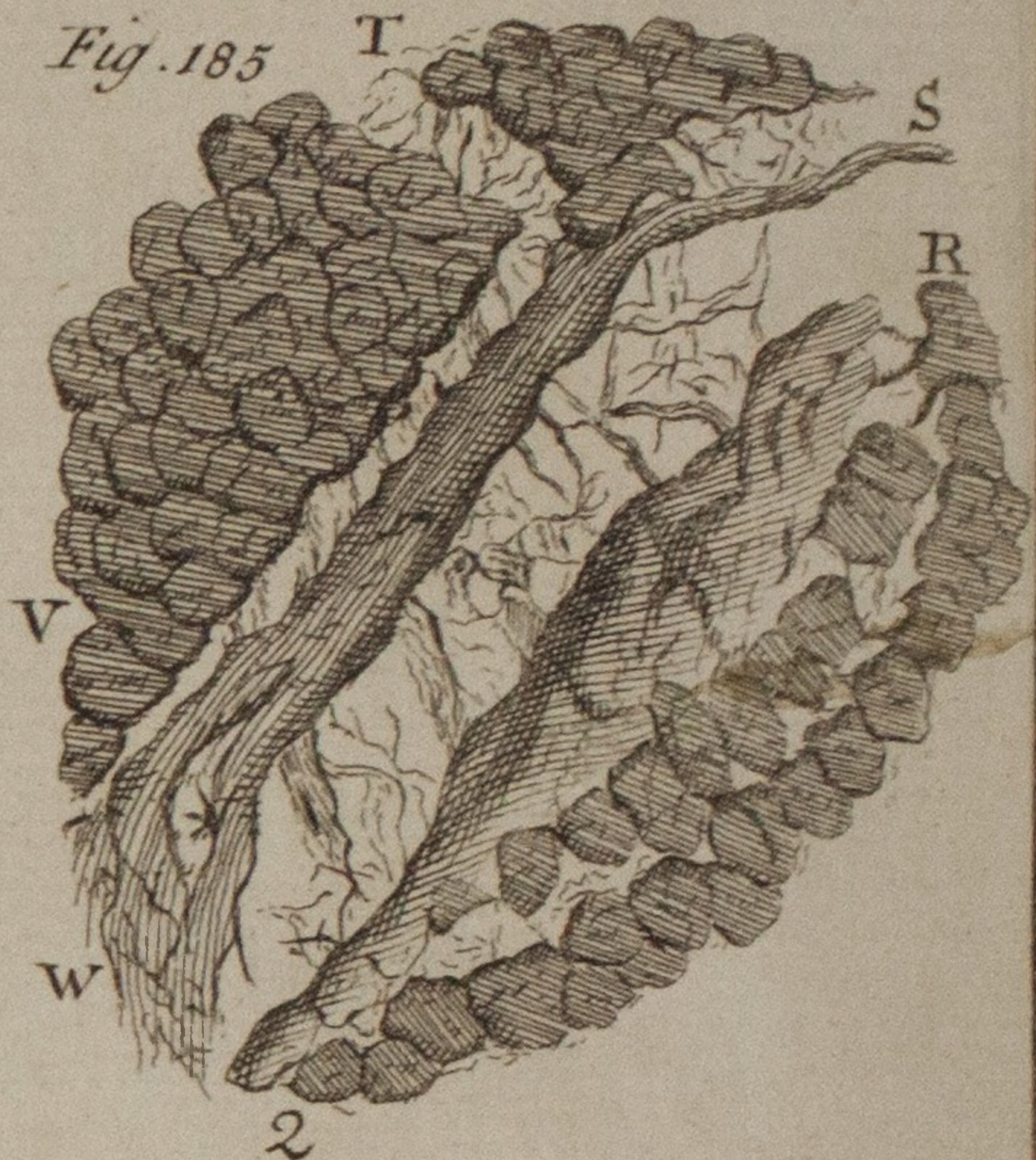


Fig. 185



Fig. 186



Fig. 187

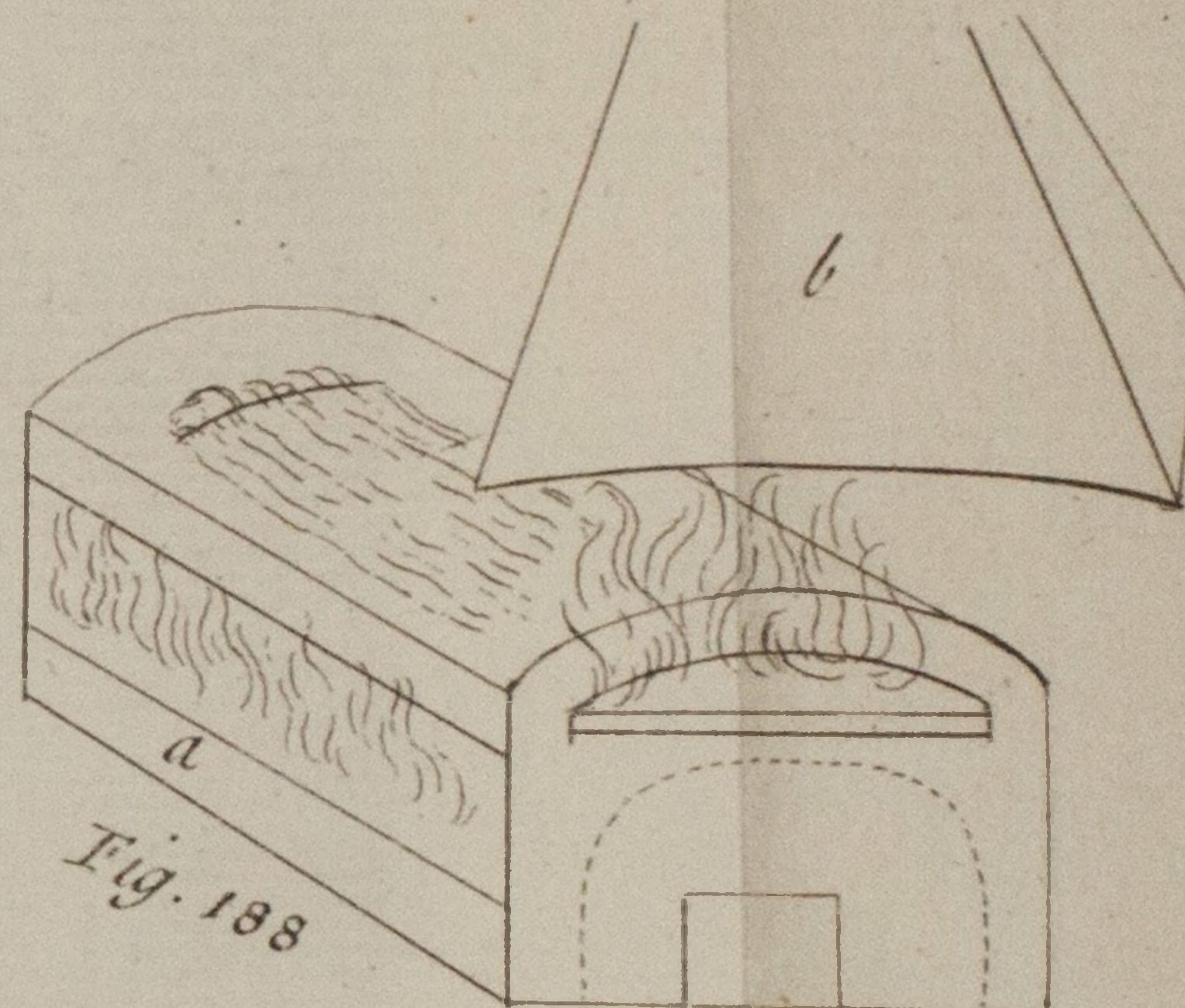


Fig. 188

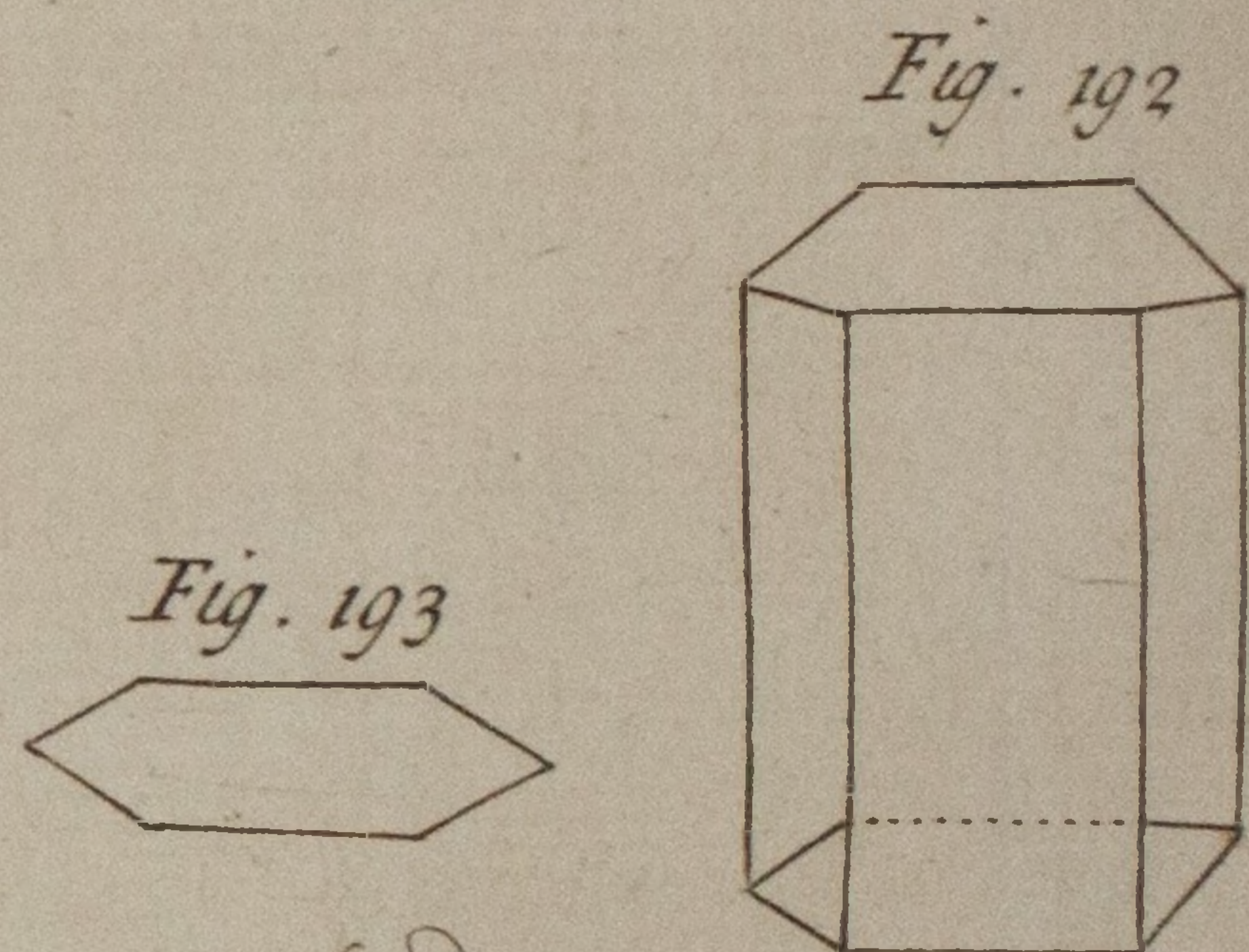


Fig. 192

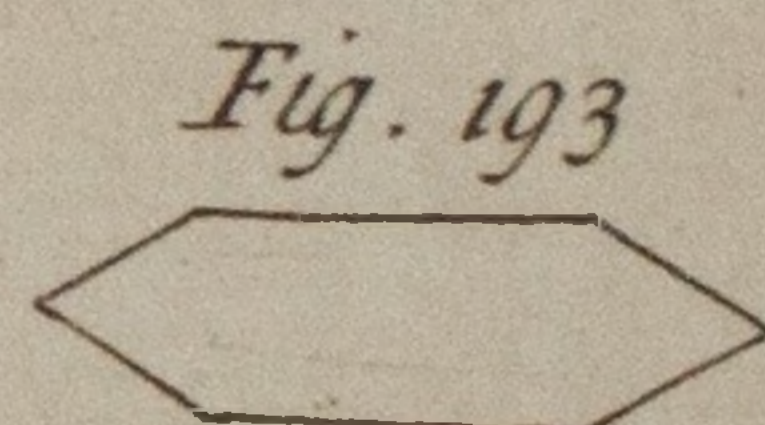


Fig. 193

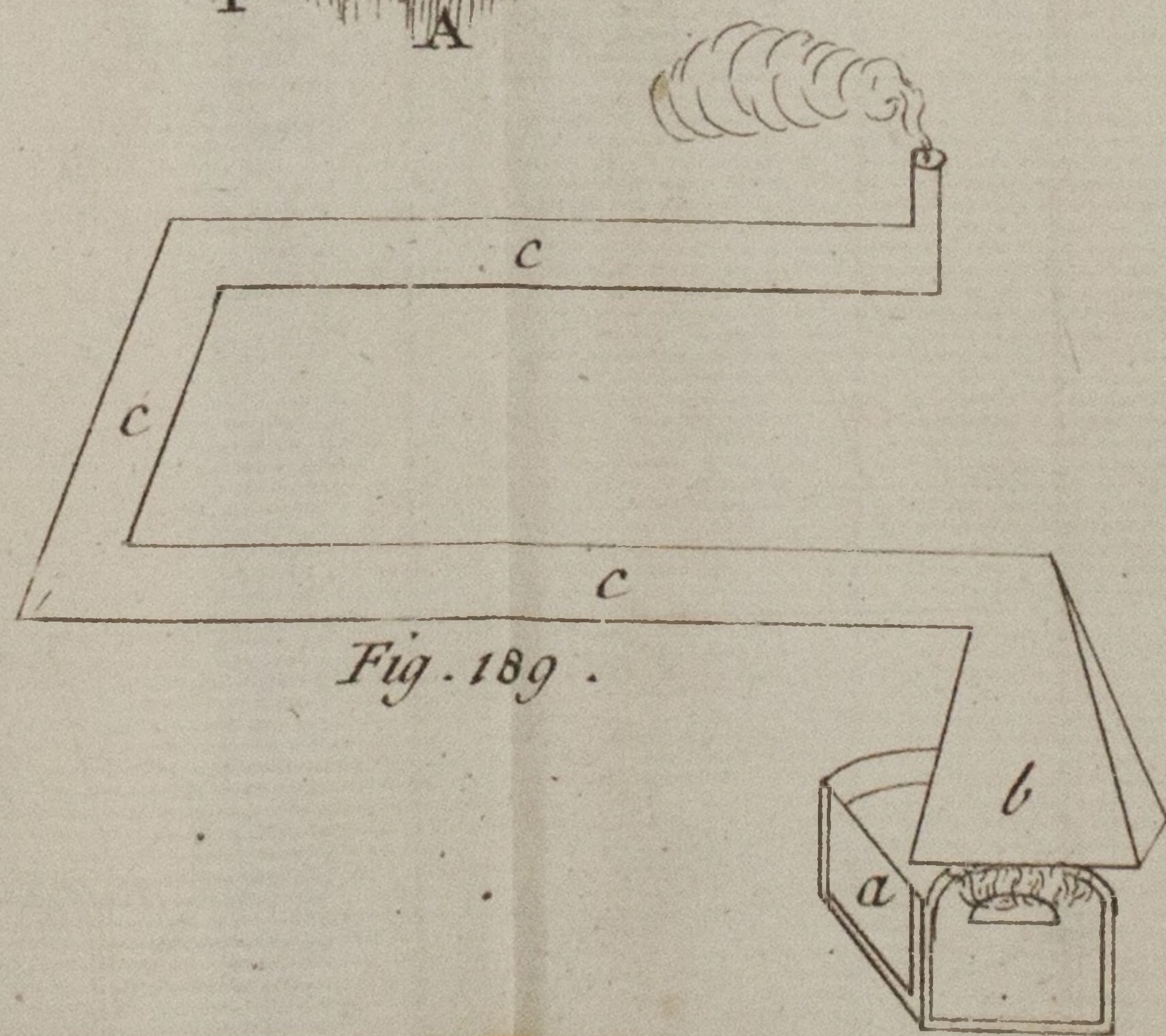


Fig. 189.

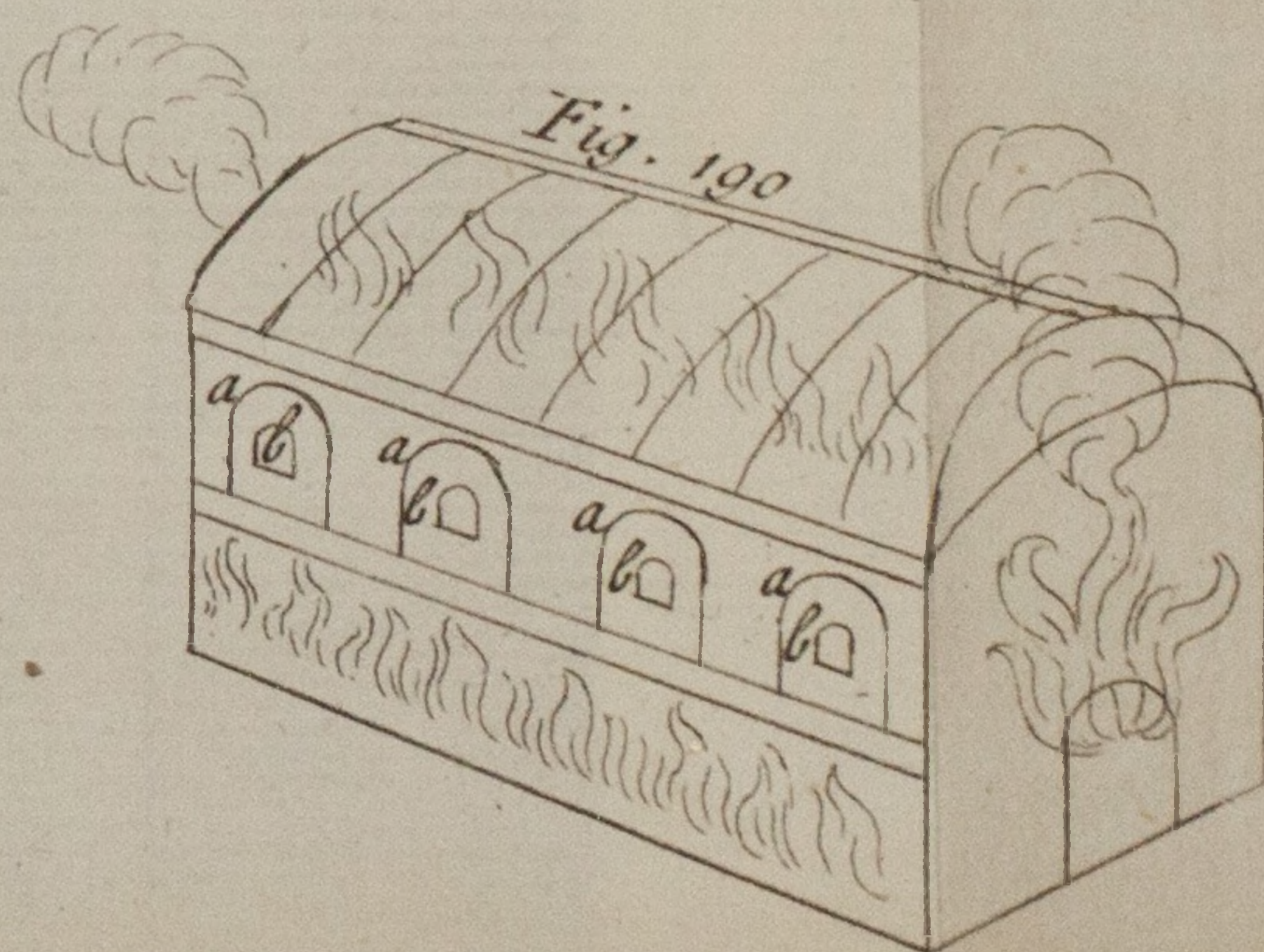


Fig. 190

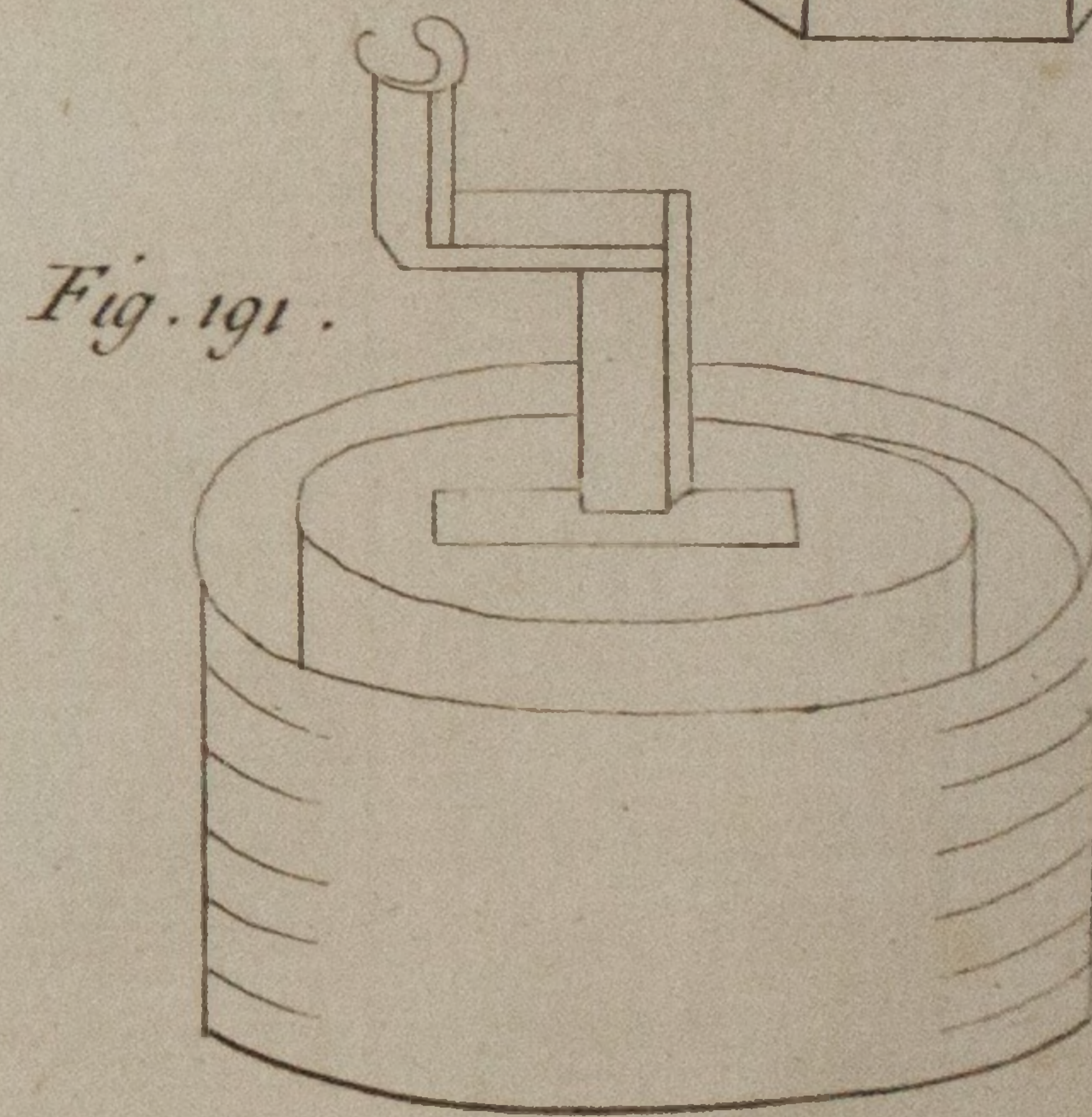
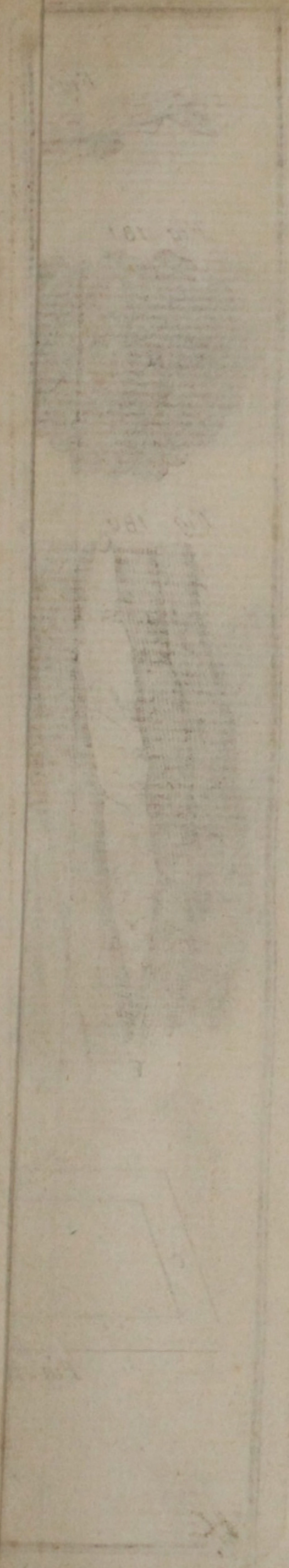


Fig. 191.







meter, which I held hanging above the Subject Matter, tho' that which was dipped within did descend, and shew'd a very great Cold.

Sea-Salt mixed with acid Spirits, heats the Liquors, instead of cooling them. Being mixed with Spirit of Salt, it raised the Liquor of the Thermometer some Lines, without shewing any sensible Ferment. With Oil of Vitriol it ferments with a Noise, and raises a great Smoke: The Liquor thickens, and becomes a Sort of a clear Jelly. The Liquor of the Thermometer rises very much in this Mixture, and the Heat is sensible to the Touch.

All the Volatile Alkalious Salts mingled with different acid Liquors, excited a Ferment more or less strong, according to the Acidity of the Liquors, and the Purification of these Salts from their foetid Oils. They all made the Liquor of the Thermometer to descend: But that which did so the most considerably, is the Salt of Urine.

One Ounce of Volatile Salt of Urine very well rectified, in four Ounces of distilled Vinegar, made a strong Fermentation. The Substance is elevated very much, and with Noise; and the Liquor of the Thermometer descends in the Ferment one Inch nine Lines.

One Ounce of Volatile Salt of Urine, in three Ounces of Spirit of Vitriol, raised a violent Ferment, during which the Liquor of the Thermometer descended two Inches four Lines.

The Mixture of Salt of Tartar, or other fix'd Alcalious pure Salts, with acid Liquors, excited Fermentations with Heat.

I made all these Experiments with the same Thermometer, when the Weather was sufficiently cold, and the Temperature of the Air equal enough.

As to the Reason of these Experiments, I first of all examined the simple cold Dissolutions, and having (with all Physicians) fixed this Principle, That Cold is nothing but the Diminution of Motion; I say, that the Coldness which the Salts bring to the Water, seems to be occasion'd from this, that the salt Particles being without Motion, and dividing that Liquor, diminishes it so much the more. This (is that) which produces the Cold greater or less in the same Liquor.

There is one thing to be observed; which is, that some time after the Dissolution is made, the Liquor of the Thermometer rises again a little; which may be occasioned by this, that the subtile Matter which glided abundantly between the Liquid Particles, had ceased to glide there in the same Quantity for some Time, the gross Particles of the Salts opposing themselves against their Passage; but these Saline Particles being divided by little and little, they opened again the Passages to the subtile Matter. This gave to the Liquor more Motion than it had at the Beginnig of the Dissolution; but yet less than it had when it was pure and without Mixture; the Saline Particles, altho' dissolved, abating somewhat of their Motion.

We



Whence proceeds the Heat of the Dissolutions of Lixivious Salts.

We may easily comprehend why lixivious Salts, purely alkalious and well calcin'd, as also the Salt of Tartar, do heat the Liquor, and are very far from cooling it, if we consider that these Salts in the strong Calcination which they have undergone, are loaded with many fiery Particles which they hold, as it were in Prison, in their Pores. These igneous Particles regain their Liberty by the Dissolution of the saline Particles. And in the same time that these Salts ought to slacken the Motion of the aqueous Particles, and cool it, the igneous Particles being very active, do augment the Agitation of the watry Particles, till they make it very hot.

Great Coldness of Sal Armoniac even to Freezing.

I observe next, that *Sal Armoniac* cools the Water wherein it is dissolved, more than any other Salt. Its Cold equals that of Water which is ready to freeze. And it happened one time, that in dissolving a good Quantity of this Salt, in Water, some Drops which fell on the outside of the Viol, in which I made the Dissolution, did freeze; and the Straw upon which the Viol stood, being wet, was fastned to the Glass-Vessel, for some time, by the Ice. This fell out since the Summer, at a time when the Weather was warm. I have many times since tried the same Experiment, in different Ways, but without ever being able to produce the Ice. Chance had apparently made me meet with in this Experiment, not only a very exact Proportion between the Salt and the Water, but also a Temperature in the Water besides, which I suppose necessary: Because the Dissolution being quick, the Coldness must also be more sudden and great: And this is that Degree of Temperature to which I could never afterwards attain.

Reason of the Coldness.

The great Coldness of the Dissolution of *Sal Armoniac* proceeds not from any Difficulty which it has to be dissolved, since it dissolves sooner than any other. And Sea-Salt, whose Dissolution is different and very slow, is that which does least cool its Dissolver. On the contrary, it seems that the Facility and Readiness with which it dissolves, may be the Cause of this great Cold, in this manner.

*Sal Armoniac* is a Composition of Sea-Salt, and Salt of Urine, the one very easy, the other very hard to dissolve; the Particles of Sea-Salt being, as it were, imprisoned among the Particles of the Salt of Urine, it comes to pass, that many of the aqueous Particles, penetrating at first dash the saline Particles of the Urine, do there immediately lose much of their Motion; and this Motion grows weaker by so much the more, as the aqueous Particles meet afterwards with saline Particles of another Nature, whose Resistance is much more considerable, than that of the Salts of Urine. So that in the first Instance of the Dissolution, the Motion of a great Quantity of aqueous Particles being very much abated all at once by the Salts of Urine, and by the Sea-Salt, it excited in a few Moments, a Cold far greater than the Cold of other Dissolutions of Salts, which the Water does not penetrate so readily.



It may be objected, that the Sea-Salt being the hardest to dissolve, its Dissolution would be also the coldest. To which I answer, that this might be, if the Water could penetrate suddenly into all its Parts: But the Slowness with which it penetrates them, because of the close Texture of the *Molecules* of this Salt, does hinder that the Diminution of the Motion of the Parts of the Water, can't be so ready, nor by consequence so great: Whereas in *Sal Armoniac*, the Parts of the Sea-Salt being extended by the Salt of Urine, the Pores of the Alkalious Salt of Urine are like so many Ways open to the Parts of the Water, for going to penetrate the Parts of the Sea-Salt in numberless Places.

I place in the Rank of Cold Dissolutions, an Experiment which Monsieur *Homberg* made some time ago, before the Society. Take a Pound of corrosive Sublimate, a Pound of *Sal Armoniac*, powder them, each apart; then mix both the Powders very exactly; put the Mixture into a Vial, pouring upon it a Pint and a half of distilled Vinegar, shaking it well together. This Composition will be so very cold, that a Man can hardly hold the Vessel in his Hands in Summer. And it happen'd that, as Monsieur *Homberg* was making this Mixture, the Subject froze.

*Experiment of  
a Saline Dis-  
solution excel-  
sively Cold.*

We see, in this Experiment, a Cold yet greater than that in the Dissolution of *Sal Armoniac* alone in common Water. And this Cold is caused by the corrosive Sublimate, which alone is not at all, or at least very little dissoluble in distilled Vinegar. So that the fluid Parts of the distilled Vinegar having quickly penetrated the Parts of the *Sal Armoniac*, and having already lost a great deal of their Motion, engaging afterwards in the Pores of a Body which they could not dissolve, and having Action not more than enough for that, they do there lose that little Activity which they had. They coagulate there, if not all, at least the greatest Part: And this Want of Action is the Cause of that great Cold which we perceive there.

In order to shew the Reason of *Cold Ferments*, I own (with the Physicians) that Heat and Cold in Liquors are neither more nor less than Motion in the little Parts of these Liquors, caused by the continual Current of the subtile Matter in the Spaces which these Particles do leave between them. And I affirm, that every time this Motion is diminished, and when the Course of the subtile Matter is interrupted, the Liquor appears less hot, or more cold.

*Explications  
of Cold Fer-  
ments.*

This being supposed, if we do attend to that which happens in cold Fermentations, we shall observe on the one hand, for the most part, very considerable Coagulations, and a very sensible thickening of the Liquors: On the other hand, we shall perceive a very violent Agitation of some of the Parts of these Mixtures; many Vapours are exhaled, the Matter swells, sends out many Bubbles, and ferments with Noise. And in this manner I conceive that all these Effects are produced.



In the Mixture which I made of Salts with Acid Liquors, the greatest part of the Liquor coagulating with a part of the Salts, its Motion was much abated in a little time; but its Parts not being able to coagulate, without stopping or weakening the Current of the subtile Matter; this Matter finding the Passages shut up, takes its Course by the Interstices, which remained between the coagulated Particles, where the Passage was yet free; and as it glided away in a Quantity together, it caused a very considerable Agitation in the Parts which it met with in its Passage. 'Tis this Agitation which causes the Fermentation which we perceive: 'Tis this which raises the Bubbles of Air and the Smoke: 'Tis this which puffs up and swells the Matter with so much the more Violence, as all the Parts of the Liquor being almost half coagulated, do hinder the Motion and Agitation of these little Particles. Nevertheless this Agitation, how violent soever it may appear, is not considerable enough to break the Coagulum intirely, which is formed in the Liquor, nor consequently to overcome the Cold, which causes this Coagulation. All it can do, is to preserve yet some kind of Fluidity. In short, the more these Mixtures are disposed to coagulate, the more they excite the Cold. This we may see in the Mixture of the *Sal Armoniac* with the Oil of *Vitriol*, in which the Coagulum becomes so strong, that at last it forms above the Liquor a very thick Saline Crust. In the Mixture of other Salts with weaker Acids, as in the Mixture of volatile Salts with Spirit of Vinegar, the Coagulum can hardly be perceived; nor is the Cold so considerable as in the former. I add farther, That even the violent Agitation which this Mixture causes, being not universal, and passing no farther than some few Places of the Liquor; it may for all that, contribute to the great Coldness in the Mixture of the *Sal Armoniac* and Oil of *Vitriol*, in increasing the Coagulum, so that the little Particles which are violently agitated in this Mixture, being not able to draw along with them, in their Motion, the coagulated Parts which are too gross, they drive them away from the Centre of their Motion: So that these Particles almost half coagulated, being got amongst these little Whirl-pools, and press'd one against another, they stick close to one another, coagulate more strongly, and lose their Motion intirely; which causes a very great Cold. If any Man can scarce persuade himself that the violent Agitation in some Parts of the Mixture does contribute to the Coldness of the Liquor, he may be convinced by the following Experiment.

Experiment of  
Water cooled  
by Fire.

I put some cold Water into a great Basin; I put into the middle of the Water a Cucurbit of Glass full of Water equally cold; I put into the Cucurbit a very good Thermometer, which I let lie a good while for a Trial. When it was adjusted to a degree proportionable to the Cold of the Water, I threw suddenly into the Water in the Basin 4 or 5 Shovels full of Coals well kindled; and in an instant, the Liquor of the Thermometer descended 2 or 3 Lines. After some moments, the  
Liquor



Liquor rose again, when the Heat of the Water in the Basin was communicated to the Vessel of Glafs.

The Cold of the Water of the Cucurbit, can't be attributed to any thing besides the Pression or sudden Condensation which the Fire caused in the Water, wherein it was put. Which Condensation may be explained in this manner. *Reason of this Experiment.*

In the instant that the burning Coals were thrown into the Water, the Vortex of the subtile Matter by which it was turn'd round, being press'd by the Water which environ'd it, scatter'd with Violence all the Particles of the Water. This scattering being made all at a time in many places of the Water in the Basin all round the Vessel of Glafs, all the Particles which environ'd the Vessel, being at once press'd on all sides, were condensed considerably and successively. The Vessel being in the Centre of Pression, bore all the Weight of this Pression, as well as the Liquor which contained it. And this Liquor lost by its Condensation very much of the Motion of the Liquid, which it had before, which was considerable enough to cause the Liquor of the Thermometer to fall. This Cold goes off quickly, because all the Water in the Basin being very much heated, it quickly heats also that in the Vessel of Glafs.

The ordinary Thermometers not being capable of marking to me the Cold of the Water so readily and nicely as I would, in this Experiment, I had Recourse to another sort of Thermometer † which was more exact. † Vid. *Supra* Vol. iv. Part ii. p. 10.

As for the sensible Heat of the Vapours which rise from the Mixture of *Sal Armoniac* with *Oil of Vitriol*, it is not difficult to find the Cause, if we consider that these Vapours are but the most subtile and active Parts of this Mixture, which the subtile Matter raises within it, crossing it. The Motion of these Particles is free in the Air; but it is more repressed by the too gross coagulated Particles. It becomes by so much the more violent, by how much it has been retained and hindred for some Time; and is perceived by Heat, which is the ordinary Effect of rapid and violent Motion. *Reasons of the Hot Vapours from the Cold Ferment caus'd by the Mixture of Sal Armoniac and Oil of Vitriol.*

I shall relate another considerable Experiment of the Cold Fermentation, caused by the Mixture of *Sal Armoniac* and *Oil of Vitriol*.

If after having made the Mixture of four Ounces of *Oil of Vitriol*, and one Ounce of *Sal Armoniac*, one throws upon it a Spoonful of common Water, in the time when the Fermentation is strongest, the Cold is greatest, and the Thermometer falls with the greatest Quickness, the Ferment ceases, and the Cold changes immediately into a great Heat, and makes the Liquor of the Thermometer to rise very high. One may easily conceive the Reason of this Experiment, if we consider that the Water heating quickly and strongly with the *Oil of Vitriol*, makes here the same Effect. And this Heat is sufficiently great at that time to destroy the Cold of the coagulated Particles, the Water by itself being otherwise very proper to dissolve this *Coagulum*. *Change of the Cold Ferment from the Mixture of Sal Armoniac and Oil of Vitriol, into very hot Ferment with a little Water.*



Dr. J. Freind's  
Defence of  
his Chemical  
Lectures, &c.  
n. 331. p. 330.

X. When I publish'd my Chemical Lectures, I had a Suspicion that I might give some Offence to the Chemists. For being an unknown Author, I made bold to rescue a most useful Art from those Fables and fanciful Opinions, with which they had too long obscured it, and endeavour'd to place it in a proper Light. I made no doubt but such as had any Regard for Truth, would be so fair, as to give a Writer Thanks who should produce any thing new in this Part of Philosophy, and should be the first to reduce it to the Principles of Nature, such as should be found and incontestable. But the Matter has fallen out otherwise than I expected. For the Editors of the *Leipsick* Acts, not meddling with the Experiments produced by me, nor the Manner in which I have endeavour'd to reduce them to the Laws of Nature, have attempted to overthrow the Principles themselves, which have so long been held as certain, and on which my whole Explication of Chemical Matters depends. This they do at the first Onset, without giving any Account of the Book itself, that no one might read it without first being prejudiced against it. And surely these their Cavils are the less to be tolerated, because on this account they go out of the Limits of their Province. For all that these scribbling Index-makers pretend to, is in a compendious Way to relate simply and faithfully what is contain'd in a Treatise, but to leave the Judgment of the Reader free and unbiass'd. For a Foundation of the Theory of Chemistry, I assumed the Principles, and the Method of arguing from them, which *Newton*, the Prince of Mathematicians and Philosophers, has introduced: which great Man, by his own excellent Genius, has taught us a sure Way for the Improvement of Physics, and has fix'd natural Knowledge on such weighty Reasons, has enrich'd it with such a Number of new Discoveries, that he has done more to illustrate and explain it than all the Philosophers of all Nations. I shall therefore lay open, in a few Words, the Doctrine of this most sagacious Man, because the Editors seem to know nothing of it; and I shall shew, that whatever we have in this kind of Knowledge that is compleat and satisfactory, is derived from this Way of reasoning. Then I shall make it appear, that the Arguments they use to undermine this Doctrine proceed from the false Notions they have entertain'd of this Matter; and that more such Shadows of Reasons which they have recourse to, may be brought against their own Principles, than against those of *Newton*.

The *Cartesians*, and almost all those that profess themselves Masters of the Mechanical Philosophy, always proceed in this Method, to assume some Hypothesis or Fiction, which no where exists but in their own fond Imaginations. Then, in Words that are neither clear nor determinate, they contrive Means how Nature shall adapt every thing to the Rule of this Hypothesis. But *Newton* proceeds in a very different Way. He feigns nothing, he assumes nothing that is precarious, he takes nothing for granted but what is known by Experiment and Observation,  
and



and is evident to all by the Use of their Senses. From these Principles, with mathematical Accuracy, he deduces all his Conclusions, which then he happily accommodates to the explaining the other Phænomena of Nature. Proceeding in this Method, he has most elegantly demonstrated, that the Planets move round the Sun with an elliptical Motion, and always describe Areas corresponding to the Times. Also that the Satellites revolve in the same Manner about the Planets, which they continually follow as Companions. Hence he has put it out of all doubt, that the Planets have a Tendency or Inclination towards the Sun, and the Satellites towards their primary Planets; and that this Inclination decreases in a duplicate Ratio of the increasing Distances. Therefore that in all Bodies there is an immutable Force, by which they are urged towards one another. And hence it is that the Inflection of the Moon towards the Earth amounts to the same as the Force of Gravity, and is the Cause of the reciprocal Approach and Retreat of the Sea. This Inclination or Attraction, if they please, they may call an occult Quality, and I believe it will always remain occult. Nor do I yet see, that any one of the Editors is so acute in the more recondite Philosophy, as to explain to us, by what Means and by what mechanical Force Nature performs this Attraction. But however occult this Force of Nature is, in regard to its Cause, yet by no means can it be call'd a Fiction or Hypothesis, which, by their own Confession, must be said of their Principles: For that it exists as surely as the Sun and the Planets, may be proved by irrefragable Arguments. Now if it be a Principle of that Kind, that it perpetually inheres in all Matter, why may not Philosophers adapt it to their Purposes, and explain to us, by its Means, how many Effects are produced, which fall under daily Observation?

In like manner, by constant Observation, and most convincing Experiments, the same *Newton* has discover'd the different Refrangibility of the Rays of Light; and hence he has so happily laid open the admirable Nature of Light and Colours, that all must acknowledge this Part of Opticks was treated of before him but in a very slight and superficial manner.

It appears therefore that this is the true Method in which Philosophers must proceed, in their Investigation of real Science. First, they must search out the Natures and Forces of Bodies by a multitude of Experiments; then neglecting to inquire into the Causes from whence they proceed, they should pursue and explain the Phænomena that result from the innate Virtue of every one. The divine *Archimedes*, proceeding in this Way, searched into the Laws of Mechanicks and Hydrostaticks; but did not amuse himself with settling the Cause either of Gravity or Fluidity. By taking for Principles only that which is perceiv'd by our Senses, he very ingeniously penetrated into the Mysteries of both those Sciences. And so likewise *Galileus*, tho' he advanced no Hypothesis concerning the Cause of Gravity, yet he found out the Velocity of the Motion which heavy Bodies acquire by falling, the Course and Impetus

of



of Projectiles, and was the first that explain'd the reciprocating Motion of Pendulums; and laid those Foundations of Science, upon which the greatest Masters in Physics have built their finest Inventions. Again: Have not Mathematicians proceeded with great Success in illustrating Opticks, by taking for granted the two Principles of Reflection and Refraction, altho' their true Cause is hitherto known but to very few?

If the Authority of the Editors were of any Weight, these notable Discoveries of very ingenious Men must be wholly rejected, for no other Reason but because they are derived from such Powers of Bodies, whose Origin and Causes are altogether unknown; *nor can be commodiously explain'd without that occult Quality, which confounds the Principles of true Philosophy, and reduces it to its ancient Chaos.* I find that the learned *Wolffius*, in his *Aërometria*, has recourse to the Gravity of the Air, as a Principle which he requires to be granted him; and from thence has clear'd up many Phænomena of Nature to good purpose. Yet he does not once mention any mechanical Cause of Gravity; nor do I believe that any Hypothesis has been yet proposed for explaining this Cause, which *Wolffius* himself cannot easily prove to be very remote from Truth. Will therefore the Editors object to him, that he introduces an occult Quality into Physics? *Newton* has gone farthest of any in promoting this Gravity, which we know to be a sensible Quality. For he shews it to arise from an attractive Force, which propagates itself on all Sides through all Matter. This Force the Editors, by that Authority they claim in philosophical Matters, call by the Name of a Figment. But it is hard to understand by what Propriety that can be call'd a Figment, which is proved really to obtain in the nature of things. *Newton* has very clearly explain'd that Species of Attraction, which prevails in the whole Planetary World; nor have I yet seen what, with any appearance of Reason, can be objected to the Demonstrations of this most sagacious Philosopher. As to this other kind of Attraction, which decreases in more than a duplicate Ratio of the Distance, that it really exists, and exerts its Power eagerly in the minutest Corpuscles, I have more Experiments at hand to prove it, than *Wolffius* can produce to demonstrate the Gravity of the Air. Why then must the Principles, on which this whole Reasoning is founded, in one of these Subjects be treated as fictitious, and in the other not? It is found by Experience, that Rays of Light proceeding either from the Sun, from the fix'd Stars, or from our common Fires, are alike attracted towards the Edges of solid Bodies. But this is an immutable Law of Nature, that where-ever Action is, there must necessarily be Re-action. Therefore we may very fairly conclude, that this Principle which we call Attraction really exists, and is universally diffused through all Matter whatever. And though it inheres in all Matter, yet that it displays its Force more sensibly in the minutest Particles, the very acute Philosopher *Dr. Keil* has plainly demonstrated.

But these Men say, *If such things are once admitted, and a License of feigning introduced, others will invent other occult Qualities, or such as themselves*



themselves own to be absolutely inexplicable, and so by degrees we shall return to the old Refuges of Ignorance. If a Force of attracting is allow'd, or a Sympathy, why not a Force of repelling likewise, or an Antipathy? So an Antiperistasis will be as easily granted, so Qualities emitted by the way of Species with their Potentials in Act, the attractive Chord of Linus; a Variation of Extension in the same Matter, not only apparent but real. Do they thus begin their Recital of Absurdities, If a Force of attracting is allow'd? Does not manifest Experience shew that this must be allow'd? This is not a Matter of Opinion, invented to account for other Phænomena, but is itself a Phænomenon, and so constituted by Nature. And tho' the Editors here applaud themselves, as having reduced the Maintainers of this Doctrine to something like an Absurdity; yet all the Argumentation, of which they boast so confidently, only amounts to this; That if some one Principle must be granted, which by certain Observation we find actually to exist in the nature of things, therefore we must admit others that have never existed. For Instance; if we acknowledge Gravity, which we are sure is inherent in all Bodies whatever, tho' we are altogether ignorant of its Cause, therefore we must necessarily espouse all the Fables and Whimsies of Philosophers, which are neither confirm'd by Experience, nor can be proved by Reason. If this be reasoning after the manner of Mathematicians, it were better to return to those old Refuges of Ignorance, than to fall into such a licentious Way of Argumentation.

Now they oppose attractive Force chiefly on this Account, because it cannot be explain'd by mechanical Reasonings. Therefore will they admit nothing into Physics, unless its Reason and Cause is understood? Has any one of the Editors ever explain'd the Elasticity of the Air, or solved it upon mechanical Principles? Yet all Philosophers take it for granted, and agree in applying it to the Solution of many natural Phænomena. We freely allow that an Artist may understand the Construction of a Clock, tho' he does not know the Reason of Gravity or Elasticity, upon which the whole Motion of the Wheels depends. Shall we deny the same Privilege to a natural Philosopher? He that investigates that Power by which all Bodies are actuated, all are directed in their Motion and Order; who can determine the Laws of this moving Power, and apply them to explain the principal Phænomena of Nature, tho' he frankly confesses he is quite ignorant of the Cause of this governing Power; shall we affirm that he knows nothing of Nature, and understands nothing of its Effects? Now if the Editors are desirous of prosecuting this Principle of Attraction to the Fountain-Head, they may do as they please; *Newton* will leave this Glory to them. It is sufficient for him, if, without giving Offence to the Editors, he may be excused from undertaking to solve a Problem, which he thinks to be very intricate and difficult.

I am well aware that the learned *Leibnitz*, whom the Editors regard as a kind of Deity, in that Specimen which he calls by a pretty sounding Name,



Name, *Dynamic*, has very plainly told us, that active Power or Endeavour constitutes the intimate Nature of Bodies. This Force or Endeavour, if I rightly understand what he means, is the same thing as that mutual Propension which we have said is implanted in all Bodies, and which *Newton* had discover'd long before, tho' he had no where asserted that the Nature of Matter was contain'd in it. If *Leibnitz's* Doctrine is true, it may with as much Reason be required of us to search into the Cause of Extension and Solidity, as to inquire into the Reason of this attracting Principle, which is inherent in all Matter. If we lay this down as a Foundation, all the Effects which we perceive in this whole Machine of the World, derive their necessary Origin from the mere Constitution of Matter. But the intimate Nature of Bodies is so little known to me, that I am far from affirming this Force was necessarily inherent in them, and belong'd to them by the same natural Connection as Extension and Solidity. Certainly this Opinion seems to be so very ill grounded, that the Arguments which it would be easy to alledge against it can hardly be enumerated, and much less refuted. If the Editors espouse Mr. *Leibnitz's* Opinion, I cannot see why they should reject a Principle, which he judges to be so very necessary, as to pronounce it to be constituted in the intimate Nature of Things. Since therefore it is evident from the Motion of all Bodies, that this attractive Power is really existing, if they think it is not necessarily inherent in Matter, nor to be mechanically explain'd, I think we shall not be guilty of any Absurdity, or offend against true Philosophy, if we resolve it into the Will of God; and allow it to be an universal Law, by which this whole Machine of the World is regulated and govern'd, and the Harmony and Correspondence of all Bodies are preserved, whatever different Motions they are actuated with. Though even this Power, as well as the whole Construction of Nature, is derived only from the Divine Will. They who will acknowledge no such Law as this, but maintain that the whole Business of natural Philosophy is perform'd of itself, and by some mechanical Power, and that not only as to the nearer Causes, but even the most remote; so that they imagine there is nothing but what proceeds from the Power of Matter itself, and an immutable Condition of Motion; what else do they do but, with *Epicurus*, root out of the Minds of Men the Notion of a God, who governs all things by his Providence, and supply Arguments to Atheists and impious Men.

Now whatever we may conclude about this attracting Virtue, there is no doubt but that the Nature of Things requires some active Principle to support it. For Bodies, however at first put into Motion, if they were afterwards left to themselves, could not so constantly perform their Vicissitudes in a certain Time. When the most acute Mr. *Leibnitz* perceived this, he elegantly concluded, that to act in the Character of Substances. But where-ever this Force is constituted, that by its Motions agitates and stirs up all things, it must necessarily be resolved into some occult Quality; for hitherto we have sought in vain for a Cause different from that of the

Divine



Divine Will. Some who have thought themselves to be very discerning in mechanical Matters, have placed this Power in the Ether, or some very subtile Fluid. These I would ask, What is it that actuates this Ether, and keeps it in perpetual Agitation? How is it that such contrary Motions do not destroy one another? Again, What is it that endues these Motions with such a Faculty, that each performs its own proper Office? All these things must arise from some occult Quality, which they pretend the Ether is endued with. For if we admit this Hypothesis into Nature, it will soon appear that they introduce more occult Qualities than there are Phænomena to be explained by them. How much more rationally does *Newton* proceed in his Philosophy? He only requires that one Principle may be granted him, and this a very simple one, and confirm'd by manifold Experience: From thence he deduces Wonders.

But that whole Hypothesis of a certain Ethereal Virtue, or a subtile Fluid, under what Obscurity it labours, and with what weak Reasons it is supported, may be shewn by a very pregnant Argument taken from what the Editors have deliver'd about it. For they say, *All these things may be conveniently explain'd, and are already explain'd in part by learned Men, without this occult Quality of Attraction, which confounds the true Principles of Philosophy, and brings us back to the ancient Chaos.* For this purpose therefore they conceive *there are very many Particles of Matter, that are surrounded by a certain magnetical Sphere of a subtiler Fluid, by the Motion of which (as comes to pass in our Magnets) they attract or repel one another, or dispose to a convenient Situation, as often as they obtain this Liberty.* I desire to know what else is a certain Magnetical Sphere, but something very occult? To which something more occult is affix'd, that is, *Magnetism.* Whence is it that this Sphere of subtile Matter perpetually adheres to the Body which it surrounds? The Thing itself seems to require, that the Body, as soon as it changes its Place by impress'd Motion, should have this ambient Sphere behind it. Thus, if the Earth were actuated by any new Impulse, and so were obliged to change its present Course; it appears very plain from the Laws of Mechanicks, that not only the Atmosphere, but whatever was loose and at liberty on the Surface would be hurry'd away. What therefore are we to conclude in this State of Things? Whether that the Atmosphere would immediately follow the Motion of the Body by a certain occult Quality, or that another Sphere of subtile Matter would again be produced by an occult Quality likewise? However this is, I should be glad to know, what that Quality is which puts this Magnetical Sphere into Motion? Of what kind is this Motion, and how it is excited, which is the Cause that *the Particles of Matter attract one another, or repel, or dispose to a convenient Situation?* How many occult Qualities are they forced to have recourse to, to explain the several Phænomena, while they reject that one simple one, which is diffused through the whole Fabrick of Nature, and so admirably adapted to solve most of the Phænomena? This I cannot sufficiently



sufficiently admire in the Editors, who so eagerly contend against attractive Force, and think they can account for every thing without it, yet they introduce it into their own Essays in natural Philosophy. Nor do they abstain from the Use of the word Attraction, which seems to sound so elegantly in their Ears, that they might palliate their Ignorance. For they speak of a certain fluid Sphere, *which attracts, repels, and disposes to a convenient Situation.* As there is nothing of Truth in this Fable of a subtile Sphere, Care was to be taken, that that Agreement or Convenience might not be wanting, that would make the Matter probable. It would indeed be very easy to illustrate all the Phænomena of Nature in this manner; for this magnetical Sphere and subtile Fluid can do Wonders, and reconciles things that are most opposite to one another. And there can be no surer Asylum for Ignorance than this Fiction which they have invented, concerning a subtile Matter and a magnetical Force. For it far exceeds all the occult Qualities that hitherto have crept into Philosophy. Every one must perceive how fictitious and precarious they are; for what this subtile Fluid is, or whether there is one or no, can neither be known by Observation, or infer'd by Ratiocination. Let the Reader determine, whether these their Weapons of Reasoning, which they aim at the true or *Newtonian* Philosophy, may not be retorted against this their weak Way of Philosophizing. All those things which, with Ostentation enough, they advance as sure and certain, are nothing but vain and fabulous, depending upon no Observation or Experiment. And if they were granted them as true, they are attended with such a Tribe of occult and obscure Powers, that it is much easier to comprehend the Nature of Sympathy, Antipathy, and Antiperistasis. For I have always found, that this kind of Hypotheses are subject to this Defect, and they are more obscure and more difficult to understand than the things themselves they are introduced to explain. In that Hypothesis of Vortices, of which above all they seem to be fond, they alledge no Reason why the fluid Matter should affect a curved Passage, and turn itself about a Centre, since the Nature of all Bodies is such, as to move in strait Lines. Whence is it provided in so many Vortices, that they should not disturb and hinder one another in their Courses? Whence is it that the Comets pass through them, and wheel about by a Motion contrary to that of the Vortex? Their very swift Conversion is so far from hindering them, that in their Orbits about the Sun they are directed by the same Law as the Planets, and in a like manner are inflected towards him. In this Hypothesis of Vortices these philosophical Artists entangle themselves in such Snares, that they can never get clear of them; and yet in this consists the whole Foundation of this kind of Philosophy. When they undertake to explain any Phænomenon, their subtile Matter is ready at hand, which can perform whatever they please, in a Manner and by a Motion which is entirely unknown and inexplicable. Is this more becoming Philosophy, than if any one should say they proceed from Sympathy, Antipathy, or some occult Quality? Will not this Manner of  
philoso-



philosophizing, as much as that which they carp at, become a mere Asylum for Ignorance? And if we comply with Custom, which is ready enough to indulge such Romances, why may we not embrace those other Whimsies, which are contrived by Men ingenious at Invention?

How far different and unlike to this is the true Method of cultivating philosophical Knowledge! In this nothing is supposed but what most evident Observation pronounces to be the Constitution of things; and tho' the Cause and Origin of the Principle we make use of is conceal'd from us, yet from this many things may flow, which daily Use will inform us of, and may depend upon it. Therefore it is the Business of an ingenuous Philosopher, first to deduce the Powers of Bodies by Experiments; and afterwards, when they are carefully examin'd and establish'd, to shew distinctly and plainly what other Effects will necessarily follow from them. Nor can I think that any of the Arguments produced by my Adversaries are of such Weight, as to subvert this Method of investigating Truth. For, if the Principles and Postulates are fully verified by Experiment; if the Propositions are granted and duly premised, and nothing is urged contrary to the Rules of Logick; the Conclusion cannot but be most certain and indubitable. So that whatever we have that is examin'd and explain'd in this manner, may be deservedly esteem'd as improving and enlarging natural Philosophy by Discoveries. Therefore we trust that we are still in full and firm Possession of this attractive Force, notwithstanding the Endeavours of the Editors to wrest it from us.

There is also another Axiom, which has not the Consent and Approbation of the Editors; that is, *The Moments of Bodies, or the Quantities of their Motions, are in a compound Ratio of their Quantities of Matter and their Velocities.* They that think thus (according to them) *are in a common Error, as in their Acts is frequently observed.* In them indeed I find a little Discourse or two about this Matter of the learned Mr. *Leibnitz*. But he is so far from giving any Reasons, that he has nothing but some fallacious and minute Conclusions, or Disputes about Words. Therefore what he has produced about this Argument is disapproved of by almost all Mathematicians; some of which have very well defended this Axiom. The Reader, if he pleases, may consult these; for the Dispute, as it is copious enough, so it is too foreign from my Purpose here.

But now it is time to dismiss the Editors with a good Grace. For I must acknowledge this Civility of theirs, that by not denying it they seem to confess, that I have properly apply'd to my Design the Principles I have used, if those Principles are but true.

XI. *An Account of a Book omitted.*

Prælectiones Chymicæ, Oxoniæ habitæ, à Johanne Freind, M. D. n. 320. p. 312.  
Ædis Christi Alumno, 8vo.

*The End of the FIRST PART.*



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Præfationes Cyprianæ, Ovario habuit, a Johanne Fovino, M. D. & 220 p. 312.  
 Medis Christi Alumno, &c.







T H E

# Philosophical Transactions

A B R I D G ' D .

P A R T II .

C O N T A I N I N G

The *Philological* and *Miscellaneous* P A P E R S .

C H A P . I .

*Manuscripts, Printing.*

I. **T**H E Substance of what your Grace is pleas'd to say about *Manuscripts* and *Copied Writings* (as I apprehend it) is, *That 'tis not only possible, but very easy, upon the Perusal of a written Book, to pronounce in what Age or Century it was written, supposing a Man to be tolerably well versed in Books of that Language or Country. And that this Judgment may be made, only by observing the Shape and Figure of the Letters of the Book, which (as all other Things) have their fixed Periods for their Duration: As being form'd this way in such a Century, and such a way in the next; Time only (which alters the outward State of other things) working this Change in Letters also, of what Age, Language, or Country soever they be. And then as*

*Of the Age of MSS. Authors, Painters, Musicians, &c. (in a Letter to a Rev. Prelate) by Mr. H. Wanley, N. 300. P. 1993.*



to Original Compositions, your Grace is of Opinion, *That the Style and Diction of any noted Author being well observed, 'is very easy to discover such others of his Works as have gone abroad without his Name; and also the very Time when the Author liv'd.*

'Tis evident, my Lord, that a Man may judge of *some* MSS. by the Hand; and of the genuine and spurious Works of *some* Authors; and of the *Time* likewise, wherein they lived, by the *Style* of them: But whether this be so *easy* a Work, and that the Rules Men generally go by in these Cases, are *always infallible Guides*, is what (I own) I very much doubt of.

Suppose, my Lord, for Instance, a Man should bring to any Antiquary a good MS. Copy of the *Hebrew Bible, Pentateuch, or Psalter*, written in a small common Letter, without Points, without fine Knots, and Flourishes, without Pictures, and great Letters, or any thing that should look like pompous: Suppose that the Ink, Parchment, &c. should carry a seeming Face of Antiquity with them, and that a Man should say his MS. was 1000, 1200, or 1300 Years old, when as really it was written within a very few Years: Could he from the Hand alone soon find out the Cheat?

All the *Hebrew* MSS. that I have as yet seen, are written either with *Samaritan* or *Chaldee* Letters. As to the *Samaritan*, I own they bear a good Resemblance one to another, and that they differ very much from those *Samaritan* Characters, which we find stamp'd upon divers truly *Ancient* and *Genuine* Coins. But then there seems to be such a Resemblance (as to the Character) between those Coins struck in Ages far distant from one another, that 'tis hard (from the Consideration of the *Metal*, its *Fabrick*, *Weight*, from the Shapes of the *Letters* in the Inscription, &c.) to say which Coin was made in the Time of *David*, or *Solomon*, and which no older than the Time of the *Machabees*; this being rather to be gather'd from the *Words* and *Meaning* of their Inscriptions, than from the Figure of the Characters which compose them. The same may be said, in a great measure, of the old *Greek*, *Punic*, *Roman*, *British*, and other Coins.

The *Chaldee* Character has indeed varied in Tract of Time, according to the different Fancies and Humours of Men. The *even plain* Letter, I think, is the most ancient. This they altered into a more *neat* way of making it, as your Grace finds in *R. Stephens's Hebrew Bibles*. There is a third Fashion, of *waving* the perpendicular Strokes like Rays, as your Grace remembers in some of the *Hebrew* Coins exhibited in the *Prolegomena* to the *Polyglot* Bibles. Then fourthly, there is a *large fat* Letter in the MS. *Rituals* and *Liturgies*, besides the *Rabbinical* Letters of *Italy* and *Germany*, with their *Offspring*; the *Literæ Coronatæ*, and perhaps others that I never saw: (Not to mention here the *Jewish* Custom of writing the *Vulgar Language* of the Country, wherein they live, with *Hebrew* Letters). It seems a hard matter, my Lord, to trace the *Original* and *Progress* of all these Ways of Writing,



ting, so as, upon the bare Sight of a MS. written in the *Hebrew Language* or Character, to say, *by the Shape of the Letters of this Book it appears to be so old*: And it seems much more difficult to assign the particular *Province* or *Country* wherein each *Hebrew Book* was written: As for Example, in *Italy, France, Spain, Portugal, England, Holland, Germany, Poland, Barbary, Persia, India*, in the several *Provinces of Turkey*, &c.

The same almost may be said of the *Greek Manuscripts*, in which Language there has been a great Diversity of Writing, according to the *different Humours of the Scribes*, the *Fashion then in use*, or the *Manner of that particular Province*, in which such a Book was written. Nor is it *easy* (tho' one would be apt to take such *Differences* for so many Landmarks) to tell the Age of a *Greek MS.* without the Date; and I never yet saw such a *Date* so high as the Year 6400, according to the *Greek Computation*. And it is still much harder, from any Remarks about the *Character, Illumination, Ink, Parchment, Paper, Binding, &c.* to find out what \* *Country, Province, or Island*, such a *Greek Book* should be written in, or what *Countryman* the † *Scribe* should be. Nay, and what does farther add to the Difficulty, is, that 'tis known that the Shapes of the *Majuscule Letters* found in *Greek MSS.* have been retain'd for above 600 Years together, with little Variation; and also, that some MSS. written with *Minuscules* and with Accents, are older than some others which want them. And also, that the present *Greek Copistes* or *Librarii* have three or four different Hands commonly used by 'em, one being their own *Common Hand*, the others an Imitation of old MSS. which are more beautiful, but troublesome in writing, than their ordinary running Hands: It being customary, as I have been told, when a Man wants a Copy of such a Book to be written, for the *Copiste* to ask in what Hand it must be written, (for one Hand, it may be, is more costly than another;) and according as they agree, the Book is written. And thus I have seen some very new Things written in the same Hand with Books which are certainly 400 Years old.

What Methods learned Men have taken, in order to inform themselves of the *different Ages of MSS.* I know not; but my own has been this. I have been careful to get all the *Dates* I could, wherein

\* If a Man is born in one Country, and writes a Book in another, keeping still to the *Character and Manner of Writing* used in his own Country, I look upon it as the same thing as if he wrote it at home. And therefore I look upon the *Greek MSS.* which *Angelus Borgecius* wrote at *Paris*, as if they were written in *Candy*, where he was born. And so (amongst many others) to instance in a *Latin MS.* I look upon a Copy of *Pope Gregory's Pastoral Care*, now remaining in the *Bodleian Library*) as a noble Monument of our *Saxon Ancestors*: Tho' *St. Willibald* wrote it, perhaps, at *Mount Cassinum* in *Italy*, and afterwards (as it is probable) carried it with him into *Germany*, where it remain'd at *Wurtzburg*, till that City was plunder'd by the *Swedes* about 70 Years ago.

† Now this may in some measure be done by *Latin MSS.* because there are greater Plenty of them. For even I, by exactly observing the Nature of the Characters, &c. of those MSS. whose Country I was sure of, have afterwards been enabled to say, that this *Book looks as if it had been written in France, Italy, Spain, Germany, the Netherlands, England, Ireland, &c. and*, it may be, *about such a Time.*