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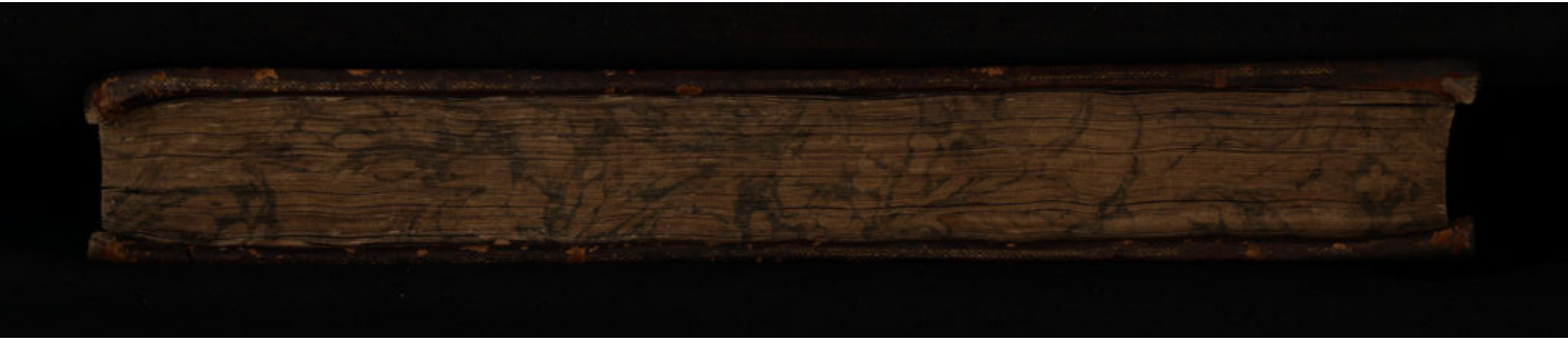

SYLVA SYLVARUM:

OR

A Natural History,

IN

TEN CENTURIES.

Whereunto is newly added

The *History Natural* and *Experimental* of LIFE and DEATH, or of the Prolongation of LIFE.

Published after the Authors Death,

By WILLIAM RAWLEY, *Doctor in Divinity*,

One of his Majesties Chaplains.

Whereunto is added *Articles of Enquiry*, touching *Metals* and *Minerals*. And the *New Atlantis*. With an *Alphabetical Table* of the *Principal things* contained in the *Ten Centuries*.

Written by the Right Honourable

FRANCIS

Lord *Verulam*, Viscount *St. Albans*.

The *Tenth Edition*,

In which is added an Epitomy of another peice of his Lord ship's Works intitled *Novum Organum* (being Translated for the clearer understanding of this his *Natural History*) never before published in English.

LONDON, Printed by *S. G.* and *B. Griffin* for *Thomas Lee*, at the Sign of the *Turks*-head in *Fleet street*, Between *Mitre* Court and *Ram-Alley*, over against *Fetter-Lane*. 1676.

TO THE

MOST HIGH AND MIGHTY

PRINCE CHARLS,

By the Grace of GOD,

KING of *Great Britain, France,* and *Ireland,*

Defender of the Faith, &c.

May it please Your Most Excellent Majesty,

THE whole Body of the *Natural History*, either designed or written; by the late Lord Viscount St. *Alban*, was Dedicated to Your Majesty, in his Book *De Ventis*, about Four years past, when Your Majesty was Prince: So as there needed no new Dedication of this VVork, but onely in all humbleness, to let Your Majesty know, it is Yours. It is true, if that Lord had lived, Your Majesty, e're long had been invoked to the Protection of another History, whereof, not Natures Kingdom, as in this; but these of Your Majesties, (dnring the time and Reign of King *Henry* the Eighth) had been the subject;

ject; which since, it died under the Designation meerly: There is nothing left, but Your Majesties Princely goodness, graciously to accept of the undertakers Heart and Intentions; who was willing to have parted for a while with his darling Philosophy, that he might have attended Your Royal Commandment in that other VVork, Thus much *I* have been bold, in all lowliness to represent unto Your Majesty, as one that was trusted with his Lordships VVritings, even to the last. And as this Work affecteth the Stamp of Your Majesties Royal Protection, to make it more currant to the VVorld; so under the protection of this VVork, I presume in all humbleness to approach Your Majesties presence, and to offer it up into Your Sacred Hands.

Your Majesties most Loyal

and devoted Servant.

W. RAWLEY.

TO THE

READER.

HAving had the Honor to be continually with my Lord, in compiling of this Work; and to be employed therein, I have thought it not amiss (with his Lordships good leave and liking) for the better satisfaction of those that shall read it, to make known somewhat of his Lordships intentions, touching the ordering and publishing of the same. I have heard his Lordship often say, That if he should have served the glory of his own Name, he had been better not to have published this Natural History; for it may seem an indigested heap of Particulars, and cannot have that lustre which Books cast into Methods: But that he resolved to prefer the good of Men, and that which might best secure it before any thing that might have relation to himself. And, he knew well, that there was no other way open to unloose Mens mind, being bound; and (as it were) Maleficiate, by the charms of deceiving Notions and Theories; and thereby made impotent for Generation of Works: But only no where to depart from the Sense and clear experience, but to keep close to it, especially in the beginning. Besides, this Natural History was a Debt of his, being designed and set down for a third Part of the Instauration. I have also heard his Lordship discourse, That Men (no doubt) will think many of the Experiments contained in this Collection, to be Vul-

gar

gar and Trivial, mean and sordid, curious and fruitlesse; and therefore he wisheth, that they would have perpetually before their eyes, what is now in doing; and the difference between this Natural History, and others, For those Natural Histories which are extant, being gathered for delight and use, are full of pleasant Descriptions and Pictures; and affect and seek after Admiration, Rarities, and Secrets. But contrariwise, the scope, which his Lordship intendeth, is to write such a Natural History, as may be fundamental to the erecting and building of a true Philosophy: for the illumination of the Understanding; the extracting of Axioms, and the producing of many noble Works and Effects. For he hopeth by this means, to acquit himself of that, for which he taketh himself in a sort bound; and that is, the advancement of Learning and Sciences. For having, in this present Work, collected the materials for the Building; and in his Novum Organum (of which his Lordship is yet to publish a Second Part) set down the Instruments and Directions for the Work; Men shall now be wanting to themselves, if they raise not knowledge to that perfection, whereof the Nature of Mortal Men is capable. And in this behalf, I have heard his Lordship speak complainingly, That his Lordship (who thinketh, that he deserveth to be an Architect in this Building) should be forced to be a Workman, and a Labourer; and to dig the Clay, and burn the Brick; and more then that, (according to the hard condition of the Israelites, at the latter end) to gather the Straw and Stubble, over all the Fields to burn the Bricks withal. For he knoweth, that except he do it, nothing will be done; Men are so set to despise the means of their own good. And as for the baseness of many of the Experiments, as long as they be Gods Works, they are honourable enough: And for the vulgarness of them true Axioms must be drawn from plain experience, and not from doubtful; and his Lordships course is to make Wonders plain,

and

and not plain things Wonders, and that Experience likewise must be broken and grinded, and not whole, or as it groweth; and for Use, his Lordship hath often in his Mouth, the two kinds of Experiments, Experimenta Fructifera, *and* Experimenta Lucifera Experiments of Use, *and* Experiments of Light: *And he reporteth himself, whether he were not a strange Man, that should think, that Light hath no Use, because it hath no matter. Further his Lordship thought good also, to add unto many of the* Experiments *themselves, some gloss of the Causes, that in the succeeding work of* Interpreting Nature, *and* Framing Axioms, *all things may be in more readiness. And for the Causes herein by him assigned; his Lordship perswadeth himself, they are far more certain, than those that are rendred by others; not for any excellency of his own wit, (as his Lordship is wont to say) but in respect of his continual conversation with* Nature *and* Experience. *He did consider likewise, That by this Addition of* Causes, *Mens minds (which make so much haste to find out the causes of things;) would not think themselves utterly lost in a vast* Wood of Experience, *but stay upon these* Causes *(such as they are) a little, till true* Axioms *may be more fully discovered. I have heard his Lordship say also, That one great reason, why he would not put these Particulars into any exact Method, though he, that looketh attentively into them, shall find, that they have a secret order) was, Because he conceived that other men would now think that they could do the like; and so go on with a further Collection, which, if the Method had been exact, many would have despaired to attain by Imitation As for his Lordships love of Order,* I *can refer any Man to his Lordships Latin Book,* De Augmentis Scientiarum; *which, if my judgement be any thing, is written in*

The Epiſtle is the ſame, that ſhould have been prefixed to this Book, if his Lordſhip had lived.

the exacteſt order, that I know any writing to be. I will conclude, with a uſual Speech of his Lordſhips. That this Work of his Natural Hiſtory, *is the* World, *as* God *made it, and not as Men have made it; for that it hath nothing, if Imagination.*

W. RAWLEY.

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NATURAL HISTORY

Century I.

1. Experiments in Consort, touching the *Straining and Passing of Bodies one thorow another; which they call* Percolation.

Dig a *Pit* upon the *Sea-shore*, somewhat above the High-water Mark, and sink it as deep as the Low-water Mark; And as the *Tide* cometh in, it will fill with *Water*, Fresh and Potable. This is commonly practised upon the Coast of *Barbary*, where other Fresh *Water* is wanting. And *Cæsar* knew this well, when he was besieged in *Alexandria*; for by digging of *Pits* in the *Sea-shore* he did frustrate the laborious Work of the Enemies, which had turned the *Sea-water* upon the Wells of *Alexandria*, and so saved his Army, being then in Desperation. But *Cæsar* mistook the cause; for he thought that all *Sea-sands* had Natural Springs of *Fresh-water*. But it is plain, that it is the *Sea-water*, because the Pit filleth according to the Measure of the *Tide*: And the *Sea-water* passing or straining through the Sand leaveth the Saltness.

2. I remember to have read, that Tryal hath been made of *Salt-water* passed through *Earth*; through ten Vessels, one within another, and yet it hath not lost his Saltness, as to become potable: But the same Man saith, that (by the relation of another) *Salt-water* drained through twenty Vessels, hath become fresh. This *Experiment* seemeth to cross that other of *Pits*, made by the *Sea side*; and yet but in part, if it be true, that twenty repetitions do the effect. But it is worth the Note, how poor the Imitations of Nature are, in common course of *Experiments*, except they be led by great Judgment, and some good Light of *Axioms*. For first, there is no small difference between a Passage of *Water* through twenty small Vessels, and through such a distance, as between the Low-water and High-water Mark. Secondly, there is a great difference between Earth and Sand; for all Earth hath in it a kind of Nitrous Salt, from which, Sand is more free: And besides, Earth doth not strain the Water so finely as Sand doth. But there is a third point, that I suspect as much, or more than the other two; and that is, that in the *Experiment* of *Transmission* of *Sea-water* into the *Pits*, the *Water* riseth; but in the *Experiment* of *Transmission* of the *Water*, through the Vessels, it falleth: Now certain it is, that the Salter part of *Water* (once

 salted

salted throughout) goeth to the bottom. And therefore no marvel if the draining of Water by descent, doth make it fresh: Besides, I do somewhat doubt, that the very dashing of the Water that cometh from the Sea, is more proper to strike off the salt part, than where the Water slideth of her own motion.

3. It seemeth *Percolation* or *Transmission* (which is commonly called *Straining*) is a good kind of *Separation*, not only of thick from thin, and gross from fine, but of more subtile Natures; and varieth according to the Body, through which the *Transmission* is made. As if through a Woollen-bag, the liquor leaveth the fatness; if through sand, the saltness, &c. They speak of severing Wine from Water, passing it through Ivy-wood, or through other the like porous body, but *Non constat*.

4. The Gum of Trees (which we see to be commonly shining and clear) is but a fine passage, or straining of the Juyce of the Tree, through the Wood and Bark. And in like manner *Cernish Diamonds*, and *Rock Rubies*, (which are yet more resplendent than Gums) are the fine Exudations of Stone.

5. *Aristotle* giveth the cause vainly, Why the *Feathers* of Birds are of more lively colours than the Hairs of Beasts; for no Beast hath any fine Azure, or Carnation, or Green Hair. He saith it is, because Birds are more in the Beams of the Sun than Beasts, but that is manifestly untrue; for Cattle are more in the Sun than Birds, that live commonly in the Woods, or in some Covert. The true cause is that the excrementitious moisture of living Creatures, which maketh as well the Feathers in Birds as the Hairs in Beasts, passeth in Birds through a finer and more delicate Strainer, than it doth in Beasts: For Feathers pass through Quils, and Hair through Skin.

6. The *Clarifying* of *Liquors* by Adhesion, is an inward *Percolation*, and is effected, when some cleaving Body is mixed and agitated with the *Liquors*; whereby the grosser part of the Liquor sticks to that cleaving Body; and so the finer parts are freed from the grosser. So the *Apothecaries* clarifie their Syrups by Whites of Eggs, beaten with the Juices which they would clarifie; which Whites of Eggs gather all the dregs and grosser parts of the Juice to them; and after the Syrup being set on the fire, the Whites of Eggs themselves harden and are taken forth. So *Ippocrass* is clarified by mixing with Milk, and stirring it about, and then passing it through a Woolling-Bag, which they call *Hippocrates Sleeve*; and the cleaving Nature of the Milk, draweth the Powder of the Spices, and grosser parts of the Liquor to it, and in the passage they stick upon the Woollen bag.

7. The clarifying of Water, is an experiment tending to Health, besides the pleasure of the Eye, when Water is Crystaline. It is effected by casting in, and placeing pebbles at the head of a Current, that the Water may strain through them.

8. It may be *Percolation* doth not onely cause clearness and splendor, but sweetness of savor; for that also followeth, as well as clearness, when the finer parts are severed from the grosser. So it is found, that the sweats of men that have much heat, and exercise much, and have clean Bodies and fine Skins, do smell sweet, as was said of *Alexander*; and we see commonly, that Gums have sweet Odors.

9. Experiments in Consort, touching *Motion of Bodies upon their Pressure.*

TAke a Glass and put Water into it, and wet your finger, and draw it round about the lip of the Glass, pressing it somewhat hard; and after you have drawn it some few times about, it will make the Water frisk and

and ſprinkle up in a fine Dew. This *inſtance* doth excellently demonſtrate the force of *Compreſſion* in a ſolid Body. For whenſoever a ſolid Body (as Wood, Stone, Metal, &c.) is preſſed, there is an inward tumult in the parts thereof, ſeeking to deliver themſelves from the Compreſſion: And this is the cauſe of all *Violent Motion*. Wherein it is ſtrange in the higheſt degree, that this *Motion* hath never been obſerved, nor inquired; it being of all *Motions*, the moſt common, and the chief root of all *Mechanical Operations*. This *Motion* worketh in round at firſt, by way of Proof and Search, which way to deliver it ſelf, and then worketh in Progreſs, where it findeth the deliverance eaſieſt. In *Liquors* this *Motion* is viſible; for all Liquors ſtricken, make round circles, and withal daſh; but in *Solids* (which break not) it is ſo ſubtile, as it is inviſible, but nevertheleſs bewrayeth it ſelf by many effects, as in this *inſtance* whereof we ſpeak. For the *Preſſure* of the Finger furthered by the wetting (becauſe it ſticketh ſo much the better unto the Lip of the *Glaſs*) after ſome continuance, putteth all the ſmall parts of the *Glaſs* into work, that they ſtrike the *Water* ſharply; from which *Percuſſion*, that ſprinkling cometh.

10. If you ſtrike or pierce a *Solid Body* that is brittle, as *Glaſs* or *Sugar*, it breaketh not only where the immediate force is, but breaketh all about into ſhivers and fitters; the *Motion* upon the *preſſure* ſearching all ways, and breaking where it findeth the *Body* weakeſt.

11. The Powder in Shot being dilated into ſuch a Flame, as endureth not *Compreſſion*, moveth likewiſe in round (the Flame, being in the nature of a *Liquid Body*) ſometimes recoyling; ſometimes breaking the *Piece*; but generally diſcharging the *Bullet*, becauſe there it findeth eaſieſt deliverance.

12. This *Motion* upon *Preſſure*, and the Reciprocal thereof, which is *Motion* upon *Tenſure*; we uſe to call (by one common name) *Motion of Liberty*; which is, when any *Body* being forced to a *Preternatural* Extent or Dimenſion, delivereth and reſtoreth it ſelf to the natural: As when a *blown Bladder* (preſſed) riſeth again; or when *Leather* or *Cloth* tentured, ſpring back. Theſe two *Motions* (of which there be infinite inſtances) we ſhall handle in due place.

13. This *Motion* upon *Preſſure* is excellently alſo demonſtrated in *Sounds*: As when on chimeth upon a *Bell*, it ſoundeth; but as ſoon as he layeth his hand upon it, the *Sound* ceaſeth: And ſo, the *ſound* of a *Virginal String*, as ſoon as the Quill of the Jack falleth upon it, ſtoppeth. For the *ſounds* are produced by the ſubtile Percuſſion of the Minute parts of the *Bell* or *String* upon the Air; All one, as the *Water* is cauſed to leap by the ſubtile Percuſſion of the Minute parts of the *Glaſs* upon the *Water*, wherefore we ſpake a little before in the *Ninth Experiment*, For you muſt not take it to be the local *ſhaking* of the *Bell* or *String* that doth it. As we ſhall fully declare when we come hereafter to handle *Sounds*.

14. Experiments in Conſort, touching *Separations of Bodies by weight*.

TAke a *Glaſs* with a *Belly*, and a long *Neb*, fill the *Belly* (in part) with *Water*: Take alſo another *Glaſs*, whereinto put *Claret Wine* and *Water* mingled. Reverſe the firſt *Glaſs*, with the *Belly* upwards, ſtopping the *Neb* with your Finger; then dip the mouth of it within the ſecond *Glaſs*, and remove your Finger. Continue it in that poſture for a time, and it will unmingle the *Wine* from the *Water*; the *Wine* aſcending and ſetling in the top of the upper *Glaſs*, and the *Water* deſcending and ſetling in the bottom of the ower *Glaſs*. The paſſage is apparent to the Eye; for

you ſhall ſee the *Wine*, as it were, in a ſmall vein, riſing throught the *Water*. For handſomneſs ſake (becauſe the working requireth ſome ſmall time) it were good you hang the upper *Glaſs* upon a Nail. But as ſoon as there is gathered ſo much pure and unmixed *Water* in the bottom of the lower *Glaſs*, as that the Mouth of the upper *Glaſs* dipeth into it, the *Motion* ceaſeth.

15. Let the upper *Glaſs* be *Wine*, and the lower *Water*; there followeth no *Motion* at all. Let the upper *Glaſs* be *Water* pure, the lower *Water* coloured or contrariwiſe there followeth no *Motion* at all. But it hath been tryed, that though the mixture of *Wine* and *Water*, in the lower *Glaſs*, be three parts *Water*, and but one *Wine*; yet it doth not dead the *Motion*. This *Separation* of *Water* and *Wine* appeareth to be made by *Weight*; for it muſt be of *Bodies* of unequal *weight*, or elſe it worketh not; and the heavier *Body* muſt ever be in the upper *Glaſs*. But then note withal, that the water being made penſile, and there being a great *Weight* of *Water* in the Belly of the *Glaſs*, ſuſtained by a ſmall Pillar of *Water* in the neck of the *Glaſs*; it is that which ſetteth the *Motion* on work: For *Water* and *Wine* in one *Glaſs* with long ſtanding, will hardly ſever.

16. This *Experiment* would be extended from mixtures of ſeveral *Liquors* to *Simple Bodies*, which conſiſt of ſeveral Similiar parts: Try it therefore with *Broyn* or *Salt-water* and *Freſh-water*, placing the *Salt-water* (which is the heavier) in the upper *Glaſs*, and ſee whether the *Freſh* will come above. Try it alſo with *Water thick Sugred*, and *Pure Water*; and ſee whether the *Water* which cometh above, will loſe his ſweetneſs: For which purpoſe, it were good there were a little Cock made in the Belly of the upper *Glaſs*.

17. Experiments in Conſort, touching *Judicious* and *Accurate Infuſions* both in *Liquors* and *Air*

IN *Bodies* containing fine Spirits, which do eaſily diſſipate when you make *Infuſions*; the Rule is, A ſhort ſtay of the *Body* in the *Liquor* receiveth the Spirit, and a longer ſtay confoundeth it; becauſe it draweth forth the Earthy part withal, which embaſeth the finer. And therefore it is and Error in *Phyſitians*, to reſt ſimply upon the length of ſtay for increaſing the vertue. But if you will have the *Infuſion* ſtrong, in thoſe kind of *Bodies*, which have fine Spirits, your way is not to give longer time, but to repeat the *Infuſion* of the *body* oftner. Take *Violets*, and infuſe a good Pugil of them in a Quart of Vinegar, let them ſtay three quarters of an hour, and take them forth, and refreſh the *Infuſion* with like quantity of new *Violets* ſeven times, and it will make a Vinegar ſo freſh of the *Flower*, as of a twelvemoneth after it be brought you in a Saucer, you ſhall ſmell it before it come at you. Note, that it ſmelleth more perfectly of the Flower a good while after, then at firſt.

18. This rule which we have given, is of ſingular uſe for the preparations of *Medicines*, and other *Infuſions*. As for example, the Leaf of *Burrage* hath an excellent Spirit, to repreſs the fuliginous vapor of Duſky Melancholly, and ſo to cure Madneſs: But nevertheleſs, if the Leaf be infuſed long, it yieldeth forth but a raw ſubſtance of no vertue: Therefore I ſuppoſe, that if in the Muſt of Wine or Wort of Beer, while it worketh before it be Tunned, the *Burrage* ſtay a ſmall time, and be often charged with freſh, it will make a ſoveraign Drink for *Melancholly Paſſions*. And the like I conceive of *Orange Flowers*.

19. *Rubard* hath manifeſtly in it Parts of contrary Operations: Parts that purge, and parts that bind the Body; and the firſt lay looſer, and the latter lay deeper;

deeper; So that if you infuſe *Rubarb* for an hour, and cruſh it well, it will purge better, and bind the Body leſs after the purging, than if it ſtood Twenty four hours: This is tried, but I conceive likewiſe, that by repeating the *Infuſion* of *Rubarb*, ſeveral times (as was ſaid of Violets) letting each ſtay in but a ſmall time, you may make it as ſtrong a *Purging Medicine*, as *Scammony*. And it is not a ſmall thing won in *Phyſick*, if you can make *Rubarb*, and other *Medicines* that are *Benedict*, as ſtrong Purgers, as thoſe that are not without ſome malignity.

20. *Purging Medicines*, for the moſt part, have their *Purgative Vertue* in a fine Spirit, as appeareth by that they endure not boiling, without much loſs of vertue. And therefore it is of good uſe in *Phyſick*, if you can retain the *Purging* of Vertue, and take away the unpleaſant taſte of the Purger; which it is like you may do, by this courſe of *infuſing* oft with little ſtay. For it is probable, that the horrible and odious taſte is in the groſſer part.

21. Generally, the working by *Infuſions* is groſs and blind except you firſt try the iſſuing of the ſeveral parts of the Body, which of them iſſue more ſpeedily, and which more ſlowly; and ſo by apportioning the time, can take and leave that quality which you deſire. This to know there be two ways; the one to try what long ſtay, and what ſhort ſtay worketh, as hath been ſaid; the other to try, in order, the ſucceeding *Infuſions*, of one and the ſame Body, ſucceſſively, in ſeveral *Liquors*. As for example, Take *Orange-Pills*, or *Roſemary*, or *Cinnamon*, or what you will; and let them *infuſe* half an hour in *Water*; then take them out, and *infuſe* them again in other *Water*; and ſo the third time; and then taſte and conſider *the firſt Water*, the *Second*, and the *Third*, and you will find them differing, not only in ſtrength and weakneſs, but otherwiſe in taſte or odor; for it may be the *Firſt Water* will have more of the ſcent, as more fragrant; and the *Second* more of the taſte, as more bitter or biting, &c.

22. *Infuſions* in *Air* (for ſo we may call *Odours*) have the ſame diverſities with *Infuſions* in *Water*; in that the ſeveral *Odours* (which are in one Flower, or other Body) iſſue at ſeveral times, ſome earlier, ſome latter: So we find, that *Violets*, *VVoodbines*, *Strawberries*, yield a pleaſant ſent, that cometh forth firſt; but ſoon after an ill ſent quite differing from the former. Which is cauſed not ſo much by mellowing, as by the late iſſuing of the groſſer Spirit.

23. As we may deſire to extract the fineſt Spirits in ſome caſes; ſo we may deſire alſo to diſcharge them (as hurtful) in ſome other. So *VVine Burnt*, by reaſon of the evaporating of the finer Spirit, inflameth leſs, and is beſt in Agues: *Opium* leeſeth ſome of his poyſonous quality, if it be vapored out, mingled with *Spirit* of *VVine*, or the like: *Sean* leeſeth ſomewhat of his windineſs by decocting; and (generally) ſubtile or windy Spirits are taken off by Incenſion, or Evaporation. And even in *Infuſions* in things that are of too high a ſpirit, you are better pour off the firſt *Infuſion*, after a ſmall time, and uſe the latter.

24. Experiments Solitary, touching the *Appetite of Continuation* in *Liquids*.

Bubbles are in the form of an *Hemiſphere*; *Air* within, and a little Skin of Water without: And it ſeemeth ſomewhat ſtrange, that the *Air* ſhould riſe ſo ſwiftly, while it is in the *Water*; and when it cometh to the top, ſhould be ſtaid by ſo weak a cover, as that of the *Bubble* is. But as for the ſwift aſcent of the *Air*, while it is under the *Water*, that is a *Motion* of *Percuſſion* from the *Water*, which it ſelf deſcending, driveth up the *Air*; and no *Motion* of *Levity* in the *Air*. And this *Democritus*

called *Motus Plagæ*. In this common *Experiment*, the cauſe of the encloſure of the *Bubble* is for that the Appetite to reſiſt Separation, or Diſcontinuance (which in ſolid *Bodies* is ſtrong) is alſo in *Liquors*, though fainter and weaker: As we ſee in this of the *Bubble*; we ſee it alſo in little Glaſſes of Spittle that Children make of ruſhes; and in Caſtles of Bubbles, which they make by blowing into *Water*, having obtained a little degree of Tenacity by Mixture of Soap: We ſee it alſo in the *Stillicides* of *Water*, which, if there be *Water* enough to follow, will draw themſelves into a ſmall Thred, becauſe they will diſcontinue; but if there be no remedy, then they caſt themſelves into round Drops; which is the Figure, that ſaveth the Body moſt from Diſcontinuance: The ſame reaſon is of the Roundneſs of the *Bubble*, as well for the Skin of *VVater*, as for the *Air* within: For the *Air* likewiſe avoideth *Diſcontinuance*; and therefore caſteth it ſelf into a round Figure. And for the ſtop and arreſt of the *Air* a little while, it ſheweth, that the *Air* of it ſelf hath little, or no appetite of Aſcending.

25. Experiment Solitary, touching the making of *Artificial Springs*.

THe Rejection, which I continually uſe, of *Experiments* (though it appeareth not) is infinite; but yet if an *Experiment* be probable in the Work, and of great uſe, I receive it, but deliver it as doubtful. It was reported by a ſober man, that an *Artificial Spring* may be made thus: Find out a hanging Ground, where there is a good quick Fall of Rain-water. Lay a Half-Trough of Stone, of a good length, three or four foot deep within the ſame Ground; with one end upon the high Ground, the other upon the low. Cover the Trough with Brakes a good thickneſs, and caſt Sand upon the top of the Brakes: You ſhall ſee (ſaith he) that after ſome ſhowres are paſt, the lower end of the Trough will be like a *Spring* of *VVater*, which is no marvel, if it hold, while the Rain-water laſteth; but he ſaid it would continue long time after the Rain is paſt: As if the Water did multiply it ſelf upon the Air, by the help of the Coldneſs and Condenſation of the Earth, and the Conſort of the firſt Water.

26. Experiment Solitary touching the *Vemment quality of Mans Fleſh*.

THe *French* (which put off the name of the *French diſeaſe*, unto the name of the Diſeaſe of *Naples*) do report, That at the ſiege of *Naples*, there were certain wicked Merchants that barrelled up *Mans Fleſh* (of ſome that had been lately ſlain in *Barbary*) and ſold it for *Tunney*; and that upon that foul and high nouriſhment, was the Original of that *Diſeaſe*. Which may well be; For that it is certain, that the *Canibals* in the *VVeſt-Indies*, eat *Mans Fleſh*; and the *VVeſt-Indies* were full of the Pox when they were firſt diſcovered: And at this day the *Mortaleſt poyſons*, practiſed by the *VVeſt-Indians*, have ſome mixture of the Blood, or Fat, or Fleſh of Man. And divers Witches, and Sorcereſſes, as well amongſt the *Heathen*, as amongſt the *Chriſtians* have fed upon Mans fleſh, to aid (as it ſeemeth) their Imagination, with high and foul Vapors.

27. Experiments Solitary touching the *Verſion* and *Tranſmutation* of *Air* into *Water*.

IT ſeemeth that theſe be theſe ways (in likelihood) of *Verſion* of *Vapors* or *Air*, into *VVater* and *Moiſture*. The firſt is *Cold*, which doth manifeſtly Condenſe; as we ſee in the *Contracting of the Air* in the *VVeather-Glaſs*; whereby it is a degree nearer to *VVater*. We ſee it alſo in the *Generation of Springs*, which the *Ancients* thought (very probably) to be made by the *Verſion* of *Air* into *VVater*, holpen by the *Reſt*, which the *Air* hath in thoſe parts, whereby it cannot diſſipate. And by the coldneſs of *Rocks* for there

there *Springs* are chiefly generated. We ſee it alſo in the effects of the *Cold* of the *Middle Region* (as they call it) of the *Air*; which produceth *Dews* and *Rains*. And the Experiment of turning *Water* into *Ice* by Snow, Nitre, and Salt (wherefore we ſhall ſpeak hereafter) would be transferred to the turning of *Air* into *Water*. The ſecond way is by *Compreſſion*; as in *Stillatories*, where the Vapor is turned back, upon it ſelf, by the Encounter of the Sides of the *Stillatory*; and in the *Dew* upon the Covers of *Boiling Pots*; and in the *Dew* towards *Rain*, upon *Marble*, and *Wainſcot*. But this is like to do no great effect; except it be upon Vapors, and groſs *Air*, that are already very near in Degree to Water. The third is that, which may be ſearched into, but doth not yet appear; which is, by *Mingling* of *Moiſt Vapors* with *Air*; and trying if they will not bring a Return of more *Water*, then the *Water* was at firſt: For if ſo, That increaſe is a *Verſion* of the *Air*: Therefore put *Water* into the bottom of a *Stillatory*, with the neb ſtopped; weigh the *Water* firſt: hang in the Middle of a *Stillatory* a large *Spunge*; and ſee what quantity of *Water* you can cruſh out of it; and what it is, more, or leſs, compared with the *Water* ſpent; for you muſt underſtand, that if any *Verſion* can be wrought, it will be eaſily done in ſmall Pores: And that is the reaſon why we preſcribe a *Sponge*. The fourth way is probable alſo, though not appearing; which is, by *Receiving the Air* into the ſmall *Pores of Bodies*; For (as hath been ſaid) every thing in ſmall quantity is more eaſie for *Verſion*; and Tangible Bodies have no pleaſure in the conſort of Air, but indeavor to ſubact it into a more *Denſe Body*: But in *Entire Bodies* it is checked; becauſe, if the *Air* ſhould Condenſe, there is nothing to ſucceed: Therefore it muſt be in *Looſe Bodies*, as *Sand*, and *Powder*, which we ſee, if they lie cloſe, of themſelves gather Moiſture.

28. Experiment Solitary, touching the *Helps* towards the *Beauty* and *good Features* of *Perſons*.

IT is reported by ſome of the *Ancients*, That *Whelps*, or other *Creatures*, if they be put young into ſuch a Cage, or Box, as they cannot riſe to their Stature, but may increaſe in bread or length, will grow accordingly, as they can get room; which, if it be true, and feaſible, and that the young *Creature*, ſo preſſed, and ſtreightned, doth not thereupon die; it is a means to produce *Dwarf Creatures*, and in a very ſtrange Figure. This is certain, and noted long ſince, That the preſſure, or Forming of Parts of Creatures, when they are very young, doth alter the ſhape not a little: As the ſtroaking of the Heads of Infants, between the Hands, was noted of old, to make *Mecrocephali*; which ſhape of the Head, at that time, was eſteemed. And the raiſing gently of the Bridge of the Noſe, doth prevent the Deformity of a Saddle Noſe. Which obſervation well weighed, may teach a means, to make the Perſons of Men, and Women, in many kindes, more comely and better featured, than otherwiſe they would be; by the Forming and Shaping of them in their infancy: As by Stroaking up the Calves of the Legs, to keep them from falling down too low; and by Stroaking up the Forehead, to keep them from being low Foreheaded And it is a common practiſe to ſwathe Infants, that they may grow more ſtraight and better ſhaped and we ſee young Women, by wearing ſtraight Bodies, keep themſelves from being Groſs and Corpulent.

29. Experiments Solitary, touching the *Condenſing* of *Air* in ſuch ſort as it may put on *Weight*, and yield *Nouriſhment*,

ONions, as they hang, will many of them ſhoot forth; and ſo will *Penny-royal*; and ſo will an Herb called *Orpin*; with which they uſe, in the Countrey, to trim their Houſes, binding it to a Lath, or ſtick, and ſetting it againſt a wall. We ſee it likewiſe, more eſpecially, in the greater *Semper-*

Semper-vive, which will put out Branches, two or three years: But it is true, that commonly they wrap the Root in a cloth beſmeared with *Oyl*; and renew it once in half a year. The like is reported by ſome of the *Ancients* of the *ſtalks of Lillies*. The cauſe is, for that theſe *Plants* have a ſtrong denſe, and ſucculent moiſture, which is not apt to exhale; and ſo is able, from the old ſtore, without drawing help from the Earth, to ſuffice the ſprouting of the *Plant*: And this ſprouting is chiefly in the late Spring, or early Summer; which are the times of putting forth. We ſee alſo, that *Stumps* of *Trees*, lying out of the Ground, will put forth Sprouts for a time. But it is a noble tryal, and of very great conſequence, to try whether theſe things, in the ſprouting, do increaſe *weight*; which muſt be tryed, by weighing them before they be hanged up; and afterwards again when they are ſprouted. For if they increaſe not in *weight*, then it is no more but this, That what they ſend forth in the ſprout, they leeſe in ſome other part; but if they gather *weight*, then it is *Magvale Naturæ*: For it ſheweth, that *Air* may be made ſo to be condenſed, as to be converted into a *Denſe Body*; whereas the race and period of all things, here above the Earth, is to extenuate and turn things to be more *pneumatical*, and rare; and not to be retrograde, from *pneumatical* to that which is *Denſe*. It ſheweth alſo, that *Air* can nouriſh; which is another great matter of conſequence. Note, that to try this, the *Experiment* of the *Semper-vive*, muſt be made without oyling the cloth; for elſe it may be, the *Plant* receiveth nouriſhment from the Oyl,

30. Experiment Solitary, touching the *Commixture* of *Flame* and *Air*, and the great force thereof.

Flame and *Air* do not mingle, except it be in an *Inſtant*; or in the *Vital Spirits* of *Vegetables*, and *Living Creatures*. In *Gunpowder*, the force of it hath been aſcribed to rarefaction of the earthly ſubſtance into *Flame*. And thus far it is true; and then (forſooth) it is become another Element the form whereof occupieth more place; and ſo, of Neceſſity, followeth a Dilatation: And therefore, leſt two Bodies ſhould be in one place, there muſt needs alſo follow an Expulſion of the Pellet, or blowing up of the Mine. But theſe are crude and ignorant ſpeculations: For *Flame*, if there were nothing elſe, except it were in very great quantity, will be ſuffocate with any hard body, ſuch as a Pellet is, or the Barrel of a Gun; ſo as the *Flame* would not expel the hard Body, but the hard Body would kill the *Flame*, and not ſuffer it to kindle, or ſpread. But the cauſe of this ſo potent a motion is the *Nitre* (which we call otherwiſe *Salt-Peter*) which having in it a notable crude and windy *Spirit*, firſt by the *Heat* of the *Fire* ſuddenly dilateth it ſelf; (and we know that ſimple *Air*, being preternaturally attenuated by *Heat*, will make it ſelf room, and break, and blow up that which reſiſteth it,) And ſecondly, when the *Nitre* hath dilated it ſelf, it bloweth abroad the *Flame* as an inward Bellows. And therefore we ſee that *Brimſtone*, *Pitch*, *Champhire*, *Wildfire*, and divers other inflamable matters; though they burn cruelly, and are hard to quench, yet they make no ſuch fiery wind, as *Gunpowder* doth: And on the other ſide, we ſee that *Quick-ſilver* (which is a moſt crude and watry *Body*) heated, and pent in, hath the like force with *Gunpowder*. As for *Living Creatures*, it is certain, their *Vital Spirits* are a ſubſtance compounded of an *Airy* and *Flamy* matter; and though *Air* and *Flame*, being free, will not well mingle; yet bound in by a *Body* that hath ſome fixing, they will. For that you may beſt ſee in thoſe two Bodies (which are their *Aliments*) *Water* and *Oyl*; for they likewiſe will not well mingle of themſelves, but in the Bodies of *Plants*, and

and *Living Creature*, they will. It is no marvel therefore, that a small *Quantity of Spirits*, in the Cells of the Brain, and Cannals of the Sinews, are able to move the whole *Body* (which is of so great mass) both with so great force, as in wrestling, Leaping; and with so great swiftness, as in playing Division upon the *Lute*: Such is the force of these two Natures, *Air* and *Flame* when they incorporate.

31. Experiment Solitary, touching the *Secret Nature of Flame.*

TAke a small *Wax-Candle*, and put it in a Socket of Brass or Iron, then set it upright in a Porringer full of *Spirit of Wine*, heated; then set both the *Candle*, and *Spirit of Wine* on fire, and you shall see the *Flame* of the *Candle* open it self, and become four or five times bigger then otherwise it would have been, and appear in figure *Globular*, and not in *Piramis*. You shall see also, that the inward *Flame* of the *Candle* keepeth colour, and doth not wax any whit blew towards the colour of the outward *Flame* of the *Spirit of Wine*. This is a noble *Instance*, wherein two things are most remarkable; the one, that one *Flame* within another quencheth not, but is a fixed *Body*, and continueth as *Air* or *Water* do, and therefore *Flame* would still ascend upwards in one greatness, if it were not quenched on the *sides*; and the greater the *Flame* is at the bottom, the higher is the rise. The other that *Flame* doth not mingle with *Flame*, as *Air* doth with *Air*, or *Water* with *Water*, but onely remaineth contiguous; as it cometh to pass betwixt *Consisting Bodies*. It appeareth also, that the form of a *Pyramis* in *Flame*, which we usally see, is meerly by accident, and that the *Air* about, by quenching the sides of the *Flame*, crusheth it, and extenuateth it into that form; for of it self, it would be round: And therefore *Smoak* is in the figure of a Pyramis reversed; for the *Air* quencheth the *Flame* and receiveth the *Smoak*. Note also, that the *Flame* of the *Candle*, within the *Flame* of the *Spirit of Wine*, is troubled, and doth not only open and move upwards, but moveth waving, and to and fro: As if *Flame* of his own Nature (if it were not quenched) would roul and turn as well as move upwards. By all which it should seem, that the *Celestial Bodies* (most of them) are true *Fires* or *Flames*, as the *Stoicks* held; more fine (perhaps) and rarified, than our *Flame* is. For they are all Globular and Determinate, they have Rotation, and they have the colour and splendor of *Flame*: So that *Flame* above, is durable and consistent, and in his natural place; but with us, it is a stranger, and momentany, and impure, like *Vulcan* that halted with his fall.

32. Experiments Solitary, touching the *Different force of Flame in the midst, and on the sides.*

TAke an *Arrow*, and hold it in *Flame* for the space of ten Pulses; and when it cometh forth, you shall find those parts of the *Arrow* which were one the outsides of the *Flame*, more burned, blacked, and turned almost into a Coal; whereas that in the midst of the *Flame*, will be as if the fire had scarce touched it. This is an *instance* of great consequence for the discovery of the nature of *Flame*, and sheweth manifestly, that *Flame* burneth more violently towards the sides, then in the midst: And, which is more, that *Heat* or *Fire* is not violent or furious, but where it is checked and pent. And therefore the *Peripateticks* (howsoever their opinion of an *Element* of *Fire*, above the *Air*, is justly exploded) in that point they acquit themselves well: For being opposed, that if there were a *Sphere* of Fire, that incompassed the earth so near hand, it were impossible, but all things should be burnt up; they answer, that the pure *Elemental Fire*, in his own place, and not irritate, is but of a moderate *heat*.

It

33. Experiment Solitary, touching the *Decrease of the Natural Motion of Gravity in great distance from the Earth; or within some depth of the Earth.*

IT is affirmed constantly by many, as an usual experiment, That a *Lump* of *Ore*, in the *Bottom* of a Mine, will be tumbled and stirred, by two Mens strength; which if you bring it to the *Top* of the *Earth*, will ask six Mens strength at the least to stir it. It is a noble *instance*, and is fit to be tryed to the full: For it is very probable, that the *Motion of Gravity* worketh weakly, both far from the Earth, and also within the Earth: The former, because the appetite of Union of Dense Bodies with the Earth, in respect of the distance is more dull. The latter, because the Body hath in part attained his nature, when it is some depth in the Earth. For as for the moving to a point or place (which was the opinion of the Ancients) it is a meer vanity.

34. Experiment Solitary, touching the *Contraction of bodies in bulk, by the mixture of the more Liquid Body, with the more Solid.*

IT is strange, how the *Ancients* took up *Experiments* upon credit, and yet did build great Matters upon them. The observation of some of the best of them, delivered confidently, is, That a *Vessel* filled with *Ashes*, will receive the like quantity of *Water*, that it would have done if it had been empty. But this is utterly untrue, for the *Water* will not go in by a fifth part; and I suppose, that that fifth part is the difference of the lying close, or open of the *Ashes*; as we see, that *Ashes* alone, if they be hard prest, will lie in less room; and so the *Ashes* with Air between, lie looser, and with *Water* closer. For I have not yet found certainly, that the *Water* it self by mixture of *Ashes* or Dust, will shrink or draw into less room.

35. Experiment Solitary, touching the *Making Veines more fruitful.*

IT is reported of credit, That if you lay good store of *Kernels* of *Grapes*, about the *Root* of a *Vine* it will make the *Vine* come earlier, and prosper better. It may be tried with other *Kernels*, laid about the *Root* of a *Plant* of the same kind; as *Figs*, *Kernels* of *Apples*, *&c.* The cause may be, for that the *Kernels* draw out of the Earth Juice fit to nourish the *Tree*, as those that would be *Trees* of themselves, though they were no *Root*; but the *Root* being of greater strength, robbeth and devoureth the nourishment, when they have drawn it; as great *Fishes* devour little.

36. Experiments in Consort, touching *Purging Medicines.*

THe *operation* of *Purging Medicines*, and the *Causes* thereof, have been thought to be a great Secret; and so according to the slothful manner of men, it is referred to a *Hidden Propriety*, a *Specifical Vertue*, and a *Fourth Quality*, and the like shifts of Ignorance. The *Causes* of *Purging* are divers, All plain and perspicuous, and throughly maintained by experience. The first is, That whatsoever cannot be overcome and digested by the *Stomack*, is by the *Stomack*, either put up by *Vomit*, or put down to the *Guts*; and by that *Motion* of *Expulsion* in the *Stomack* and *Guts*, other *Parts of the Body* (as the *Orifices* of the *Veins*, and the like) are moved to expel by *Consent*: For nothing is more frequent then *Motion of Consent* in the *Body of Man.* This Surcharge of the *Stomack*, is caused either by the *Quality* of the *Medicine*, or by the *Quantity.* The *Qualities* are three, *Extream bitter*, as in *Aloes*, *Coloquintida*, *&c.* *Loathsome*, and of horrible taste, as in *Agarick*, *Black Hellebore*, *&c.* And of *Secret Malignity*, and disagreement towards *Mans Body*, many times not appearing much in the taste, as in *Scammony*, *Mechoacham*, *Antimony*, *&c.* And note well, that if there be any *Medicine* that *Purgeth*, and hath neither, of the first two *Manifest Qualities*, it is to be held suspected as a kind of *Poyson*; For that it worketh either by *Corrosion* or by a *Secret Malignity*, and Enmity to *Nature*; and therefore such Medicines are warily to be prepared and used, The *quantity* of that which is taken, doth also cause *Purging*, as we see in a great *quantity*, of *New Milk* from the Cow; yea, and a great *quantity of Meat*: For

Surfeits

Surfeits many times turn to *Purges*, both upwards and downwards. Therefore we see generally, that the working of *Purging Medicines* cometh two or three hours after the *Medicines* taken: For that the *Stomach* first maketh a proof, whether it can concoct them. And the like happeneth after *Surfeits*, or Milk in too great quantity.

37. A second cause is *Mordication* of the *Orifices* of the Parts, especially of the *Mesentery Veins*; as it is seen, that Salt, or any such thing that is sharp and biting, put into the Fundament, doth provoke the part to expel, and *Mustard* provoketh sneezing; and any sharp thing to the eyes provoketh tears. And therefore we see, that almost all *Purgers* have a kind of twitching and vellication, besides the griping which cometh of wind. And if this *Mordication* be in an over high degree, it is little better than the *Corosion of Poyson*; and it cometh to pass sometimes in *Antimony*, especially if it be given to Bodies not repleat with humors; for where humors abound, the humors save the parts.

38. The third cause is *Attraction*: For I do not deny, but that *Purging Medicines* have in them a direct force of *Attraction*; as Drawing-Plaisters have in *Surgery*: And we see *Sage* and *Bittony* bruised, *Sneezing-Powder*, and other *Powders* or *Liquors* (which the *Physitians* call *Errhines*) put into the Nose, draw Flegm and Water from the Head; and so it is in *Apophlegmatisms* and *Gargarisms* that draw the Rheum down by the Palat. And by this vertue, no doubt, some *Purgers* draw more one humor, and some another, according to the opinion received: As *Rubarb* draweth Choler, *Sean* Melancholy, *Agarack* Flegm, &c. but yet (more or less) they draw promiscuously. And note also that besides Sympathy between the *Purger* and the *Humor*, there is also another cause, why some *Medicines* draw some humor more than another; and it is, for that some *Medicines* work quicker than others; and they that draw quick, draw only the lighter, and more fluid humors; they that draw slow, work upon the more tough, and viscuous humors. And therefore, men must be ware how they take *Rubarb*, and the like, alone, familiarly; for it taketh only the lightest part of the humour away, and leaveth the Mass of Humours more obstinate. And the Like may be said of *Wormwood*, which is so much magnified.

39. The fourth cause is *Flatuosity*: For wind stirred, moveth to expel; and we find that (in effect) all *Purgers* have in them a raw *Spirit* or *Wind*, which is the principal cause of *Tortion* in the Stomack and Belly. And therefore *Purgers* leese (most of them) the vertue, by decoction upon the fire; and for that cause are chiefly given in Infusion, Juyce, or Powder.

40. The fifth cause is *Compression* or *Crushing*: As when Water is crushed out of a Spunge: So we see that taking cold moveth loosenes by contraction of the Skin, and outward parts; and so doth Cold likewise cause Rheums and Defluctions from the Head, and some *Astringent Plaisters* crush out purulent Matter. This kind of Operation is not found in many *Medicines*: *Mirabolanes* have it, and it may be the *Barks* of *Peaches*; for this vertue requireth an *Astriction*, but such an *Astriction*, as is not grateful to the Body (for a pleasing *Astriction* doth rather bind in the humors, than expel them:) And therefore such *Astriction* is found in things of an harrish taste.

41. The sixth cause is *Lubrefaction* and *Relaxation*: As we see in *Medicines Emollient*, such as are *Milk*, *Honey*, *Mallows*, *Lettuce*, *Mercurial*, *Pellitory of the Wall*, and others. There is also a secret vertue of *Relaxation of Cold*; for the heat of the Body bindeth the Parts and Humors together, which

Cold

Cold relaxeth: As it is ſeen in *Vrine*, *Blood*, *Pottage*, or the like; which if they be *cold*, break and diſſolve. And by this kind of *Relaxation*, *Fear* looſneth the Belly; becauſe the heat retiring inwards towards the Heart, the Guts, and other parts are relaxed; in the ſame manner as *Fear* alſo cauſeth trembling in the Sinews. And of this kind of purgers are ſome *Medicines* made of *Mercury*.

42. The ſeventh *Cauſe* is *Abſterſion* which is plainly a *ſcouring off*, or *Inciſion* of the more *viſcuous humors*, and making the *humors* more fluid, and cutting between them, and the part; as is found in *Nitrous Water* which ſcoureth Linnen-Cloth (ſpeedily) from the foulneſs. But this *Inciſion* muſt be by a *Sharpneſs*, without *Aſtriction*; which we find in *Salt*, *Wormwood*, *Oxymel*, and the like.

43. There be *Medicines* that move *Stools*, and not *Vrine*: ſome other *Vrine*, and not *Stools*. Thoſe that *Purge by ſtool*, are ſuch as enter not at all, or little into the *Meſentery Veins*; but either at the firſt, are not digeſtible by the *Stomack*, and therefore move immediately downwards to the Guts: or elſe are afterwards rejected by the *Meſentery Veins*, and ſo turn likewiſe downwards to the *Guts*; and of theſe two kinds, are moſt *Purgers*. But thoſe that move *Vrine*, are ſuch as are well digeſted of the *Stomack*, and well received alſo of the *Meſentery Veins*; ſo they come as far as the *Liver*, which ſendeth *Vrine* to the *Bladder*, as the *Whey of Blood*: And thoſe *Medicines*, being opening and piercing, do fortifie the operation of the *Liver*, in ſending down the Wheyey part of the Blood to the *Reins*. For *Medicines Vrinative* do not work by rejection and indigeſtion, as *Solutive* do.

44. There be divers *Medicines*, which in greater *quantity* move *Stool*, and in ſmaller *Vrine*; and ſo contrariwiſe, ſome that in greater *quantity* move *Vrine*, and in ſmaller *Stool*. Of the former ſort is *Rubarb*, and ſome others. The cauſe is, for that *Rubarb* is a *Medicine*, which the *Stomack* in a ſmall quantity doth digeſt, and overcome (being not Flatuous nor Loathſome,) and ſo ſendeth it to the *Meſentery Veins*; and ſo being opening, it helpeth down *Vrine*. But in a greater quantity, the *Stomack* cannot overcome it, and ſo it goeth to the *Guts*. *Pepper*, by ſome of the *Ancients*, is noted to be of the ſecond ſort; which being in ſmall *quantity*, moveth wind in the Stomack or Guts, and ſo expelleth by Stool; but being in greaer *quantity*, diſſipateth the wind, and it ſelf getteth to the *Meſentery Veins*, and ſo to the *Liver* and *Reins*; where, by Heating and Opening, it ſendeth down *Vrine* more plentifully.

45. Experiments in Conſort touching *Meats and Drinks that are moſt nouriſhing*

WE have ſpoken of *Evacuating* of the *Body*, we will now ſpeak ſomething of the *filling* of it by *Reſtoratives* in *Conſumptions* and *Emaciating Diſeaſes*. In *Vegetables*, there is one part that is more nouriſhing than another; as *Grains* and *Roots* nouriſh more than the *Leaves*, inſomuch as the Order of the *Foliatans* was put down by the *Pope*, as finding Leaves unable to nouriſh Mans Body. Whether there be that difference in the Fleſh of *Living Creatures*, is not well enquired; as whether *Livers*, and other *Entrails*, be not more nouriſhing than the *outward* Fleſh. We find that amongſt the *Romains* a *Gooſes* Liver was a great delicacy; inſomuch as they had artificial means to make it fair, and great; but whether it were more nouriſhing, appeareth not. It is certain, that *Marrow* is more *nouriſhing* than *Fat*. And I conceive, that ſome dicoction of *Bones* and *Sinews*, ſtamped and well ſtrained, would be a very nouriſhing Broth: We find alſo, that *Scotch Skinck* (which is a pottage of ſtrong nouriſhment) is made

made with the *Knees* and *Sinews* of *Beef*, but long boiled: *Jelly* alſo, which they uſe for a Reſtorative, is cheifly made of *Knuckles of Veal*. The *Pulp*, that is within the *Craſiſh* or *Crab*, which they ſpice and butter, is more nouriſhing than the *Fleſh* of the *Crab*, or *Craſiſh*. The *Yolks* of *Eggs* are clearly more nouriſhing than the *Whites*. So that it ſhould ſeem, that the parts of *Living Creatures* that lie more inwards, nouriſh more than the outward fleſh: except it be the *Brain*, which the Spirits prey too much upon, to leave it any great vertue of nouriſhing. It ſeemeth for the nouriſhing of aged Men, or Men in Conſumptions, ſome ſuch thing ſhould be deviſed, as ſhould be half *Chylus*, before it be put into the ſtomack.

Take two large *Capons*, perboil them upon a ſoft fire, by the ſpace of an hour or more, till in effect all the Blood be gone. Add in the decoction the *Pill* of a *Sweet-Lemmon*, or a good part of the *Pill* of a *Citron*, and a little *Mace*. Cut off the *Shanks*, and throw them away; then with a good ſtrong Chopping-knife, mince the two *Capons*, Bones and all, as ſmall as ordinary minced Meat; put them into a large neat Boulter, then take a Kilderkin, ſweet, and well ſeaſoned, of four Gallons of Beer of Eight ſhillings ſtrength, new as it cometh from the Tunning; make in the Kilderking a great Bung-hole of purpoſe, then thruſt into it, the Boulter (in which the *Capons* are) drawn out in length; let it ſteep in it three days and three nights, the Bung-hole open to work, then cloſe the Bung-hole, and ſo let it continue a day and a half, then draw it into Bottles, and you may drink it well after three days Bottling, and it will laſt ſix weeks (approved). It drinketh freſh, flowreth, and mantleth exceedingly, it drinketh not newiſh at all, it is an excellent drink for a Conſumption to be drunk either alone, or carded with ſome other Beer. It quencheth thirſt, and hath no whit of windineſs. Note, that it is not poſſible, that Meat and Bread, either in Broths, or taken with Drink, as is uſed, ſhould get forth into the Veins, and outward Parts, ſo finely, and eaſily, as when it is thus incorporate, and made almoſt a *Chylus* aforehand. 46.

Tryal would be made of the like Brew with *Potado-Roots*, or *Bur-Roots*, or the *Pith* of *Artichoaks*, which are nouriſhing Meats: It may be tryed alſo, with other fleſh, as *Pheſant*, *Patride*, *Young Pork*, *Pig*, *Veniſon*, eſpecially of *Young Deer*, &c. 47.

A *Mortreſs* made with the *Brawn* of *Capons*, ſtamped and ſtrained, and mingled (after it is made) with like quantity, (at the leaſt,) of *Almond Butter*, is an excellent Meat to nouriſh thoſe that are weak, better than *Blanck-Manger* or *Jelly* And ſo is the *Cullice* of *Cocks*, boiled thick with the like mixture of *Almond Butter*: For the *Mortreſs* or *Cullice* of it ſelf is more ſavory and ſtrong, and not ſo fit for nouriſhing of weak Bodies, but the *Almonds* that are not of ſo high a taſte as fleſh, do excellently qualifie it. 48.

Indian Maiz hath (of certain) an excellent Spirit of Nouriſhment, but it muſt be throughly boiled, and made into a *Maiz-Cream* like a *Barley-Cream*. I judge the ſame of *Rice*, made into a Cream; for *Rice* is in *Turky*, and other Countreys of the Eaſt, moſt fed upon, but it muſt be throughly boiled in reſpect of the hardneſs of it; and alſo, becauſe otherwiſe it bindeth the Body too much. 49.

Piſtachoes, ſo they be good and not muſty, joyned with *Almonds* in *Almond Milk*, or made into a *Milk* of themſelves like unto *Almond Milk* but more green, are an excellent nouriſher. But you ſhall do well, to add a little *Ginger* ſcraped, becauſe they are not without ſome ſubtil windineſs. 50.

51. *Milk* warm from the Cow, is found to be a great nouriſher, and a good remedy in *Conſumptions*: But then you muſt put into it, when you Milk the Cow, two little Bags; the one of *Powder of Mint*, the other of *Powder of Red Roſes*; for they keep the *Milk* ſomewhat from turning, or crudling in the Stomack; and put in Sugar alſo for the ſame cauſe, and partly for the taſtes ſake: But you muſt drink a good draught, that it may ſtay leſs time in the Stomack, leſt it cruddle: And let the Cup, into which you milk the Cow, be ſet in a greater Cup of hot Water, that you may take it warm And *Cows-milk* thus prepared, I judge to be better for a *Conſumption* than *Aſs-milk*, which (it is true) turneth not ſo eaſily, but it is a little hariſh: Marry it is more proper for ſharpneſs of Urine, and Exulceration of the Bladder, and all manner of Lenifyings. *Womans-milk* likewiſe is preſcribed, when all fail; but I commend it not, as being a little too near the Juyce of Mans Body, to be a good nouriſher; except it be in *Infants*, to whom it is natural.

52. *Oyl* of *ſweet Almonds* newly drawn, with *Sugar* and a little *Spice*, ſpred upon Bread toſted, is an excellent nouriſher; but then to keep the *Oyl* from frying in the Stomack, you muſt drink a good draught of Mild-beer after it; and to keep it from relaxing the Stomack too much, you muſt put in a little *Powder of Cinnamon*.

53. The *Yolks* of *Eggs* are of themſelves ſo well prepared by *Nature* for nouriſhment, as (ſo they be potched, or Rear boyled) they need no other preparation or mixture; yet they may be taken alſo raw, when they are new laid, with *Marmſey* or *Sweet Wine*; you ſhall do well to put in ſome few ſlices, of *Eringium Roots*, and a little *Amber-greece*: For by this means, beſides the immediate faculty of nouriſhment, ſuch drink will ſtrengthen the Back, ſo that it will not draw down the *Urine* too faſt. For too much *Urine* doth always hinder nouriſhment.

54. *Mincing of Meat*, as in *Pies*, and *Buttered minced Meat*, ſaveth the grinding of the Teeth; and therefore (no doubt) it is more nouriſhing, eſpecially in Age, or to them that have weak Teeth; but the Butter is not ſo proper for weak Bodies, and therefore it were good to moiſten it with a little *Claret Wine*, Pill of *Lemmon* or *Orenge* cut ſmall, *Sugar*, and a very little *Cinnamon* or *Nutmeg*. As for *Chuets*, which are likewiſe Minced-meat, inſtead of Butter, and Fat, it were good to moiſten them, partly with *Cream* or *Almond*, or *Piſtachomilk*, or *Barley*, or *Maiz Cream*; adding a little *Coriander-ſeed*, and *Carrawayſeed*, and a very little Saffron. The more full handling of *Alimentation*, we reſerve to the due place.

We have hitherto handled the Particulars, *which yield beſt, and eaſieſt, and plentifulleſt Nouriſhment; and now we will ſpeak of the beſt Means of conveying and converting the Nouriſhment.*

55. The firſt *Means* is to procure, that the *Nouriſhment* may not be robbed and drawn away; wherein that which we have already ſaid, is very material, to provide, that the *Reins* draw not too ſtrongly an over-great part of the *Blood* into *Urine*. To this add that Precept of *Ariſtotle*, That *Wine* be forborn in all *Conſumptions*; for that the *Spirits* of the *Wine* do prey upon the Roſcide Juyce of the Body, inter-common with the Spirits of the Body; and ſo deceive and rob them of their Nouriſhment. And therefore if the *Conſumption*, growing from the weakneſs of the Stomack, do force you to uſe *Wine*, let it always be burnt, that the quicker Spirits may evaporate, or (at the leaſt) quenched with too little Wedges of Gold, ſix or ſeven times repeated. Add alſo this Proviſion, that there be not too much expence

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of the *Nouriſhment*, by *Exhaling* and *Sweating*: And therefore if the Patient be apt to ſweat, it muſt be gently reſtrained. But chiefly *Hypocrates* Rule is to be followed, who adviſeth quite contrary to that which is in uſe: Namely, That the *Linnen* or *Garment* next the Fleſh, be in Winter dry and oft changed; and in Summer ſeldom changed, and ſmeared over with Oyl: For certain it is, that any ſubſtance that is fat, doth a little fill the Pores of the Body, and ſtay Sweat in ſome degree. But the more cleanly way is to have the *Linnen* ſmeared lightly over with *Oyl* of *Sweet Almonds*, and not to forbear ſhifting as oft as is fit.

56. The ſecond *Means* is to ſend forth the *Nouriſhment* into the *Parts* more ſtrongly, for which, the working muſt be by *Strengthning* of the *Stomack*; and in this, becauſe the *Stomack* is chiefly comforted by *Wine* and *Hot Things*, which otherwiſe hurt, it is good to reſort to *Outward Applications* to the *Stomack*: Wherein it hath been tryed, that the *Quilt* of *Roſes*, *Spices*, *Maſtick*, *Wormwood*, *Mint*, &c. are nothing ſo helpful, as to take a *Cake* of *New-Bread*, and to be dew it with a little *Sack* or *Alegant*, and to dry it, and after it be dryed a little before the Fire, to put it within a clean Napkin and to lay it to the Stomack: For it is certain, that all Flower hath a potent Vertue of *Aſtriction* inſomuch, as it hardneth a piece of Fleſh, or a Flower that is laid in it. And therefore a *Bag* quilted with *Bran*, is likewiſe very good, but it dryeth ſomewhat too much, and therefore it muſt not lie long.

57. The third *Means* (which may be a branch of the former) is to ſend forth the *Nouriſhment* the better by *Sleep*. For we ſee, that Bears and other *Creatures* that *Sleep* in the Winter, wax exceeding fat: And certain it is, (as it is commonly believed) that *Sleep* doth nouriſh much, both for that the Spirits do leſs ſpend the nouriſhment in *Sleep*, than when living *Creatures* are awake: And becauſe (that which is to the preſent purpoſe) it helpeth to thruſt out the nouriſhment into the parts. Therefore in aged-men, and weak bodies, and ſuch as abound not with Choler, a ſhort *Sleep* after dinner doth help to nouriſh; for in ſuch Bodies there is no fear of an over-haſty digeſtion, which is the inconvenience of Poſt meridian *Sleepes*. *Sleep* alſo in the morning, after the taking of ſomewhat of eaſie digeſtion; as Milk from the Cow, nouriſhing Broth, or the like, doth further nouriſhment: But this would be done ſitting upright that the *Milk* or *Broth* may paſs the more ſpeedily to the bottom of the Stomack.

58. The fourth *Means* is to provide, that the parts themſelves may draw to them the nouriſhment ſtrongly. There is an excellent obſervation of *Ariſtotle*, that a great reaſon why Plants (ſome of them) are of greater age than *Living Creatures* is, for that they yearly put forth new Leaves and boughs; whereas *Living Creatures* put forth (after their period of growth) nothing that is young, but Hair and Nails, which are excrements, and no Parts. And it is moſt certain, that whatſoever is young, doth draw nouriſhment better, than that which is old; and then (that which is the myſtery of that obſervation) young *Boughes* and *Leaves*, calling the Sap up to them, the ſame nouriſheth the *Body* in the paſſage. And this we ſee notably proved alſo, in that the oft cutting or pulling of *Hedges*, *Trees*, and *Herbs*, doth conduce much to their laſting. Transfer therefore this obſervation to the helping of nouriſhment in *Living Creatures*: The Nobleſt and Principal Uſe whereof is, for the *Prolongation* of *Life*; *Reſtauration* of ſome degree of *Youth*, and *Intenceration* of the *Parts*: For certain it is, that there are in *Living Creatures* Parts that nouriſh and repair eaſily, and parts that

nouriſh and repair hardly; and you muſt refreſh, and renew thoſe that are eaſie to nouriſh, that the other may be refreſhed, and (as it were) drink in nouriſhment in the paſſage. Now we ſee that *Draught Oxen* put into good Paſture, recover the Fleſh of young Beef; and Men after long emaciating Diets, wax plump and fat, and almoſt new: So that you may ſurely conclude, that the frequent and wiſe uſe of thoſe *emaciating Diets*, and of *Purgings*; and perhaps of ſome kind of *Bleeding*, is a principal means of *Prolongation* of *Life*, and *Reſtoring* ſome degree of *Youth*: For as we have often ſaid, *Death* cometh upon *Living Creatures* like the Torment of *Mezentius*,

Mortua quinetiam jungebat corpora vivis,
Component Manibuſque Manus, atque oribus ora.

For the parts in Mans body eaſily repairable (as *Spirits*, *Blood*, and *Fleſh*) die in the embracement of the parts hardly repairable, (as *Bones*, *Nerves*, and *Membranes*) and likewiſe ſome *Entrails* (which they reckon amongſt the *Sparmatical Parts*) are hard to repair: Though that diviſion of *Sparmatical* and *Menſtrual Parts*, be but a conceit. And this ſame *Obſervation* alſo may be drawn to the preſent purpoſe of nouriſhing emaciated Bodies: And therefore *Gentle Frication* draweth forth the nouriſhment, by making the parts a little hungry and heating them, whereby they call forth nouriſhment the better. This *Frication* I wiſh to be done in the morning. It is alſo beſt done by the *Hand*, or a piece of Scarlet-Wool, wet a little with *Oyl* of *Almonds*, mingled with a ſmall quantity of *Bay-Salt*, or *Saffron*: We ſee that the very Currying of Horſes doth make them fat, and in good liking.

59. The fifth *Means* is, to further the very *Act* of *Aſſimilation* of *Nouriſhment*; which is done by ſome outward *emollients*, that make the parts more apt to *Aſſimilate*. For which I have compounded an *Oyntment* of excellent odour, which I call *Roman Oyntment*, *vide* the *Receit*. The uſe of it would be between ſleeps; for in the latter ſteep, the parts Aſſimilate chiefly.

60. Experiment Solitary touching the *Filum Medicinale*.

THere be many *Medicines*, which by themſelves would do no cure but perhaps hurt, but being applied in a certain order, one after another, do great cures. I have tried (my ſelf) a *Remedy* for the *Gout*, which hath ſeldom failed, but driven it away in Twenty four hour ſpace: It is firſt to apply a *Pultaſs*, which, *vide* the *Receit*, and than a *Bath* or *Fomentation*, of which, *vide* the Receit, and then a plaiſter, *vide* the Receit. The *Pultaſs* relaxed the Pores, and maketh the humour apt to exhale. The *Fomentation* calleth forth the Humor by Vapors; but yet in regard of the way made by the *Pultaſs*, draweth gently; and therefore draweth the Humor out, and doth not draw more to it: For it is a *Gentle Fomentation*, and hath withal a mixture (though very little) of ſome *Stupefactive*. The *Plaiſter* is a moderate *Aſtringent Plaiſter*, which repelleth new humor from falling. The *Pultaſs* alone would make the part more ſoft and weak, and apter to take the defluxion and impreſſion of the Humor. The *Fomentation* alone, if it were too weak, without way made by the *Pultaſs*, would draw forth little; if too ſtrong, it would draw to the part, as well as draw from it. The *Plaiſter* alone would pen the Humor already contained in the part, and ſo exaſperate it, as well as forbid new Humor; therefore they muſt be all taken in order, as is ſaid: The *Pultaſs* is to be laid to for two or three hours; the *Fomentation* for a quarter of an hour, or ſomewhat better, being uſed hot, and ſeven or eight times repeated; the *Plaiſter* to continue on ſtill, till the part be well confirmed.

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61. Experiment Solitary, touching the *Cure by Cuſtom.*

THere is a ſecret way of *Cure*, (unpractiſed) by *Aſſuetude* of that which in it ſelf hurteth. *Poyſons* have been made, by ſome, Familiar, as hath been ſaid. *Ordinary keepers* of the *ſick* of the *Plague*, are ſeldom infected. *Enduring* of *Tortures*, by *cuſtom*, hath been made more eaſie: The *brooking* of enormous *quantity* of *Meats*, and ſo of *Wine*, or *ſtrong drink*, hath been, by *cuſtom*, made to be without *Surfeit* or *Drunkenneſs*. And generally *Diſeaſes* that are Chronical, as *Coughs*, *Phthiſicks*, ſome kind of *Palſies*, *Lunacies*, &c. are moſt dangerous at the firſt: Therefore a wiſe *Phyſitian* will conſider, whether a *Diſeaſe* be incurable, or whether the juſt cure of it be not full of peril; and if he find it to be ſuch, let him reſort to *Palliation*, and alleviate the *Symptom* without buſying himſelf too much with the perfect cure: And many times (if the *Patient* be indeed patient) that courſe will exceed all expectation. Likewiſe the *Patient* himſelf may ſtrive, by little and little to overcome the *Symptom* in the Exacerbation, and ſo, by time, turn ſuffering into Nature.

62. Experiment Solitary touching *Cure by Exceſs.*

DIvers *Diſeaſes*, eſpecially *Chronical*, (ſuch as *Quartan Agues*) are ſometimes cured by *Surfeits* and *exceſſes*; as *exceſs of Meat*, *exceſs of Drink*, *extraordinary Faſting*, *extraordinary Stirring*, or *Laſſitude*, and the like. The cauſe is, for that *Diſeaſes* of *Continuance*, get an adventitious ſtrength from Cuſtom, beſides their *material cauſe* from the *Humors*: So that the *breaking* of the *Cuſtom* doth leave them onely to their firſt cauſe; which, if it be any thing weak, will fall off: Beſides, ſuch Exceſſes do excite and ſpur *Nature*, which whereupon riſeth more forcible againſt the *Diſeaſe*.

63. Experiment Solitary touching *Cure by Motion of Conſent.*

THere is in the Body of Man, a great *conſent* in the *Motion* of the ſeveral parts: We ſee it is Childrens ſport, to prove whether they can rub upon their breaſt with one hand, and pat upon their Forehead with another; and ſtraight ways they ſhall ſometimes rub with both hands, or pat with both hands. We ſee, that when the Spirits that come to the Noſtrils, expel a bad ſent, the Stomack is ready to expel by vomit. We find that in *Conſumptions* of the *Lungs*, when Nature cannot expel by *Cough*, Men fall into *Fluxes* of the *Belly*, and then they die. So in *Peſtilent Diſeaſes*, if they cannot be expelled by *Sweat*, they fall likewiſe into *Looſneſs*, and that is commonly Mortal. Therefore *Phyſicians* ſhould ingeniouſly contrive, how by *Motions* that are in their *Power* they may excite *inward Motions* that are not in their *Power* by *conſent*; as by the *ſtench* of *Feathers*, or the like, they cure the *Riſing* of the *Mother*.

64. Experiment Solitary touching *Cure of Diſeaſes which are contrary to Predispoſition*

HIppocrates *Aphoriſm*, in *morbis minùs*, is a good profound *Aphoriſm*. It importeth, that *Diſeaſes* contrary to the *Complexion*, *Age*, *Sex*, *Seaſon of the year*, *Diet*, &c. are more dangerous than thoſe that are concurrent. A Man would think it ſhould be otherwiſe; For that when the *Accident* of *Sickneſs*, and the *Natural diſpotion*, do ſecond the one the other; the *Diſeaſe* ſhould be more forcible. And ſo (no doubt) it is, if you ſuppoſe like quantity of Matter. But that which maketh good the *Aphoriſm*, is, becauſe ſuch *Diſeaſes* do ſhew a greater collection of Matter, by that they are able to overcome thoſe Naturel inclinations to the contrary. And therefore in *Diſeaſes* of that kind, let the *Phyſitian* apply himſelf more to *Purgation*, than to *Alteration*; becauſe the offence is in the *Quantity*, and the qualities are rectified of themſelves.

65. Experiment Solitary, touching *Preparations before Purging, and setling of the Body afterward.*

Physitians do wisely prescribe, that there be *Preparatives* used before *Just Purgations*; for certain it is, that *Purgers* do many times great hurt, if the Body be not accommodated, both before and after the *Purging*. The hurt that they do, for want of *Preparation* before *Purging*, is by the sticking of the Humors, and their not coming fair away; which causeth in the Body great perturbations, and ill accidents, during the *Purging*; and also the diminishing and dulling of the working of the *Medicine* it self, that it purgeth not sufficiently: Therefore the work of *Preparation* is double, to make the *Humors fluide* and mature, and to make the *Passages* more open; For both those help to make the Humors pass readily: And for the former of these, *Syrups* are most profitable, and for the latter, *Apozums* or *Preparing Broths*; *Clysters* also help lest the *Medicine* stop in the Guts, and work grippingly. But it is true, that *Bodies abounding* with *Humors*. And *fat Bodies*, and *open Weather*, are *Preparatives* in themselves; because they make the Humors more fluid: But let a *Physitian* beware how he purge after hard *Frosty Weather*, and in a *lean Body*, without *Preparation*. For the hurt that they may do after *Purging*, it is caused by the *lodging* of some *Humors* in *ill places*; for it is certain, that there be *Humors*, which somewhere placed in the Body, are quiet, and do little hurt; in other places (especially Passages) do much mischief. Therefore it is good after *Purging*, to use *Apozums* and *Broths*,, not so much *opening* as those used before *Purging* but *Abstursive* and *Mundifying*, *Clysters* also are good to conclude with, to draw away the relicks of the Humours that may have descended to the *lower region* of the *Body*.

66. Experiment Solitary touching *Stanching of Blood.*

Blood is stanched divers ways: First, by *Astringents* and *Repercussive Medicines*. Secondly, by *drawing* of the *Spirits* and *Blood inwards*, which is done by *Cold*; as *Iron* or *Stone* laid to the Neck doth stanch the Bleeding of the Nose; also it hath been tried, that the *Testicles* being put into sharp Vinegar, hath made a sudden recess of the Spirits, and stanched Blood. Thirdly, by the *Recess of the Blood by Sympathy*; so it hath been tried, that the part that bleedeth, being thrust into the body of a Capon, or Sheep, new ript and bleeding hath stanched *Blood*; the *Blood*, as it seemeth, sucking and drawing up, by similitude of substance, the Blood it meeteth with, and so it self going back. Fourthly, by Custom and Time; so the Prince of *Aurange*, in his first hurt by the *Spanish Boy*, could find no means to stanch the *Blood*, either by *Medicine* or *Ligament*, but was fain to have the *Orifice* of the *Wound* stopped by *Mens Thumbs*, succeeding one another for the space, at the least, of two days; and at the last the Blood by *custom* onely retired. There is a fifth way also in use, to let *Blood* in an *adverse part* for a *Revulsion*.

67. Experiment Solitary touching *Change of Aliments and medicines.*

It helpeth, both in *Medicine* and *Aliment*, to change and not to continue the same *Medicine* and *Aliment* stills. The cause is, for that *Nature* by continual use of any thing, groweth to a *satiety* and *dulness*, either of *Appetite* or *Working*. And we see that *Assuetude* of *things hurtful*, doth make them leese their force to hurt; As *Poyson*, which with use some have brought themselves to brook. And therefore it is no marvel, though *things helpful* by *custom*, leese their force to help, I count *intermission* almost the same thing with *change*; for that, that hath been intermitted, is after a sort new.

IT is found by experience, that in *Diets of Guiacum, Sarza*, and the like, (especially, if they be ſtrict) the *Patient* is more troubled in the beginning than after continuance; which hath made ſome of the more delicate ſort of Patients, give them over in the midſt; Suppoſing, that if thoſe Diets trouble them ſo much at firſt, they ſhall not be able to endure them to the end. But the cauſe is, for that all thoſe *Diets*, do dry up *Humors, Rheums* and the like; and they cannot dry up until they have firſt attenuated: And while the *Humor* is attenuated, it is more fluid, than it was before, and troubleth the Body a great deal more, until it be dryed up, and conſumed. And therefore *Patients* muſt expect a due time, and not cheek at them at the firſt. 68. *Experiment Solitary touching Diets.*

THe *Producing* of *Cold* is a thing very worthy the Inquiſition, both for uſe and diſcloſure of cauſes. For *Heat* and *Cold* are *Natures* two hands, whereby ſhe chiefly worketh; and *Heat* we have in readineſs, in reſpect of the *Fire*: But for *Cold*, we muſt ſtay till it cometh, or ſeek it in deep Caves, or high Mountains; and when all is done, we cannot obtain it in any great degree: For *Furnaces* of *Fire* are far hotter than a *Summers Sun*, but *Vaults* or *Hills* are not much colder than a *Winters Froſt*. *Experiment in Conſort touching Production of Cold.*

The firſt *Means* of *Producing cold*, is that which *Nature* preſenteth us withal; namely, the *Expiring* of *Cold* out of the *Inwards parts of the Earth* in *Winter*, when the Sun hath no power to overcome it; the Earth being (as hath been noted by ſome) *Primum Frigidum*. This hath been aſſerted as well by Ancient, as by Modern *Philoſophers*: It was the tenet of *Parmenides*: it was the opinion of the *Author* of the Diſcourſe in *Plutarch*, (for I take it, that Book was not *Plutarchs* own) *De primo Frigido*. it was the opinion of *Teleſius*, who hath renewed the *Philoſophy* of *Parmenides*, and is beſt of the *Noveliſts*. 69.

The ſecond *Cauſe* of *Cold* is, the *Contract* of *Cold Bodies*; for *Cold* is Active and Tranſitive into Bodies adjacent, as well as *Heat*; which is ſeen in thoſe things that are touched with *Snow* or *Cold Water*. And therefore whoſoever will be an Enquirer in Nature, let him reſort to a *Conſervatory* of *Snow* and *Ice*; ſuch as they *uſe for delicacy*, to cool Wine in Summer: Which is a poor and contemptible uſe, in reſpect of other uſes that may be made of ſuch *Conſervatories*. 70.

The third *Cauſe* is the *Primary Nature* of all *Tangible Bodies*; for it is well to be noted, That all things whatſoever (*Tangible*) are of themſelves *Cold*; except they have an acceſſory *Heat* by *Fire, Life*, or *Motion*: For even the *Spirit* of *Wine*, or *Chymical Oyls*, which are ſo hot in operation, are to the firſt touch, *Cold*; and *Air* it ſelf compreſſed, and condenſed a little by blowing, is *Cold*. 71.

The fourth *Cauſe* is, the *Denſity of the Body*, for all *Denſe Bodies* are *Colder* than moſt other *Bodies*, as *Metals, Stone, Glaſs*, and they are longer in *Heating* than *Safter Bodies*. And it is certain, that *Earth, Denſe, Tangible*, hold all of the Nature of *Cold*: The cauſe is, for that all *Maters Tangible* being Cold, it muſt needs follow, that were the *Matter* is moſt congregate the *Cold* is the greater. 72.

The fifth *Cauſe* of *Cold*, or rather of increaſe and vehemency of Cold, is *A Quick Spirit incloſed in a cold Body*; as will appear to any that ſhall attentively conſider of *Nature* in many inſtances. We ſee *Nitre* (which hath a *Quick Spirit*) is Cold, more *Cold* to the Tongue than a Stone; ſo *Water* 73.

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is *colder* than *Oyl*, because it hath *a quicker Spirit*; for all *Oyl*, though it hath the tangible parts better digested than *Water*, yet hath it a duller *Spirit*: So *Snow* it *colder* than *Water*, because it hath *more Spirit* within it: So we see that *Salt* put to *Ice* (as in the producing of the *Artificial Ice*) encreaseth the *activity* of *cold*: So some *Insects* which have *Spirit* of *Life*, as *Snakes* and *Silkworms*, are to the touch, *Cold*. So *Quick-silver* is the *coldest of* Metals, because it is *fullest of Spirit*,

74. The sixth *cause* of *Cold* is, *the chasing and driving away of Spirits*; such as have some *degree of Heat*; for the banishing of the *Heat* must needs leave any Body *cold*. This we see in the operation of *Opium*, and *Stupefactives* upon the Spirits of Living Creatures; and it were not amiss to try *Opium* to laying it upon the top of a *Weather-Glass*, to see whether it will contract the *Air*; but I doubt it will not succeed: For besides that, the vertue of *Opium* will hardly penetrate thorow such a body as Glass, I conceive that *Opium*, and the like, make the *Spirits* flie rather by *Malignity*, than by *Cold*.

75. Seventhly, the same *effect* must follow upon the *exhaling or drawing out of the warm Spirits*, that doth upon the flight of the Spirits. There is an opinion, that the Moon is Magnetical of *Heat*, as the *Sun* is of *Cold*, and *Moisture*: It were not amiss therefore to try it with *warm waters*; the one exposed to the Beams of the *Moon*, the other with some skreen betwixt the Beams of the *Moon* and the *VVater*: As we use to the *Sun* for shade, and to see whether the former will cool sooner. And it were also good to enquire, what other means there may be, to draw forth the exile heat which is in the *Air*; for that may be a secret of great power to produce cold Weather,

76. Experiment in Consort touching the *Version and Transmutation of Air into water.*

WE have formerly set down the *Means of turning Air into VVater*, in the *Experiment* 27. But because it is *Magnale Naturæ*, and tendeth to the subduing of a very great effect, and is also of manifold use: We will add some *instances* in *Consort* that give light thereunto.

It is reported by some of the *Ancients*, that *Sailers* have used every night, to hang *Fleeces of Wool* on the sides of their *Ships*, the *VVool* towards the Water; and that they have crushed fresh water out of them in the Morning, for their use. And thus much we have tried, that a *quantity* of Wool, tied loose together, being let down into a deep Well; and hanging in the *middle*, some three Fathom from the Water for a night in the Winter time, increased in weight, (as I now remember) to a fifth Part.

77. It is reported by one of the *Ancients*, that in *Lydia* near *Pergamus* there were certain *VVorkmen* in time of Wars, fled into Caves; and the Mouth of the *Caves* being stopped by the Enemies, they were famished. But long time after the dead Bodies were found, and some vessels which they had carried with them, and the Vessels full of *Water*; and that *Water* thicker, and more towards Ice, than common *Water*; which is a notable instance of *Condensation* and *Induration* by *Burial under Earth* (in Caves) for long time; and of *Version* also (as it should seem) of *Air* into *Water*; if any of those Vessels were empty. Try therefore a small *Bladder* hung in *Snow*, and the like in *Nitre*, and the like in *Quick-silver*: And if you find the *Bladders* faln or shrunk, you may be sure the *Air* is condensed by the *Cold* of those *Bodies*, as it wold be in a *Cave* under *Earth*,

It

It is reported of very good credit, that in the *East-Indies* if you set a Tub of *Water* open in a Room where *Cloves* are kept, it will be drawn dry in Twenty four hours, though it ſtand at ſome diſtant from the *Cloves*. In the Countrey, they uſe many times in deceit, when their *Wool* is new ſhorn, to ſet ſome Pails of *Water* by in the ſame Room, to encreaſe the weight of the *Wool*: But it may be, that the Heat of the *Wool* remaining from the Body of the Sheep, or the heat gathered by the lying cloſe of the *Wool* helpeth to draw the watry vapor; but that is nothing to the *Verſion*. 78.

It is reported alſo credibly, that *Wool* new ſhorn, being laid caſually upon a *Veſſel* of *Verjuice*, after ſome time hath drunk up a great part of the *Verjuice*, though the Veſſel were whole without any flaw, and had not the Bung-hole open. In this *Inſtance* there is (upon the by) to be noted, the *Percolation* or *Suing* of the *Verjuice* thorow the Wood; for *Verjuice* of it ſelf would never have paſſed through the Wood: So as it ſeemeth, it muſt be firſt in a kind of vapor before it paſs. 79.

It is eſpecially to be noted, that the cauſe that doth facilitate the *Verſion* of *Air* into *Water*, when the *Air* is not in groſs, but ſubtlty mingled with *Tangible Bodies*, is, (as hath been partly touched before) for that *Tangible Bodies* have an antipathy with *Air*; and if they find any *Liquid Body* that is more denſe near them, they will draw it; and after they have drawn it, they will condenſe it more, and in effect incorporate it: For we ſee that a *Spunge* or *Wool*, or *Sugar*, or a *Woolen Cloth*, being put but in part, in *Water* or *Wine*, will draw the *Liquor* higher, and beyond the place, where the *Water* or *Wine* cometh. We ſee alſo, that *Wood*, *Lute-ſtrings*, and the like, do ſwell in moiſt ſeaſons; as appeareth by the *Breaking* of the *Strings* the *Hard turning* of the *Pegs*, and the *Hard drawing forth of Boxes*, and *Opening of Wainſcot doors*, which is a kind of *infuſion*; and is much like to an *Infuſion* in Water, which will make Wood to ſwell; as we ſee in the filling of the Chops of Bowls by laying them in Water. But for that part of theſe *Experiments*, which concerneth *Attraction* we will reſerve to the proper *Title* of *Attraction*. 80.

There is alſo a *Verſion* of *Air* into *Water*, ſeeing in the *Sweating* of *Marbles*, and other *Stones*; and of *Wainſcot* before, and in moiſt weather. This muſt be, either by ſome *Moiſture* the Body yieldeth, or elſe by the moiſt Air thickned againſt the hard Body. But it is plain, that it is the latter; for that we ſee *Wood painted with Oyl-colour*, will ſooner gather drops in a moiſt night, than *Wood* alone; which is cauſed by the ſmoothneſs and cloſeneſs which letteth in no part of the vapor, and ſo turneth it back, and thickneth it into Dew. We ſee alſo, that *Breathing* upon a *Glaſs*, or ſmooth Body, giveth a Dew; and in *Froſty mornings* (ſuch as we call *Rime Froſts*) you ſhall find drops of Dew upon the inſide of Glaſs-windows: And the Froſt it ſelf upon the ground, is but a *Verſion* or *Condenſation* of the moiſt vapors of the night, into a watry ſubſtance; Dews likewiſe, and *Rain*, are but the returns of moiſt vapors condenſed; the Dew, by the cold onely of the Suns departure, which is the gentler *Cold*; *Rains*, by the *Cold* of that which they call the *Middle Region* of the *Air*, which is the more violent *Cold*. 81.

It is very probable (as hath been touched) that that which will turn *Water* into *Ice*, will likewiſe turn *Air* ſome degree nearer unto *Water*. Therefore try the *Eperiment* of the *Artificial turning Water into Ice* (whereof we ſhall ſpeak in another place) with *Air* in place of *Water*, and the 82.

the *Ice* about it. And although it be a greater alteration to turn *Air* into *Water*, than *Water* into *Ice*; yet there is this hope, that by continuing the *Air* longer time, the effect will follow; for that artificial *Converſion of Water* into *Ice*, is the work of a few hours; and this of *Air* may be tried by a moneths ſpace, or the like.

Experiments in Conſort touching the *Induration of Bodies.*

Induration or *Lapidification*, of Subſtances more ſoft, is likewiſe another degree of *Condenſation*, and is a great *Alteration* in Nature. The effecting and accelerating thereof, is very worthy to be enquired. It is effected by three means.

The firſt is by *Cold*, whoſe property is to *Condenſe*, and conſtipate, as hath been ſaid.

The ſecond is by *Heat*, which is not proper but by conſequence; for the heat doth attenuate, and by attenuation doth ſend forth the Spirit, and moiſter part of a Body; and upon that, the more groſs of the tangible parts do contract and ſerve themſelves together, both to avoid *Vacuum* (as they call it) and alſo to munite themſelves againſt the force of the *Fire*, which they have ſuffered.

And the third is by *Aſſimilation*, when a hard Body aſſimilateth a ſoft, being contiguous to it.

The examples of *Induration* taking them promiſcuouſly, are many: As the Generation of *Stones* within the Earth, which at the firſt are but Rude Earth or Clay; and ſo of *Minerals*, which come (no doubt) at firſt of Juyces Concrete, which afterward indurate: And ſo of *Porcellane*, which is an *Artificial Cement*, buried in the Earth a long time; and ſo the making of *Brick* and *Tile*; alſo the making of *Glaſs*, of a certain *Sand* and *Brake-Roots*, and ſome other matters: alſo the *Exudations* of *Rock-Diamonds* and *Chriſtal*, which harden with time; alſo the *Induration* of *Bead-Amber*, which at firſt is a ſoft ſubſtance, as appeareth by the *Flies* and *Spiders*, which are found in it, and many more. But we will ſpeak of them diſtinctly.

83. For *Indurations* by *Cold*, there be few Trials of it; for we have no ſtrong or intenſe cold here on the ſurface of the *Earth*, ſo near the Beams of the Sun and the Heavens, the likelieſt trial is by *Snow* and *Ice*; for as *Snow* and *Ice*, eſpecially being holpen, and their *Cold* activated by *Nitre* or *Salt*, will turn *Water* into *Ice*, and that in a few hours: So it may be it will turn *Wood* or *Stiff Clay* into *Stone* in longer time. Put therefore into a *Conſerving Pit* of *Snow* and *Ice*, (adding ſome quantity of *Salt* and *Nitre*) a piece of *Wood*, or a piece of *Tough Clay*, and let it lie a moneth or more.

84. Another tryal is by *Metalline Waters*, which have virtual *Cold* in them Put therefore *Wood* or *Clay* into *Smiths water*, or other *Metalline water*, and try whether it will not harden in ſome reaſonable time, But I underſtand it of *Metalline waters*, that come by waſhing or quenching, and not of *Strong Waters* that come by diſſolution; for they are too Corroſive to conſolidate.

91. It is already found, that there are ſome *Natural Spring waters* that will inlapidate *Wood*; ſo as you ſhall ſee one piece of *Wood*, whereof the part above the *Water* ſhall continue *Wood*; and the part under the *Water* ſhall be turned into a kind of *Gravelly ſtone*. It is likely thoſe *Waters* are of ſome *Metalline Mixture*; but there would be more particular requiry made of them. It is certain, that an *Egg* was found, having lain many years in the

bottom

bottom of a Moat, where the Earth had somewhat over grown it: And this Egg was coming to the hardness of a *Stone*, and had the colours of the White and Yolk perfect; and the Shell shining in small Grains, like Sugar or Alablaſter

Another experience there is of *Induration by Cold*, which is already found, which is, That *Metals* themselves are hardened by often *heating*, and *quenching* in *Cold-water*: For *Cold* ever worketh most potently upon *Heat* precedent. 86.

For *Induration by Heat*, it must be considered, That *Heat*, by the exhaling of the moister parts, doth either harden the Body; as in *Bricks*, *Tiles*, &c. Or if the *Heat* be more fierce, maketh the grosser part it self, run and melt; as in the making of ordinary *Glass*, and in the *Vitrification* of *Earth*, (as wee see in the inner parts of Furnaces) and in the *Vitrification* of *Brick*, and of *Metals*. And in the former of these, which is the hardning by Baking, without Melting, the *Heat* hath these degrees: First, It *Induratcth*, and then maketh *Fragile*; and lastly, It doth *Incinerate* and *Calcinate*. 87.

But if you desire to make an *Induration* with *Toughness*, and less Fragility, a middle way would be taken, which is that which *Aristotle* hath well noted, but would be throughly verified. It is, to decoct *Bodies* in *Water* for two or three days; but they must be such Bodies, into which the *Water* will not enter; as *Stone* and *Metal*. For if they be bodies, into which the *Water* will enter, then long seething will rather soften than indurate them, as hath been tried in *Eggs*, &c. Therefore, softer Bodies must be put into Bottles, and the Bottles hung into *Water* seething, with the Mouths open above the *Water*, that no *Water* may get in: For by this Means, the Virtual *Heat* of the *Water* will enter; and such a *Heat*, as will not make the Body adust or fragile; But the Substance of the *Water* will be shut out. This *Experiment* we made, and it sorted thus, It was tryed with a piece of *Freestone*, and with *Pewter*, put into the *Water* at large; the Free-stone we found received in some *Water*; for it was softer and easier to scrape, than a piece of the same stone kept dry. But the *Pewter*, into which no *Water* could enter, become more white, and liker to Silver, and less flexible by much. There were also put into an Earthen Bottle, placed as before, a good pellet of *Clay*, a piece of *Cheese*, a piece of *Chalk*, and a piece of *Free-stone*. The *Clay* came forth almost of the hardness of *Stone*: The *Cheese* likewise very hard, and not well to be cut: The *Chalk*, and the *Free-stone* much harder then they were. The colour of the *Clay* inclined not a whit to the colour of *Brick*, but rather to white, as in ordinary drying by the Sun. Note, that all the former tryals were made by a boiling upon a good hot fire, renewing the *Water* as it consumed, with other hot *Water*; but the boyling was but for Twelve hours onely: And it is like, that the Experiment would have been more effectual, if the boyling had been for two or three days, as we prescribed before. 88.

As touching *Assimilation* (for there is a degree of *Assimilation*, even in Inanimate Bodies) we see examples of it in some *Stones*, in *Clay grounds*, lying near to the top of the Earth where *Pebble is*; in which you may manifestly see divers *Pebbles* gathered together, and a crust of Cement or *Stone* between them, as hard as the *Pebbles* themselves. And it were good to make a tryal of purpose, by taking *Clay*, and putting in it divers *Pebble-stones*, thick set, to see whether in continuance of time, it will not be harder than other *Clay* of the same lump, in which no *Pebbles* are set. We see also in Ruins 89.

of

of old Walls, especially towards the bottom, the *Morter* will become as hard as the *Brick*: We see also, that the *Wood* on the sides of *Vessels* of *Wine*, gathereth a crust of *Tartar* harder then the *Wood* it self; and Scales likewise grow to the *Teeth*, harder than the *Teeth* themselves.

90. Most of all, *Induration* by *Assimilation* appeareth in the bodies of *Trees*, and *Living Creatures*: For no nourishment that the *Tree* receiveth, or that the *Living Creature* receiveth, is so hard as *Wood*, *Bone*, or *Horn*, &c. But is *indurated* after by *Assimilation*.

91. Experiment Solitary, touching the *Version of Water into Air*

THe Eye of the Understanding, is like the Eye of the Sense: For as you may see great objects through small Cranies, or Levels; so you may see great *Axioms* of *Nature*, through small and contemptible *Instances*. The *Speedy Depredation* of *Air* upon *Watry Moisture*, and *Version* of the same into *Air*, appeareth in nothing more visible than in the sudden discharge, or vanishing of a little *Cloud* of *Breath*, or *Vapour*, from *Glass* or the *Blade* of a *Sword*, or any such polished Body; such as doth not at all detain or imbibe the moisture: For the mystiness scattereth and breaketh up suddenly. But the like *Cloud*, if it were *Oyly* or *Fatty* will not discharge; not because it sticketh faster, but because *Air*, preyeth upon *Water*, and *Flame*, and *Fire*, upon *Oyl*; and therefore, to take out a spot of Grease, they use a *Coal* upon brown Paper, because *Fire* worketh upon Grease or *Oyl*, as *Air* doth upon *Water*. And we see *Paper Oyled*, or *Wood Oyled*, or the like, last long moist; but *Wet* with *Water*, dry do putrifie sooner. The cause is, for that *Air* meddleth little with the *Moisture* of *Oyl*.

92. Experiment Solitary touching the *Force of Union*.

THere is an admirable demonstration in the same trifling *Instance* of the little *Cloud* upon *Glass*, or *Gems*, or *Blades* of *Swords* of the *Force of Union*, even in the least quantities, and weakest Bodies, how much it conduceth to preservation of the present form, and the resisting of a new. For mark well the discharge of that *Cloud*, and you shall see it ever break up, first in the skirts, and last in the midst. We see likewise, that much *Water* draweth forth the Juyce of the Body infused, but little *Water* it imbibed by the Body: and this is a principal cause, why, in operation upon *Bodies*, for their *Version* or *Alteration*, the tryal in great quantities doth not answer the tryal in small, and so deceiveth many; for that (I say) the greater Body resisteth more any alteration of Form, and requireth far greater strength in the Active Body that should subdue it.

93. Experiment Solitary touching the *Producing of Feathers and Hairs of divers Colours*.

WE have spoken before in the Fifth *Instance*, of the cause of *Orient Colours* in *Birds*; which is by the fineness of the Strainer, we will now endeavor to reduce the same *Axiom* to a *Work*. For this Writing of our *Sylva Sylvarum*, is (to speak properly) not *Natural History*, but a high kind of *Natural Magick*. For it is not a discription onely of Nature but a breaking of Nature, into great and strange Works. Try therefore the anointing over of *Pigeons*, or other *Birds*, when they are but in their Down, or of *Whelps*, cutting their Hair as short as may be, or of some other Beast; with some oyntment, that is not hurtful to the flesh, and that will harden and stick very close, and see whether it will not alter the colours of the *Feathers*, or *Hair*. It is received, that the *pulling off* the first *Feathers* of *Birds* clean, will make the new come forth *White*: And it is certain, that *White* is a penurious colour, and where moisture is scant. So *Blew Violets*, and other *Flowers*, if they be starved, turn *Pale* and *White*.

Birds

Birds, and *Horſes*, by age or ſcars, turn *white*; and the *hoary Hairs* of Men, come by the ſame reaſon. And therefore in *Birds*, it is very likely, that the *Feathers* that come firſt, will be many times of divers colours, according to the Nature of the Birds; for that the skin is more porous, but when the skin is more ſhut and cloſe, the Feathers will come *white*. This is a good *Experiment*, not onely for the producing of *Birds* and *Beaſts* of ſtrange colours, but alſo, for the diſcloſure of the nature of *colours* themſelves; which of them require a finer poroſity, and which a groſſer.

94. Experiment Solitary touching the *Nouriſhment of Living Creatures before they be brought forth.*

IT is a work of providence that hath been truly obſerved by ſome; that the *Tolk* of the *Egg* conduceth little to the *Generation* of the *Bird*, but onely to the *nouriſhment* of the ſame: For if a *Chicken* be opened when it is new hatched, you ſhall find much of the *Tolk* remaining. And it is needful, that *Birds* that are ſhaped without the Females Womb, have in the *Egg*, as well matter of nouriſhment, as matter of generation for the Body. For after the *Egg* is laid, and ſevered from the body of the *Hen*, it hath no more nouriſhment from the *Hen*, but onely a quickning *Heat* when ſhe ſitteth. But Beaſts and Men need not the matter of nouriſhment within themſelves, becauſe they are ſhaped within the Womb of the Female, and are nouriſhed continually from her body.

95. Experiments in Conſort touching *Sympathy and Antipathy for Medicinal uſe.*

IT is an inveterate and received opinion, That *Cantharides* applied to any part of the Body, touch the *Bladder*, and exulcerate it, if they ſtay on long. It is likewiſe received, that a kind of *Stone*, which they bring out of the *Weſt-Indies*, hath a peculiar force to move Gravel, and to diſſolve the *Stone*; inſomuch, as laid but to the Wreſt, is hath ſo forcibly ſent down Gravel, as Men have been glad to remove it, it was ſo violent.

96.

It is received and confirmed by daily experience that the Soals of the Feet, have great affinity with the *Head*, and the *Mouth* of the *Stomack*. As we ſee, *Going wetſhod*, to thoſe that uſe it not, effecteth both; Applications of *hot Powders* to the *Feet*, attenuate firſt, and after dry the *Rheume*. And therefore a *Phyſitian* that would be myſtical, preſcribeth for the cure of the *Rheume*, That a Man ſhould work continually upon a *Camomil-Ally*; meaning, that he ſhould put *Camomil* within his Socks. Likewiſe *Pigeons bleeding*, applied to the *Soals* of the *Feet*, eaſe the *Head*; and *Soporiferous Medicines* applied unto them, provoke *ſleep*.

97.

It ſeemeth, that as the *Feet* have a ſympathy with the *Head*; ſo the *Wreſts* and *Hands* have a ſympathy with the *Heart*. We ſee the affects and paſſions of the *Heart*, and *Spirits*, are notably diſcloſed by the *Pulſe*: And it is often tryed, that Juyces of *Stock-gilly flowers*, *Roſe-campion*, *Garlick*, and other things, applied to the *Wreſts*, and renewed, have cured long Agues. And I conceive, that waſhing with certain *Liquors* the *Palms* of the *Hands* doth much good: And they do well in *Heats* of *Agues* to hold in the Hands, *Eggs of Alablaſter*, and *Balls* of *Cryſtal*.

Of theſe things we ſhall ſpeak more, when we handle the Title *of* Sympathy and Antipathy, *in the proper place.*

98. Experiment Solitary touching the *Secret Proceſſes of Nature.*

THe knowledge of Man (hitherto) hath been detemined by the view or ſight; ſo that what whatſoever is inviſible, either in reſpect of the *fineneſs of the* Body it ſelf, or the *ſmalneſs of the Parts*, or of the *ſubtilty of the Motion*,

Motion, is little inquired. And yet theſe be the things that govern Nature principally, and without which, you cannot make any true *Analyſis* and *Indications* of the proceedings of Nature. The *Spirits* or *Pneumaticals* that are in all *Tangible Bodies*, are ſcare known: Sometimes they take them for *Vacuum*, whereas they are the moſt active of Bodies: Sometimes they take them for *Air*, from which they differ exceedingly, as much as Wine from Water, and as Wood from Earth: Sometimes they will have them to be *Natural Heat*, or a *Portion* of the *Element of Fire*, whereas ſome of them are crude and cold: And ſometimes they will have them to be the *Vertues* and *Qualities* of the *Tangible Parts* which they ſee, whereas they are things by themſelves: And then, when they come to Plants and Living Creatures, they call them *Souls*. And ſuch ſuperficial ſpeculations they have; like Proſpectives that ſhew things inward, when they are but paintings. Neither is this a queſtion of words, but infinitely material in *Nature*: For *Spirits* are nothing elſe but a *Natural Body* rarified to a Proportion, and included in the *Tangible Parts* of *Bodies*; as in an Integument: And they be no leſs differing one from the other, then the *Denſe* or *Tangible Parts*: And they are in all *Tangible* Bodies, whatſoever, more or leſs, and they are never (almoſt) at reſt: And from them, and their Motions, principally proceed *Arefaction*, *Colliquation* *Concoction*, *Maturation*, *Putrefaction*, *Vivification*, and moſt of the effects of *Nature*. For, as we have figured them in our *Sapientiâ Veterum*, in the *Fable of Proſerpina*, you ſhall in the Infernal Regiment hear little doings of Pluto, but moſt of *Proſerpina*: For *Tangible Parts* in *Bodies*, are ſtupid things, and the *Spirits* do (in effect) all. As for the differences of *Tangible Parts* in *Bodies* the induſtry of the *Chymiſts* hath given ſome light in diſcerning by their ſeparations, the *Oily*, *Crude*, *Pure*, *Impure*, *Fine*, *Groſs*, *Parts of Bodies*, and the like. And the *Phyſitians* are content to acknowledge, that *Herbs*, and *Drugs* have divers parts: as that *Opium* hath a ſtupefactive part, and a heating part; the one moving Sleep, the other a Sweat following; and that *Rubarb* hath Purging parts, and Aſtringent parts, &c. But this whole *Inquiſition* is weakly and negligently handled. And for the more ſubtil differences of the *Minute Parts*, and the poſture of them in the Body, (which alſo hath great effects) they are not at all touched: As for the Motions of the *Minute Parts of Bodies*, which do ſo great effects, they have not been obſerved at all; becauſe they are inviſible, and incur not to the eye; but yet they are to be deprehended by experience. As *Democritus* ſaid well, when they charged him to hold, that the World was made of ſuch little Moats, as were ſeen in the Sun. *Atomus* (ſaith he) *neceſſitate Rationis & Experientiæ eſſe convincitur: Atomum enim nemo unquam vidit.* And therefore the tumult in the parts of ſolid Bodies, when they are compreſſed, which is the cauſe of all *flight* of Bodies thorow the Air, and of other *Mechanical Motions*, (as hath been partly touched before, and ſhall be throughly handled in due place) is not ſeen at all, but nevertheleſs, if you know it not, or inquire it not attentively and deligently, you ſhall never be able to diſcern, and much leſs to produce, a number of *Mechanical Motions*. Again, as to the *Motions Corporal* within, the Encloſures of Bodies, whereby the effects (which were mentioned before) paſs between the *Spirits* and the *Tangible Parts* (which are *Arefaction*, *Colliquation*, *Concoction*, *Maturation*, *&c*) they are not at all handled; but they are put off by the names of *Vertues*, and *Natures*, and *Actions*, and *Paſſions*, and ſuch other *Logical words*.

It

99. Experiment Solitary touching the Power of Heat.

IT is certain, that of all *Powers* in *Nature*, *Heat* is the chief; both in the Frame of *Nature* and the in Works of *Art*. Certain it is likewise, that the effects of *Heat*, are most advanced, when it worketh upon a Body without loss or dissipation of the matter: for that ever betrayed the account. And therefore it is true, that the power of *Heat* is best perceived in *Distillations*, which are performed in close Vessels and Receptacles. But yet there is a higher degree; For whosoever *Distillations* do keep the Body in Cells and Cloysters, without going abroad, yet they give space unto Bodies to turn into vapor, to return into Liquor, and to seperate one part from another. So as *Nitre* doth expiatiate, although it hath not full liberty; whereby the true and ultime operations of *Heat*, are not attained. But if *Bodies* may be altered by *Heat*, and yet no such Recipocration of *Rarefaction*, and of *Condensation*, and of *Separation*, admitted; then it is like that this *Proteus* of *Matter*, being held by the Sleeves, will turn and change into many *Metamorphoses*. Take therefore a *square Vessel of iron*, in form of a Cube, and let it have good thick and strong sides; put it into a Cube of *Wood*, that may fill it as close as may be, and let it have a cover of Iron as strong (at least) as the sides, and let it be well Luted, after the manner of the *Chymists*; then place the *Vessel* within burning *Coals* kept quick kindled, for some few hours space; then take the *Vessel* from the *Fire*, and take off the Cover, and see what is become of the *Wood*, I conceive, that since all *Inflamation* and *Evaporation* are utterly prohibited, and the *Body* still turned upon it self, that one of these two effects will follow, either that the *Body* of the *Wood* will be turned into a kind of *Antalgama*, (as the *Chymists* call it,) or, that the finer part will be turned into *Air*, and the grosser stick as it were baked, and in crustate upon the sides of the *Vessel*, being become of a denser matter, than the *Wood* it self, crude. And for another tryal, take also *Water*, and put it in the like Vessel, stopped as before; but use a gentler *Heat*, and remove the Vessel sometimes from the Fire; and again, after some small time, when it is cold, renew the *heating* of it, and repeat this *alteration* some few times; and if you can once bring to pass, that the *Water* which is one of the simplest of Bodies, be changed in Colour, Odour, or Taste, after the manner of Compound Bodies, you may be sure that there is a great work wrought in Nature, and a notable entrance made into strange changes of Bodies, and productions; and also a way made to do that by Fire, in small time, which the *Sun* and *Age* do in long time. But of the admirable effects of this *Distillation in close*, (for so we will call it) which is like the *Wombs* and *Matrices* of Living Creatures, where nothing expireth nor separateth: We will speak fully, in the due place. Not that we aim at the making of *Peracelsus Pigmyes*, or any such prodigious follies; but that we know the effects of *Heat* will be such, will scarce fall under the conceit of Man, if the force of it be altogether kept in.

98. Experiment Solitary touching the Impossibility of Annihilation.

THere is nothing more certain in *Nitre*, than that it is impossible for any *Body* to be utterly *annihilated*; but that as it was the work of the Omnipotency of *God*, to make *Somewhat* of *Nothing*: So it requireth the like omnipotency, to turn *Somewhat* into *Nothing*. And therefore it well said by an obscure Writer of the *Sect* of the *Chymists*, That there is no such way to effect the strange *Transmutations* of *Bodies*, as to endeavour and urge by all means, the *Reducing* of them to *Nothing*. And herein is contained al-

so a great secret of Preservation of Bodies from change; for if you can prohibit, that they neither turn into *Air*, because no *Air* cometh to them, nor go into the *Bodies Adjacent*, because they are utterly Heterogeneal, nor make a *round* and *Circulation* within themselves; they will never change, though they be in their Nature never so perishable or mutable, We see how *Flies* and *Spiders*, and the like, get a *Sepulchre* in *Amber*, more durable than the *Monument* and *Embalming* of the *Body* of any *King*. And I conceive the like will be of Bodies put into *Quick-silver*. But then they must be but thin, as a leaf or a piece of Paper or Parchment; for if they have a greater crassitude, they will alter in their own Body, though they spend not. But of this, we shall speak more when we handle the *Title* of *Conservation* of *Bodies*.

NATVRAL HISTORY.

Century II.

MUsick in the *Practice* hath been well pursued, and in good Variety; but in the *Theory*, and especially in the *Yielding* of the *Causes* of the *Practick*, very weakly; being reduced into certain Mystical subtilties, of no use and not much truth. We shall therefore, after our manner, joyn the *Contemplative* and *Active Part* together. Experiments in Consort touching *Musick*.

All *Sounds*, are either *Musical Sounds*, which we call *Tones*; whereunto there may be an *Harmony*, which *Sounds* are ever *equal*: As *Singing*, the *Sounds of Stringed, and Wind-Instruments*, the *Ringing of Bells*, &c. Or *Immusical Sounds*, which are ever *unequal*; Such as are the *Voice in Speaking*, all *Whisperings*, all *Voices of Beasts and Birds* (except they be *Singing Birds*; all *Percussions*, of *Stones*, *Wood*, *Parchment*, *Skins*, (as in *Drums*) and infinite others. 101.

The *Sounds* that produce *Tones*, are ever from such *Bodies* as are in their Parts and Pores *equal*; as well as the *Sounds* themselves are *equal*: And such are the *Percussions* of *Metal*, as in *Bells*: Of *Glass*, as in the fillipping of a *Drinking Glass*: Of *Air*, as in *Mens Voices whilest they sing*, in *Pipes*, *Whistles*, *Organs*, *Stringed Instruments*, *&c.* And of *Water*, as in the *Nightingal-Pipes* of *Regals*, or *Organs*, and other *Hydraulicks*, which the *Ancients* had, and *Nero* did so much esteem, but are now lost. And if any Man think, that the *String* of the *Bow*, and the *String* of the *Viol*, are neither of them *equal Bodies*, and yet produce *Tones*, he is in an error. For the *Sound* is not created between the *Bow* or *Plectrum*, and the *String*; but between the *String* and the *Air*; no more than it is between the *Finger* or *Quill*, and the String in other *Instruments*. So there are (in effect) but three *Percussions* that 102.

create *Tones*; *Percussions* of *Metals* (comprehending *Glass*, and the like) *Percussions* of *Air*, and *Percussions* of *Water*.

103. The *Diapason* or *Eight* in *Musick*, is the sweetest *Concord*; insomuch, as it is in effect an *Unison* as we see in *Lutes* that are strung in the base *strings* with two strings, one an *Eight* above another, which make but as one *sound*; and every *Eighth Note* in Ascent, (as from *Eight* to *Fifteen*, from *Fifteen* to *Twenty two*, and so *in infinitum*) are but *Scales of Diapason*. The *cause* is dark, and hath not been rendred by any, and therefore would be better contemplated. It seemeth that Air (which is the subject of *Sounds*) in *Sounds* that are not *Tones* (which are all *unequal* as hath been said) admitteth much variety; as we see in the *Voices* of *Living Creatures*, and likewise in the *Voices* of several Men; (for we are capable to discern several *Men* by their *Voices*) and in the *Conjugation of Letters*, whence *Articulate Sounds* proceed; which of all others, are most various. But in the Sounds which we call *Tones* (that are ever *equal*) the *Air* is not able to cast it self into any such variety; but is forced to recur into one and the same Posture or Figure, onely differing in greatness and smallness. So we see *Figures* may be made of Lines, crooked and straight, in infinite variety, where there is inequality; but *Circles* or *Squares*, or *Triangles Equilateral*, (which are all *Figures* of equal Lines) can differ but in greater or lesser.

104. It is to be noted (the rather, lest any Man should think that there is any thing in this *number* of *Eight*, to create the *Diapason*) that this computation of *Eight*, is a thing rather received than any true computation. For a true computation ought ever to be, by distribution into equal Portions. Now there be intervenient in the *rise* of *Eight* (in *Tones*) two *Beemols* or *Half Notes*; so as if you divide the *Tones* equally, the *Eight* is but Seven whole and equal *Notes*: And if you subdivide that into *Half-Notes*, (as it is in the stops of a *Lute*) it maketh the *number* of *Thirteen*.

105. Yet this is true, That in the ordinary Rises and Falls of the *Voice* of *Man* (not measuring the *Tone* by whole Notes and Half-Notes, which is the equal Measure) there fall out to be two Beemols (as hath been said) between the *Unison* and the *Diapason*; and this varying is natural. For if a Man would endeavour to raise or fall his *Voice* still by *Half-Notes*, like the stops of a *Lute*, or by whole *Notes* alone, without *Halfs* as far as an *Eight*; he will not be able to frame his *Voice* unto it, which sheweth that after every three whole *Notes*, Nature requireth, for all Harmonical use, one *Half-Note* to be interposed.

106. It is to be considered, That whatsoever vertue is in *Numbers* for conducing to concent of *Notes*, is rather to be ascribed to the *Ante-number*, than to the *Entire number* as namely, that the Sound returneth after *Six*, or after *Twelve*: So that the *Seventh* or the *Thirteenth* is not the Matter, but the *Sixth*, or the *Twelfth*; and the *Seventh* and the *Thirteenth* are but the Limits and Boundaries of the *Return*.

107. The *Concords* in *Musick* which are *Perfect* or *Semiperfect*, between the *Unison* and the *Diapason*, are the *Fifth*, which is the most *perfect*; the *Third* next, and the *Sixth* which is more harsh: And the *Ancients* esteemed, and so do my self, and some other yet, the *Fourth* which they call *Diatesseron*; as for the *Tenth*, *Twelth*, *Thirteenth*, and so *in infinitum* they be but *Recurrences* of the former; *viz.* of the *Third*, the *Fifth*, and the *Sixth* and the *Eight* respectively from them.

For

For *Discords*, the *Second* and the *Seventh*, are of all others the most odious in *Harmony* to the *Sense*; whereof, the one is next above the *Unison*, the other next under the *Diapason*; which may shew, that *Harmony* requireth a competent distance of *Notes*. 108.

In *Harmony*, if there be not a *Discord* to the *Base*, it doth not disturb the *Harmony*, though there be a *Discord* to the *higer parts*; so the *Discord* be not of the two that are odious: And therefore the ordinary *Concent* of *Four Parts* consisteth of an *Eight*, a *Fifth*, and a *Third* to the *Base*; but that *Fifth* is a *Fourth* to the *Treble*, and the *Third* is a *Sixth*. And the *Cause* is, for that the *Base* striking more Air, doth overcome and drown the *Trebble* (unless the *Discord* be very odious) and so hideth a small imperfection. For we see, that in one of the *lower strings* of a *Lute*, there soundeth not the sound of the *Trebble*, nor any *mixt* sound, but onely the *sound* of the *Base*. 109.

We have no *Musick* of *Quarter-Notes*, and it may be, they are not capable of *Harmony*; for we see the *Half-Notes* themselves do but interpose sometimes. Nevertheless, we have some *Slides* or *Relishes* of the Voice or Strings, as it were, continued without *Notes*, from one *Tone* to another, rising or falling, which are delightful 110.

The causes of that which is *Pleasing* or *ingrate* to the *Hearing*, may receive light by that which is *Pleasing* or *ingrate* to the *Sight*. There be two things pleasing to the sight (leaving *Pictures* and *Shapes* aside, which are but Secondary Objects, and please or displease but in Memory;) these Two are *Colours* and *Order*. The pleasing of *Colour* symbolizeth with the *Pleasing* of any *Single Tone* to the *Ear*; but the pleasing of *Order* doth symbolize with *Harmony*. And therefore we see in *Garden-knots*, and the *Frets of Houses*, and all equal and well answering *Figures*, (as *Globes*, *Pyramides*, *Cones*, *Cylinders*, *&c.*) how they please; whereas *unequal Figures* are but Deformities. And both these *pleasures*, that of the *Eye*, and that of the *Ear*, are but the effects of *equality*, *good proportion*, or *correspondence*: So that (out of *question*) *Equallity* and *Correspondence* are the *causes* of *Harmony*. But to find the *Proportions* of that *Correspondence*, is more abstruse; whereof, notwithstanding we shall speak somewhat (when we handle *Tones*, in the general enquiry of *Sounds*. 111.

Tones are not so apt altogether to procure *Sleep*, as some other *Sounds*: As the *Wind*, the *Purling of Water*, *Humming of Bees*, a *sweet Voice* of one that readeth, &c. The *cause* whereof is, for that *Tones*, because they are equal and slide not, do more strike and erect the Sense, than the other. And overmuch attention hindereth *sleep*. 112.

There be in *Musick*, certain *Figures* or *Tropes*, almost agreeing with the *Figures* or *Rhetorick*, and with the *Affections* of the *Mind*, and other *Senses*. First, The *Division* and *Quavering* which please so much in *Musick*, have an agreement with the *Glittering* of *Light*; As the *Moon-Beams* playing upon a Wave. Again, the *Falling* from a *Discord* to a *Concord*, which maketh great sweetness in *Musick* hath an agreement with the *Affections*, which are reintegrated to the better, after some dislikes: it agreeth also with the *taste*, which is soon glutted with that which is sweet alone. The *sliding from the Close or Cadence*, hath an agreement with the *Figure* in *Rhetorick*, which they call *Præter Expectatum*; for there is a pleasure, even in *being deceived*. The *Reports* and *Fuges* have an agreement with the *Figures* in *Rhetorick* of Repetition and Traduction. The *Tripla's* and *Changing of Times*, have an agreement with 113.

the

the *changes of Motions*; as when *Galliard time*, and *Measure time*, are in the *Medly* of one *Dance*.

114. It hath been anciently held, and observed, That the *Sense of Hearing*, and the *Kinds of Musick* have most operation upon *Manners*; as to incourage Men and make them warlike; to make them soft and effeminate, to make them grave, to make them light, to make them gentle and inclined to pity, &c. The *cause* is for that the *Sense of Hearing* striketh the *Spirits* more immediately, than the other *Senses*, and more incorporeally than the *Smelling*: For the *Sight*, *Taste*, and *Feeling*, have their Organs, not of so present and immediate access to the *Spirits*, as the Hearing hath. And as for the *Smelling* (which indeed worketh also immediately upon the *Spirits*, and is forcible while the object remaineth) it is with a communication of the Breath or Vapor of the *object odorate*: But *Harmony* entring easily, and mingling not at all, and coming with a manifest motion, doth by custom of often affecting the *Spirits*, and putting them into one kind of posture, alter not a little the nature of the *Spirits*, even when the object is removed. And therefore we see, that *Tunes* and *Airs*, even in their own nature, have in themselves some affinity with the *Affections*: As there be *Merry Tunes*, *Doleful Tunes*, *Solemn Tunes*, *Tunes inclining Mens mindes to Pity*, *Warlike Tunes*, &c. So as it is no marvel, if they alter the *Spirits* considering that *Tunes* have a Perdispolition to the *Motion* of the *Spirits* in themselves. But yet it hath been noted, that though this variety of *Tunes*, doth dispose the *Spirits* to variety of Passions, conform unto them; yet generally, *Musick* feedeth that disposition of the *Spirits* which it findeth. We see also, that several *Airs* and *Tunes*, do please several *Nations* and *Persons*, according to the sympathy they have with their *Spirits*.

Experiments in Consort touching *Sounds*; and first touching the *Nullity*, and *Entity* of *Sounds*.

Perspective hath been with some diligence inquired; and so hath the *Nature of Sounds*, in some sort, as far as concerneth *Musick*, but the *Nature of Sounds* in general, hath been superficially observed. It is one of the subtilleſt pieces of Nature. And besides, I practise, as I do advice: Which is after long inquiry of things, immerse in matter, to enterpose some subject which is immateriate or less materiate; such as this of *Sounds*: To the end, that the *intellect* may be rectified, and become not partial.

115. It is first to be considered, what *great motions* there are in Nature which pass without *sound* or *noise*. The *Heavens* turn about in a most rapide motion, without *noise* to us perceived, though in some *dreams* they have been said to make an excellent *Musick*. So the *Motions* of the *Comets*, and *Fiery Meteors* (as *Stella Cadens*, &c.) yield no *noise*. And if it be thought, that it is the greatness of distance from us, whereby the *sound* cannot be heard; we see that *Lightnings* and *Corruscations*, which are near at hand, yield no *sound* neither; and yet in all these, there is a percussion and divission of the *Air*. The *Winds* in the *Upper Region* (which move the *Clouds* above (which we call the *Rack*) and are not perceived below) pass without *noise* The *lower Winds* in a Plain, except they be strong, make no *noise*; but amongst Trees, the *noise* of such *Winds* will be perceived. And the *Winds* (generally) when they make a *noise*, do ever make it unequally, rising and falling, and sometimes (when they are vehement) trembling at the height of their blast. *Rain* or *Hail* falling, (though vehemently,) yieldeth no *noise*, in passing through the *Air*, till it fall upon the Ground, Water, Houses, or the like. *Water* in a *River* (though a swift stream,) is not heard in the Channel, but

but runneth in silence, if it be of any depth; but the very *Stream* upon *Shallows*, of Gravel, or Pebble, will be heard. And *Waters*, when they beat upon the Shore, or are strained, (as in the falls of Bridges) or are dashed against themselves by *Winds*, give a roaring noise. Any *peice of Timber*, or *hard Body*, being thrust forwards by another Body continuous, without knocking giveth no noise. And so *Bodies* in weighing, one upon another, though the *upper Body* press the *lower* Body down, make no *noise*. So the *motion* in the *Minute parts* of any *solid* Body, (which is the principal cause of *violent Motion*, though unobserved, passeth without *sound*: For that *sound*, that is heard sometimes, is produced onely by the breaking of the *Air*, and not by the impulsion of the parts. So it is manifest, that where the anterior Body giveth way as fast as the posterior cometh on, it maketh no *noise*, be the *motion* never so great or swift,

Air open, and at *large*, maketh no *noise*, except it be sharply percussed; as in the *sound* of a string, where *Air* is purcussed by a hard and stiffe Body, and with a sharp loose: For if the string be not strained, it maketh no *noise*; but where the *Air is pent* and straitned, there breath, or other blowing (which carry but a gentle percussion) suffice to create sound; as in *Pipes* and *Wind-Instruments*. But then you must note, that in *Recorders*, which go with a gentle breath, the *Concave* of the *Pipe*, were it not for the *Fipple* that straitneth the Air (much more then the *simple Concave*) would yield no sound. For, as for other *Wind Instruments*, they require a forcible breath, as *Trumpets*, *Cornets*, *Hunters-Horns*, &c. Which appeareth by the blown Cheeks of him that windeth them. *Organs* also are blown with a strong wind by the Bellows. And note again, that some kind of *Wind-Instruments*, are blown at a small hole in the side, which straitneth the breath at the first entrance; the rather, in respect of their *traverse*, and *stop* above the hole which performeth the *Fipples* part; as it is seen in *Flutes* and *Fifes*, which will not give *sound*, by a blast at the end, as *Recorders* &c. do. Likewise in all *Whistling* you contract the mouth; and to make it more sharp, Men sometimes use their finger.

But in *open Air*, if you throw a Stone or a Dart, they give no *sound*: 116.
No more do *Bullets*, except they happen to be a little hallowed in the casting; which hollowness penneth the *Air*: Nor yet *Arrows*, except they be ruffled in their Feathers, which likewise penneth the *Air*. As for *small Whistles* or *Shepherds Oaten-Pipes*, they give a *sound*, because of their extream slenderness, whereby the *Air* is more pent than in a wider *Pipe*. Again, the *Voices* of *Men* and *Living Creatures*, pass through the Throat, which penneth the breath. As for the *Jews-Harp*, it is a sharp percussion, and besides hath the vantage of penning the *Air* in the Mouth.

Solid Bodies, if they be *very softly percussed*, give no *sound*; as when a Man 117.
treadeth very softly upon *Boards*. So *Chests*, or *Doors*, in fair weather when they open easily, give no *sound*. And *Cart-wheels* squeek not when they are liquored.

The *Flame of Tapers* or *Candles*, though it be a swift motion and breaketh 118.
the *Air*, yet passeth without *sound*. *Air in Ovens*, though (no doubt) it doth (as it were) boil, and dilate it self, and is repercussed, yet it is without *noise*.

Flame percussed by Air, giveth a *noise*; As in blowing of the *Fire* by Bellows, greater than if the Bellows should blow upon the *Air* it self. And so likewise *Flame percussing the Air strongly* (as when Flame suddenly taketh and openeth) giveth a *noise*: So great *Flames*, whiles the one impelleth the other, give a bellowing *sound*.

There

120. There is a conceit runneth abroad, that there should be a *White Powder* which will discharge a piece without *noise*, which is a dangerous experiment, if it should be true: For it may cause secret Murthers but it seemeth to me unpossible; for if the *Air pent*, be driven forth and strike the *Air open*, it will certainly make a *noise*. As for the *White Powder*, (if any such thing be that may extinguish or dead the *noise*) it is like to be a mixture of *Petre* and *Sulphur*, without *Coal*. For *Petre* alone will not take Fire. And if any Man think, that the sound may be extinguished or deaded, by discharging the *pent Air*, before it cometh to the *Mouth* of the *Piece*, and to the *open Air*, that is not probable; for it will make more divided sounds: As if you should make a Cross-barrel hollow, thorow the Barrel of a Piece, it may be it would give several sounds, both at the Nose and the sides. But I conceive, that if it were possible to bring to pass, that there should be no *Air* pent at the Mouth of the Piece, the Bullet might fly with small or no *noise*. For first it is certain, there is no *noise* in the Percussion of the *Flame* upon the *Bullet*. Next the Bullet, in piercing thorow the *Air*, maketh no *noise*, as hath been said; and then, if there be no *pent Air*, that striketh upon *open Air*, there is no cause of *noise*, and yet the flying of the *Bullet* will not be staid. For that *Motion* (as hath been oft said) is in the parts of the Bullet, and not in the *Air*. So as tryal must be made by taking some small *Concave* of *Metal*, no more than you mean to fill with Powder, and laying the Bullet in the Mouth of it half out into the *open Air*.

121. I heard it affirmed by a Man that was a great dealer in Secrets, but he was but vain; That there was a *Conspiracy* (which himself hindred) to have killed Queen *Mary*, Sister to Queen *Elizabeth*, by a *Burning-Glass*, when she walked in St. *James* Park, from the Leads of the House. But thus much, no doubt, is true; That if *Burning-Glasses*, could be brought to a great strength (as they talk generally of *Burning-Glasses*, that are able to burn a *Navy*) the *Percussion* of the *Air* alone, by such a *Burning-Glass* would make no *noise*; no more than is found in *Corruscations* and *Lightnings* without *Thunders*.

122. I suppose that *Impression* of the *Air* with *Sounds*, asketh a time to be conveighed to the *Sense*, as well as the *Impression* of *Species visible*, or else they will not be heard. And therefore, as the Bullet *moveth* so *swift*, that it is *invisible*, so the same *swiftness* of *motion* maketh it *inaudible*; for we see that the apprehension of the Eye, is quicker then that of the *Ear*.

123. All *Eruptions* of *Air*, though small and slight, give an *entity of Sound*, which we call *Crackling*, *Puffing*, *Spitting*, &c. As in *Bay-salt*, and *Bay-leaves*, cast into the Fire; so in *Chesnuts*, when they leap forth of the Ashes, so in *Green Wood* laid upon the fire, especially *Roots*; so in *Candles* that spit flame, if they be wet; so in *Rasping*, *Sneezing*, &c. So in a *Rose leaf* gathered together into the fashion of a Purse, and broken upon the Forehead, or Back of the Hand, as Children use.

124. *Experiments in Consort touching Production, Conservation, and Dilation of Sounds; and the office of the Air thereto.*

THe *cause* given of *Sound*, that it should be an *Elision* of the *Air* (whereby, if they mean any thing, they mean a *Cutting* or *Dividing*, or else an *Attinuating* of the *Air*) is but a term of Ignorance; and the motion is but a catch of the Wit upon a few Instances, as the manner is in the Philosophy received. And it is common with Men, that if they have gotten a pretty expression by a word of *Art*, that expression goeth currant, though it be empty of matter. This conceit of *Elision* appeareth most manifestly

to be falſe, in that the *Sound* of a *Bell* String, or the like, continueth melting ſometimes after the *Percuſſion*; but ceaſeth ſtraight ways, if the *Bell* or *String* be touched and ſtayed; whereas, if it were the *Eliſion* of the *Air*, that made the *Sound*, it could not be that the touch of the *Bell* or *String* ſhould extinguiſh ſo ſuddenly that motion, cauſed by the *Eliſion* of the *Air*. This appeareth yet more manifeſtly, by *Chiming* with a Hammer upon the outſide of a *Bell*; for the *Sound* will be according to the inward Concave of the *Bell*; Whereas the *Eliſion*, or *Attenuation* of the *Air*, cannot be, but onely between the *Hammer*, and the outſide of the *Bell*. So again, if it were an *Eliſion*, a broad *Hammer* and a *Bodkin* ſtruck upon Metal, would give a divers *Tone*, as well as a diverſs *Loudneſs*: But they do not ſo; for though the *Sound* of the one be *louder*, and of the other *ſofter*, yet the *Tone* is the ſame. Beſides, in *Eccho's* (whereof ſome are as loud as the *Original Voice*) there is new *Elyſion*, but a *Repercuſſion* onely. But that, which convinceth it moſt of all, is; That *Sounds* are generated, where there is no *Air* at all. But theſe, and the like conceits, when Men have cleared their Underſtanding, by the light of Experience, will ſcatter and break up like a Miſt.

125. It is certain, that *Sounds* is not produced at the firſt, but with ſome *Local Motion* of the *Air* or *Flame*, or ſome other *Medium*; nor yet without ſome *reſiſtance*, either in the *Air* or the *Body percuſſed*. For if there be a meer ylelding or ceſſion, it produceth no *Sound*, as hath been ſaid. And therein *Sounds* differ from *Light* and Colours which paſs through the *Air*, or other *Bodies* without any *Local Motion* of the *Air* either at the firſt or after. But you muſt attentively diſtinguiſh between the *Local Motion* of the Air (which is but *Vehiculum cauſæ*, *A Carrier of the Sounds*,) and the *Sounds* themſelves conveighed in the *Air*. For as to the former, we ſee manifeſtly that no *Sound* is produced (no not by *Air* it ſelf againſt other *Air*, as in *Organs*, &c.) but with a perceptible *Blaſt* of the *Air* and with ſome *reſiſtance* of the *Air* ſtrucken. For, even all *Speech*, (which is one of the gentleſt *Motions* of *Air*,) is with *expulſion* of a little *Breath*. And all *Pipes* have a *Blaſt* as well as a *Sound*. We ſee alſo manifeſtly, that *Sounds* are carried with *Wind*: And therefore *Sounds* will be heard further with the *Wind*, than againſt the *Wind*; and likewiſe, do riſe and fall with the intenſion or remiſſion of the *Wind*: But for the *Impreſſion* of the *Sound*, it is quite another thing, and is utterly without any *Local Motion* of the *Air* perceptible; and in that reſembleth the *ſpecies viſible*: For after a *Man* hath lured, or a *Bell* is rung, we cannot diſcern any *Perceptible Motion* (at all) in the *Air* as long as the *Sound* goeth, but onely at the firſt. Neither doth the *Wind*, (as far as it carrieth a *Voice*) with the *Motion* thereof, confound any of the delicate, and Articulate Figurations of the *Air*, in variety of Words. And if a *Man* ſpeak a good loudneſs againſt the *Flame* of *Candle*, it will not make it tremble much; though moſt, when thoſe *Letters* are pronounced which contract the mouth, as F, S, V, and ſome others. But *Gentle breathing*, or *blowing* without *Speaking* will move the *Candle* far more. And it is the more probable, that *Sound* is without any *Local Motion* of the *Air*, becauſe as it differeth from the *ſight* in that it needeth a *Local Motion* of the *Air* at firſt: So it paralleleth in ſo many other things with the ſight, and *Radiation of things viſible*, which (without all queſtion) induce no *Local Motion* in the *Air*, as hath been ſaid.

126. Nevertheleſs it is true, that upon the *Noiſe* of *Thunder*, and great *Ordnance*, Glaſs Windows will ſhake, and Fiſhes are thought to be frayed with the

the Motion, caused by *Noise* upon the Water. But these effects are from the local motion of the *Air*, which is a concomitant of the *Sound* (as hath been said) and not from the *Sound*.

127. It hath been anciently reported, and is still received, that *extream applauses*, and *shouting of people*, assembled in great multitudes, have so rarified, and broken the Air, that *Birds* flying over, have faln down, the Air being not able to support them. And it is believed by some, that *Great Ringing of Bells* in populous Cities, hath chased away *Thunder*; and also dissipated pestilent Air: All which may be also from the concussion of the Air, and not from the *Sound*.

128. A very great *Sound* near hand hath strucken many *deaf*; and at the instant they have found, as it were, the breaking of a Skin or Parchment in their *Ear*: And my self, standing near one that *Lured* loud and shrill, had suddenly an offence, as if some what had broken, or been dislocated in my *Ear*, and immediately after a *loud Ringing*; (not an ordinary Singing, or Hissing, but far louder, and differing;) so as I feared some *Deafness*. But after some half quarter of an hour, it vanished. This effect may be truly referred unto the *Sound*; for (as is commonly received) an *over Potent Object* doth destroy the *Sense*, and *Spiritual Species* (both *Visible* and *Audible*,) will work upon the sensories, though they move not any other Body.

129. In *Delation of Sounds*, the *Enclosure* of them preserveth them, and causeth them to be heard further. And we find in Rowls of Parchment or Truncks, the Mouth being laid to the one end of the Rowl of Parchment, or Trunck, and the *Ear* to the other, the *Sound* is heard much further then in the *Open Air*. The *cause* is, for that the *Sound* spendeth and is dissipated in the *Open Air*; but in such Concaves, it is conserved and contracted, So also in a Piece of Ordnance, if you speak in the Touch-hole, and another lay his *Ear* to the Mouth of the Piece, the *Sound* passeth, and is far better heard than in the *Open Air*.

130. It is further to be considered, how it proveth and worketh when the *Sound* is not *Enclosed*, all the length of his way, but passeth partly through open Air; as where you *speak* some distance from a *Trunck*, or where the *Ear* is some distance from the *Trunck*, at the other end: or where both *Mouth* and *Ear* are distant from the *Trunck*. And it is tryed that in a long *Trunck* of some Eight or ten foot, the *sound* is holpen, though both the *Mouth*, and the *Ear* be a handful or more from the ends of the *Trunck*; and somewhat more holpen, when the *Ear* of the *Hearer* is near, than when the *Mouth* of the *Speaker*. And it is certain, that the *Voice* is better heard in a *Chamber* from abroad, than *abroad* from within the *Chamber*.

131. As the *Enclosure* that is *round about and entire* preserveth the *Sound*; so doth a *Semiconcave*, though in a less degree. And therefore, if you divid a *Trunck* or a *Cane* into two, and one speak at the one end, and you lay your Ear at the other, it will carry the *Voice* further, than in the *Air* at large. Nay further if it be not a full *Semi-concave*; but if you do the like upon the *Mast* of a *Ship*, or a *long Pole*, or a *Piece of Ordnance* (though one speak upon Surface of the *Ordnance*, and not at any of the Bores) the *Voice* will be heard further then in the Air at large.

132. It would be tryed, how, and with what proportion of disadvantage the *Voice* will be carried in an *Horn*, which is a *Line* Arched; or in a *Trumpet*, which is a Line Retorted: or in some *Pipe* that were Sinuous.

It

It is certain, (howsoever it cross the received opinion) that *Sounds* may be created without *Air*, though *Air* be the most favourable different of *Sounds*. Take a *Vessel* of *Water*, and knap a pair of Tongs some depth within the Water, and you shall hear the *Sound* of the Tongs well, and not much diminished, and yet there is no *Air* at all present. 133.

Take one *Vessel* of *Silver*, and another of *Wood*, and fill each of them full of water, and then knap the Tonges together as before, about an handful from the bottom, and you shall find the *Sound* much more resounding from the *Vessel* of *Silver*, than from that of *Wood*; and yet if there be no Water in the *Vessel*, so that you knap the Tongs in the *Air*, you shall finde no difference between the *Silver*, and *Wooden Vessel*, whereby beside the main point of creating *sound* without *Air*, you may collect two things; the one, that the *sound* communicateth with the bottom of the *Vessel*; the other, that such a communication passeth far better thorow *Water* than *Air*. 134.

Strike any *hard Bodies* together in the midst of a *flame*, and you shall hear the sound with little difference, from the *sound* in the *Air*. 135.

The *Pneumatical Part*, which is in all *Tangible Bodies*, and hath some affinity with the *Air*, performed in some degree, the parts of the *Air*; as when you knock, upon an *empty Barrel*, the *sound* is (in part) created by the Air on the outside, and (in part) by the *Air* in the inside; for the *sound* will be greater or lesser, as the Barrel is more empty, or more full; but yet the *sound* participateth also with the *Spirit* in the *Wood*, thorow which it passeth from the outside to the inside; and so it cometh to pass in the *chiming* of *Bells* on the outside, where also the *sound* passeth to the inside; and a number of other like instances, whereof we shall speak more when we handle the *Communication* of *Sounds*. 136.

It were extream grosness to think (as we have partly touched before) that the *sound* in *Strings* is made, or produced between the Hand and the *String*, or the *Quill* and the *String*, or the *Bow* and the *String*: For those are but, *Vehicula motus*, *passages* to the *Creation* of the *sound*, the *sound* being produced between the *String* and the *Air*; and that not by any *impulsion* of the *Air*, from the first *Motion* of the *String*; but by the *return* or *result* of the *String*, which was strained by the touch to his former place; which *Motion* of *Result* is quick and sharp, whereas the first *Motion* is soft and dull. So the *Bow* tortureth the *String* continually, and thereby holdeth it in a continual *Trepidation*. 137.

TAke a *Trunk*, and let one whistle at the one end, and hold you rear at the other, and you shall find the *sound* strike so sharp, as you can scarce endure it. The *cause* is, for that *sound* diffuseth it self in round, and so spendeth it self: But if the *sound* which would scatter in *open Air* be made to go all into a Canale, it must needs give greater force to the *sound*. And so you may note, that *inclosures* do not onely preserve *sound*, but also encrease and sharpen it, 138. Experiments in Consort, touching the *Magnitude* and *Ellity*, and *Damps* of *Sounds*.

A *Hunters Horn*, being greater at one end, than at the other, doth encrease the *sound* more, than if the *Horn* were all of an equal bore. The *cause is*, for that the *Air* and *sound*, being first contracted at the lesser end, and afterwards having more room to spred at the greater end, do dilate themselves, and in coming out, strike more *Air*, whereby the *sound* is the greater, and baser. And even *Hunters Horns*, which are sometimes 139.

made ſtraight, and not oblick, are ever greater at the lower end. It would be tryed alſo in *Pipes*, being made *far larger* at the lower end, or being made with a *Belly* towards the lower end, and then iſſuing into a ſtraight concave again.

140. There is in *St. Jameſes Fields*, a *Conduit* of *Brick*, unto which joyneth a *low Vault*; and at the end of that, a *round Houſe* of Stone; and in the *Brick Conduit* there is a Window, and in the *round Houſe* a Slit or Riſt of ſome little breadth; if you cry out in the Rift, it will make a fearful roaring at the Window. The *Cauſe* is the ſame with the former: For that all *Concaves* that proceed from more narrow to more broad, do amplifie the *Sound* at the coming out.

141. *Hawks Bells* that have holes in the ſides, give a greater ring, than if the Pellet did ſtrike upon Braſs in the *open Air*. The cauſe is the ſame with the firſt *inſtance* of the *Trunk*: Namely, for that the *Sound*, encloſed with the ſides of the *Bell*, cometh forth at the *holes* unſpent and more ſtrong.

142. In *Drums*, the cloſeneſs round about, that preſerveth the *Sound* from diſperſing, maketh the *Noiſe* come forth at the *Drum-hole*, *far* more loud and ſtrong, than if you ſhould ſtrike upon the like *Skin*, extended in the open Air. The *Cauſe* is the ſame with the two precedent.

143. *Sounds* are better heard, and further off, in an *Evening*, or in the *Night*, than at the *Noon*, or in the *Day*. The *cauſe* is, for that in the *Day*, when the *Air* is more thin (no doubt) the *Sound* pierceth better; but when the *Air* is more thick (as in the *Night*) the *Sound* ſpendeth and ſpreadeth abroad leſs; and ſo it is a degree of *Encloſure*. As for the night, it is true alſo, that the general ſilence helpeth.

144. There be two kindes of *Reflections* of *Sounds*; the one at *Diſtance*, which is the *Eccho*, wherein the *original* is heard diſtinctly, and the *Reflexion* alſo diſtinctly; of which, we ſhall ſpeak hereafter. The other in *Concurrence*; when the *Sound* reflecting (the *Reflexion* being near at hand) returneth immediately upon the *original*, and ſo iterateth it not, but amplifieth it. Therefore we ſee, that *Muſick* upon the *Water* ſoundeth more; and ſo likewiſe, *Muſick* is better in Chambers Wainſcotted than Hanged.

145. The *Strings* of a Lute, or Viol, or Virginals, do give a far greater *Sound*, by reaſon of the *Knot*, and *Board*, and *Concave* underneath, than if there were nothing but onely the *Flat* of a *Board*, without that *Hollow* and *Knot*, to let in the upper Air into the lower. The *cauſe* is, the communication of the upper Air with the lower, and penning of both from expence or diſperſing.

146. An *Iriſh Harp* hath open Air on both ſides of the *Strings*; and it hath the *Concave* or *Belly*, not a long the *Strings*, but at the end of the *Strings*. It maketh a more reſounding *Sound*, than a *Bandora*, *Orpharion*, or *Cittern*, which have likewiſe *Wire-ſtrings*. I judge the *Cauſe* to be, for that open Air on both ſides helpeth, ſo that there be a *Concave*; which is therefore beſt placed at the end.

147. In a *Virginal*, when the *Lid* is down it maketh a more exile *Sound* than when the *Lid* is open. The *cauſe* is, for that all *ſhutting* in of *Air*, where there is no competent Vent, dampeth the *Sound*; which maintaineth likewiſe the former *Inſtance*; For the *Belly* of the *Lute*, or *Viol*, doth pen the *Air* ſomewhat.

There

There is a *Church* at *Gloceſter*, (and as I have heard, the like is in ſome other places) where if you ſpeak againſt the Wall ſoftly, another ſhall hear your *Voice* better a good way off, than near hand. Inquire more particularly of the frame of that place. I ſuppoſe there is ſome Vault, or Hollow, or Iſle, behind the Wall, and ſome paſſage to it, towards the further end of that Wall againſt which you ſpeak: So as the *Voice* of him that ſpeaketh ſlideth along the Wall, and then entreth at ſome paſſage, and communicateth with the *Air* of the Hollow; for it is preſerved ſomewhat by the plain Wall; but that is too weak to give a *Sound* audible, till it hath communicated with the back *Air*. 148.

Strike upon a *Bow-ſtring* and lay the *Horn* of the *Bow* near your Ear, and it will increaſe the *Sound*, and make a degree of a *Tone*. The *cauſe* is for that the ſenſory, by reaſon of the cloſe holding, is percuſſed, before the Air diſperſeth. The like is, if you hold the *Horn* betwixt your Teeth. But that is a plain *Dilation* of the *Sound*, from the Teeth to the Inſtrument of hearing; for there is a great intercourſe between thoſe two parts, as appeareth by this, that a harſh *grating Tune* ſetteth the Teeth one edge. The like falleth out, if the *Horn* of the *Bow* be put upon the Temples; but that is but the ſlide of the *Sound* from thence to the ear. 149.

If you take a *Rod* of *Iron* or *Braſs*, and hold the one end to your ear and ſtrike upon the other, it maketh a far greater *Sound*, than the like ſtroke upon the *Rod*, not ſo made contiguous to the Ear. By which, and by ſome other *inſtances* that have been partly touched, it ſhould appear; that *Sounds* do not onely ſlide, upon the ſurface of a ſmooth Body, but do alſo communicate with the Spirits that are in the Pores of the Body. 150.

I remember in *Trinity-Colledge* in *Cambridge*, there was an *upper Chamber*, which being thought weak in the Roof of it, was ſupported by a Pillar of Iron, of the bigneſs of ones arm, in the midſt of the *Chamber*, which, if you had ſtruck, it would make a little flat noiſe in the *Room* where it was ſtruck; but it would make a great bomb in the *Chamber* beneath. 151.

The *ſound* which is made by *Buckets* in a *Well*. when they totich upon the *Water*, or when they ſtrike upon the ſide of the *Well*, or when two Buckets daſh the one againſt the other. Theſe *Sounds* are deeper and fuller than if the like Percuſſion were made in the *open Air*. The cauſe is the pennin g and encloſure of the Air in the concave of the *Well*. 152.

Barrels placed in a Room under the Floor of a *Chamber*, make all *noiſes* in the ſame Chamber more full and reſounding. 153.

So that there be five ways (in general) of Majoration of Sounds, Encloſure Simple, Encloſure with the Dilatation, Communication, Reflexion, Concurrent, *and* Approach to the Senſory.

For *Exility* of the *Voice*, or other *Sounds*: It is certain, that the *Voice* doth paſs thorow *ſolid* and *hard Bodies*, if they be not too thick; and thorow *Water*, which is likewiſe a very cloſe Body, and ſuch an one as letteth not in Air. But then the *Voice* or other *Sound* is reduced, by ſuch paſſage to a great *weakneſs* or *Exility*. If therefore you ſtop the *Holes* of a *Hawks Bell*, it will make no ring but a flat noiſe or rattle. And ſo doth the *Aëtities* or *Eagles Stone*, which hath a little ſtone within it. 154.

And as for *Water*, it is a certain Tryal: Let a man go into a *Bath*, and take a *Pail* and turn the bottom upward, and carry the mouth of it (even) down to the level of the *Water*, and ſo preſs it down under the *Water* ſome handful and an half, ſtill keeping it even, that it may not tilt on either ſide, and ſo the Air get out: Then let him that is in the *Bath*, dive with 155.

with his head ſo far under *Water* as he may put his head into the *Pail*, and there will come as much *Air* bubbling forth, as will make room for his head. Then let him ſpeak, and any that ſhall ſtand without, ſhall hear his *voice* plainly, but yet made extream ſharp and exile, like the *voice* of *Puppets*: But yet the *Articulate ſounds* of the *Words* will not be confounded. Note, that it may be much more handſomly done, if the *Pail* be but over the Mans head above Water, and then he cowre down, and the *Pail* be preſſed down with him. Note, that a man muſt kneel or ſit, that he may be lower than the Water. A man would think that the *Sicilian Poet* had knowledge of this *Experiment*; for he ſaith, that *Hercules's Page Hylas* went with a Water-pot, to fill it at a pleaſant *Fountain* that was near the ſhore, and that the *Nymphs* of the *Fountain* fell in love with the Boy, and pulled him under the *Water*, keeping him alive; and that *Hercules* miſſing his *Page*, called him by his name aloud, that all the ſhore rang of it; and that *Hylas* from within the Water anſwered his Maſter; but (that which is to the preſent purpoſe) with ſo ſmall and exile a *voice*, as *Hercules* thought he had been three miles off, when the *Fountain* (indeed) was faſt by.

156. In *Lutes* and *Inſtruments* of *Strings*, if you ſtop a *String* high, (whereby it hath leſs ſcope to tremble.) the *ſound* is more *Trebble*, but yet more dead.

157. Take two *Sawcers*, and ſtrike the edge of the one gainſt the bottom of the other, within a *Pail* of *Water*, and you ſhall find that as you put the *Sawcers* lower and lower, the *ſound* groweth more flat, even while part of the *Sawcer* is above the Water; but that flatneſs of *ſound* is joyned with a harſhneſs of *ſound*, which, no doubt, is cauſed by the inequality of the *ſound*, which cometh from the part of the *Sawcer* under the *Water*, and from the part above. But when the *Sawcer* is wholly under the *Water*, the *ſound* becometh more clear, but far more low, and as if the *ſound* came from a far off.

158. A *ſoft Bodies* dampeth the *ſound*, much more than a *hard*; as if a Bell hath cloth or ſilk wrapped about it, it deadeth the *ſound* more than if it were Wood. And therefore in *Clericals*, the Keyes are lined, and in Colledges they uſe to line the Table-men.

159. Tryal was made in a *Recorder* after theſe ſeveral manners. The bottom of it was ſet againſt the Palm of the Hand, ſtopped with Wax round about, ſet againſt a Damask Cuſhion, thruſt into Sand, into Aſhes, into Water, (half an inch under the Water) cloſe to the bottom of a Silver Baſin, and ſtill the *Tone* remained: but the bottom of it was ſet againſt a Woollen Carpet, a Lining of Pluſh, a Lock of Wool, (though looſly put in;) againſt Snow, and the ſound of it was quite deaded, and but breath.

160. *Iron* hot produceth not ſo full a *ſound*, as when it is cold; for while it is hot, it appeareth to be more ſoft, and leſs reſounding. So likewiſe *warm Water*, when it faileth maketh not ſo full a *ſound* as *cold*; and I conceive it is ſofter, and nearer the nature of Oyl; for it is more ſlippery, as may be perceived, in that it ſcowreth better.

161. Let there be a *Recorder* made with two Fipples, at each end one; the *Trunk* of it of the length of two *Recorders*, and the holes anſwerable towards each end, and let to play the ſame Leſſon upon it, at an Uniſon; and let it be noted, whether the *ſound* be confounded, or amplified, or dulled. So likewiſe let a *Croſs* be made of two *Trunks* (thorowout) hollow

hollow; and let two ſpeak or ſing, the one long ways: he other traverſe. And let two hear at the oppoſite ends; and note, whether the *Sound* be confounded, amplified, or dulled. Which two *inſtances* will alſo give light to the *mixture* of *Sounds*, whereof we ſhall ſpeak hereafter.

192. A *Bellows*, blown in at the *hole* of a *Drum*, and the *Drum* then ſtrucken, maketh the *Sound* a little flatter, but no other apparent alteration. The cauſe is manifeſt; partly for that it hindreth the iſſue of the *Sound*, and partly for that it maketh the Air, being blown together, leſs moveable.

163. Experiments in Conſort touching the *Loudneſs or Softneſs of Sounds, and their Carriage at longer or ſhorter diſtance.*

THe *Loudneſs* and *Softneſs* of *Sounds*, is a thing diſtinct from the *Magnitude* and *Exility* of *Sounds*; for a *Baſe-ſtring*, though ſoftly ſtrucken, giveth the greater *Sound*; but a *Trebble ſtring*, if hard ſtrucken, will be heard much further off. And the *cauſe* is, for that the *Baſe-ſtring* ſtriketh more Air, and the *Trebble* leſs Air, but with a ſharper percuſſion.

164. It is therefore the *ſtrength* of the *Percuſſion*, that is a principal *cauſe* of the *loudneſs* or *ſoftneſs* of *Sounds*: As in knocking, harder or ſofter: Winding of a Horn, ſtronger or weaker; Ringing of an Hand bell, harder or ſofter, &c. And the *ſtrength* of this *Percuſſion* conſiſteth, as much or more, in the *hardneſs* of the *Body percuſſed*, as in the *force* of the *Body percuſſing*: For if you ſtrike againſt a Cloth, it will give a leſs ſound; if againſt Wood, greater; if againſt a Metal, yet a greater; and in Metals, if you ſtrike againſt Gold, (which is the more pliant) it giveth the flatter *ſound*; if againſt Silver or braſs, the more ringing *ſound*. As for *Air*, where it is ſtrongly pent, it matcheth a *hard Body*. And therefore we ſee in diſcharging of a *piece*, what a great noiſe it maketh. We ſee alſo, that the Charge with Bullet, or with Paper wet, and hard ſtopped; or with Powder alone rammed in hard, maketh no great difference in the *loudneſs* of the report.

165. The *ſharpneſs* or *quickneſs* of the *Percuſſion*, is a great *cauſe* of the *loudneſs*, as well as the *ſtrength*: As in a Whip or Wand, if you ſtrike the Air with it, the ſharper and quicker you ſtrike it, the *louder ſound* it giveth. And in playing upon the *Lute* or *Virginals*, the quick ſtroke or touch is a great life to the *Sound*. The *cauſe* is, for that the quick ſtriking cutteth the Air ſpeedily, whereas the ſoft ſtriking, doth rather beat than cut.

Experiments in Conſort touching the *Communication of Sounds.*

THe *Communication* of *Sounds* (as in Bellies of *Lutes*, empty Veſſel, &c.) hath been touched obiter, in the *Majoration* of *Sounds*: But it is fit alſo to make a *Title* of it apart.

166. The *Experiment*, for greateſt Demonſtration of *Communication* of *Sounds*, is the *Chiming* of *Bells*; where, if you ſtrike with a Hammer upon the upper part, and then upon the midſt, and then upon the lower, you ſhall find the *ſound* to be more Trebble, and more Baſe, according unto the concave on the inſide, though the Percuſſion be onely on the outſide.

167. When the *Sound* is created between the *Blaſt* of the *Mouth*, and the *Air* of the *Pipe*, it hath nevertheleſs ſome *communication* with the matter of the ſides of the *Pipe*, and the *ſpirits* in them contained: For in a Pipe or Trumpet of Wood and Braſs, the *ſound* will be diverſe; ſo if the *Pipe* be covered with

with *Cloth* or *Silk*, it will give a diverſe *Sound* from that it would do of it ſelf; ſo if the *Pipe* be a *little wet* on the *inſide*, it will make a differing *Sound*, from the ſame *Pipe dry*.

168. That *Sound* made within *Water*, doth communicate better with a hard Body thorow *Water*, than made in *Air*, it doth with *Air*. *Vide Experimentum*, 134.

Experiments in Conſort touching the *Equality and Inequality of Sounds*.

WE have ſpoken before (in the *Inquiſition* touching *Muſick*) of *Muſical Sounds*, whereunto there may be a Concord or Diſcord in two Parts; which *Sounds* we call *Tones*, and likewiſe of *Immuſical Sounds*; and have given the *cauſe*, that the *Tone* proceedeth of *Equality*, and the other of *Inequality*. And we have alſo expreſſed there, what are the *Equal Bodies* that give *Tones*, and what are the *Unequal* that give none. But now we ſhall ſpeak of ſuch *Inequality* of *Sounds*, as proceedeth not from the Nature of the Bodies themſelves, but accidental, Either from the *Roughneſs* or *Obliquity* of the *Paſſage*, or from the *Doubling* of the *Percutient*; or from the *Trepidation* of the *Motion*.

169. A *Bell*, if it have a *Riſt* in it, whereby the *ſound* hath not a clear paſſage, giveth a *horſe* and *jarring ſound*; ſo the Voice of *Man*, when by cold taken, the Weſil groweth rugged, and (as we call it) furred, becometh hoarſe. And in theſe two *inſtances*, the *Sounds* are ingrate, becauſe they are meerly *unequal*; but if they be *unequal* in *equality*, then the *Sound* is Grateful, but Purling.

170. All *Inſtruments* that have either *Returns*, as *Trumpets*; or *Flexions*, as Cornets; or are *drawn up*, and *put from*, as Sackbuts have a *Purling Sound*; But the *Recorder* or *Flute* that have none of theſe *Inequalities*, give a clear *Sound*. Nevertheleſs, the *Recorder* it ſelf or *Pipe*, moiſtened a little in the inſide, ſoundeth more ſolemnly, and with a little Purling or Hiſſling. Again, a *Wreathed String*, ſuch as are in the Baſe Strings of *Bandoraes*, giveth alſo a *Purling Sound*.

171. But a *Lute-ſtring*, if it be meerly *unequal* in his parts, giveth a harſh and untuneable *Sound*, which *ſtrings* we call *falſe*, being bigger in one place than in another; and therefore *Wire-ſtrings* are never *falſe*. We ſee alſo, that when we try a *falſe Lute-ſtring*, we uſe to extend it hard between the Fingers, and to fillip it; and if it giveth a double *ſpecies* it is *true*; but if it giveth a trebble or more, it is *falſe*.

172. *Waters*, in the *noiſe* they make, as they run, repreſent to the Ear a *trembling noiſe*; and in *Regals* (where they have a *Pipe*, they call the *Nightingale-Pipe*, which containeth *Water*) the *Sound* hath a continual trembling. And Children have alſo little things they call *Cocks*, which have *water* in them; and when they blow, or whiſtle in them, they yield a *trembling noiſe*; which *Trembling* of *Water*, hath an affinity with the Letter L. All which *Inequalities* of *Trepidation*, are rather pleaſant, than otherwiſe.

173. All *Baſe Notes*, or very *Treble Notes*, give an Aſper *Sound*; for that the *Baſe* ſtriketh more Air, than it can well ſtrike equally; and the *Treble* cutteth the Air ſo ſharp, as it returneth too ſwift, to make the *Sound* equal, and therefore a *Mean* or *Tenor* is the ſweeteſt part.

174. We know nothing, that can at pleaſure make a *Muſical* or *Immuſical Sound* by Voluntary *Motion*, but the *Voice* of *Man* and *Birds*. The *cauſe* is no doubt) in the Weſil or Wind-Pipe, (which we call *Aſpera Arteria*,)

which being well extended, gathered *equality*; as a Bladder that is wrinkled, if it be extended, becometh smooth. The extension is always more in *Tones*, than in *Speech*; therefore the *inward voice* or *whisper*, can never give a *Tone*. And in *singing*, there is (manifestly) a greater working and labor of the Throat, than in *speaking*; as appeareth in the thrusting out, or drawing in of the Chin, when we sing.

175. The *Humming* of *Bees* is an *unequal buzzing*, and is conceived by some of the Ancients, not to come forth at their Mouth, but to be an *inward Sound*; but (it may be) it is neither, but from the motion of their Wings; for it is not heard, but when they stir.

176. All *Metals quenched* in *Water*, give a sibilation or hissing sound (which hath an affinity with the Letter *Z*,) notwithstanding the *Sound* be created between the *Water* or *Vapor*, and the *Air*. *Seething* also, if there be but small store of Water in a Vessel, giveth a hissing *sound*; but *boyling* in a full Vessel, giveth a bubbling *sound*, drawing somewhat near to the *Cocks* used by Children.

177. Tryal would be made, whether the *Inequality*, or interchange of the *Medium*, will not produce an *Inequality* of *Sound*; as if three *Bells* were made one within another, and Air betwixt each; and then the uttermost *Bell* were chimed with a Hammer, how the *Sound* would differ from a simple *Bell*. So likewise take a *Plate* of *Brass*, and a *Plank* of *Wood*, and joyn them close together; and knock upon one of them, and see if they do not give an *unequal Sound*. So make two or three *Partitions* of *Wood* in a *Hogshead*, with *Holes* or *Knots* in them; and mark the difference of their *Sound*, from the *Sound* of an *Hogshead*, without such *Partitions*.

178. Experiments in Consort touching the *more Treble*, and the more *Base Tones* or *Musical Sounds*.

IT is evident, that the *Percussion* of the *Greater Quantity of Air*, causeth the *Baser Sound*; and the less *Quantity*, the more *Treble Sound*. The *Percussion* of the *Greater Qantity of Air*, is produced by the *Greatnesse of the Body Percussing*; by the *Latitude* of the *Concave*, by which the *Sound* passeth, and by the *Longitude* of the same *Concave*. Therefore we see, that a *Base string*, is greater than a *Treble*; A *Base-pipe* hath a greater bore than a *Treble*: And in *Pipes*, and the like, the lower the Note holes be, and the further off from the Mouth of the *Pipe*, the more *Base Sound* they yield; and the nearer the Mouth, the more *Treble*. Nay more, if you strike an *Entire Body*, as an *Andiron* of *Brass*, at the stop it maketh a more *Treble Sound*, and at the bottom a *Baser*.

179. It is also evident, that the *Sharper* or *Quicker Percussion of Air*, causeth the more *Treble Sound*; and the *Slower* or *Heavier*, the more *Base Sound*. So wee see in *Strings*, the more they are wound up and strained (and thereby give a more quick start back) the more *Treble* is the *Sound*; and the slacker they are, or less wound up, the *Baser* is the *Sound*. And therefore a bigger *string* more strained, and a lesser *String*, lest strained, may fall into the same *Tone*.

180. *Children*, *Women*, *Eunuchs*, have more small and shril *Voices* than *Men*. The reason is, not for that *Men* have greater heat, which may make the *Voice* stronger, (for the strength of a *Voice* or *Sound*, doth make a difference in the *Loudness* or *Softness*, but not in the *Tone*;) but from the dilatation of the Organ, which (it is true) is likewise caused by heat; but the cause of *Changing* the *Voice* at the years of puberty, is most obscure. It seemeth to be for that, when much of the moisture of the Body, which did before irrigate the

the Parts, is drawn down to the Spermatical Veſſels, it leaveth the Body more hot than it was; whence cometh the dilatation of the Pipes: For we ſee plainly all effects of Heat do then come on; as Piloſity, more roughneſs of the skin, hardneſs of the fleſh, &c.

181. The induſtry of the *Muſitian*, hath produced two other means of *Straining*, or *Intenſion* of *Strings*, beſides their *Winding up*. The one is the *Stopping* of the *String* with the *Finger*; as in the Necks of Lutes, Viols, &c. The other is the *Shortneſs* of the *String*; as in Harps, Virginals, &c. Both theſe have one and the ſame reaſon, for they cauſe the *String* to give a quicker ſtart.

182. In the *ſtraining* of a *String*, the further it is ſtrained, the leſs *ſuperſtraining* goeth to a *Note*: For it requireth good winding of a String, before it will make any Note at all. And in the ſtops of Lutes, &c. the higher they go, the leſs diſtance is between the Frets.

183. If you fill a *Drinking Glaſs* with *Water*, (eſpecially one ſharp below, and wide above) and fillip upon the Brim, or outſide; and after, empty part of the Water, and ſo more and more, and ſtill try the *Tone* by fillipping; you ſhall find the *Tone* fall, and be more *Baſe*, as the *Glaſs* is more empty.

Experiments in Conſort touching the *Proportion* of *Treeble* and *Baſe Tones*.

THe juſt and meaſured *Proportion* of the *Air percuſſed*, towards the *Baſeneſs* or *Trebleneſs* of *Tones*, is one of the greateſt ſecrets in the Contemplation of *Sounds*. For it diſcovereth the true *Coincidence* of *Tones* into *Diapaſons*, which is the return of the ſame *Sound*. And ſo of the *Concords* and *Diſcords*, between the *Uniſon* and *Diapaſon*; which we have touched before in the *Experiments of Muſick*, but think fit to reſume it here as a principal part of our Inquiry, touching the *Nature of Sounds*. It may be found out in the *Proportion* of the *Winding* of *Strings*, in the *Proportion* of the *Diſtance* of *Frets*, and in the *Proportion* of the *Concave* of *Pipes*, &c. But moſt commodiouſly in the laſt of theſe.

184. Try therefore the *Winding* of a *String* once about, as ſoon as it is brought to that extenſion as will give a *Tone*, and then of twice about, and thrice about, &c. And mark the ſcale or difference of the Rice of the *Tone*, whereby you ſhall diſcover in one, two effects; both the *Proportion* of the *Sound* towards the *Dimenſion* of the *Winding*, and the *Proportion* likewiſe of the *Sound* towards the *String*, as it is more or leſs ſtrained. But note that to meaſure this, the way will be to take the length in a right line of the String, upon any Winding about of the Peg.

185. As for the Stops, you are to take the number of Frets, and principally the length of the Line, from the firſt ſtop of the String, unto ſuch a ſtop as ſhall produce a *Diapaſon* to the former ſtop, upon the ſame String.

186. But it will beſt (as it is ſaid) appear in the *Bores of Wind-Inſtruments*; and therefore cauſe ſome half dozen Pipes to be made in length, and all things elſe a like, with a ſingle, double, and ſo one to a ſextuple Bore; and ſo mark what fall of Tone every one giveth. But ſtill in theſe three laſt inſtances you muſt diligently obſerve, what length of String, or diſtance of Stop, or concave of Air, maketh what riſe of Sound. As in the laſt of theſe (which, as we ſaid, is that which giveth the apteſt demonſtration) you muſt ſet down what increaſe of Concave goeth to the making of a Note higher, and what of two Notes, and what of three Notes, and ſo up to the *Diapaſon*: For then the great ſecret of *Numbers* and *Proportions* will appear. It is not unlike

unlikely, that those that make *Recorders*, &c. know this already; for that they make them in Sets. And likewise *Bell-founders* in fitting the tune of their Bells: So that enquiry may save tryal. Surely, it hath been observed by one of the *Antients*, that an *empty Barrel* knocked upon with the finger, giveth a *Diapason* to the *Sound* of the like, *Barrel full*: But how that should be, I do not well understand, for that the knocking of a *Barrel full* or *empty*, doth scarce give any *Tone*.

187. There is required some sensible difference in the *Proportion* of creating a *Note* towards the *Sound* it self, which is the Passive; and that it be not too near but at a distance: For in a *Recorder*, the three uppermost holes yield one *Tone*, which is a *Note* lower than the *Tone* of the first three. And the like (no doubt) is required in the winding or stopping of *Strings*.

Experiments in Consort touching *Exterior and Interior Sounds*.

THere is another difference of *Sounds*, which we call *Exterior* and *Interior*. It is not *Soft* nor *Loud*; nor it is not *Base*, nor *Trebble*; nor it is not *Musical*, nor *Immusical*. Though it be true, that there can be no *Tone* in an *Interior sound*; but on the other side, in an *Exterior sound*, there may be both *Musical* and *Immusical*. We shall therefore enumerate them, rather than precisely distinguish them; though to make some adumbration of (that we mean) the *Interior*, is rather an *Impulsion* or *Contusion* of the *Air*, than an *Elysion* or *Section* of the same; so as the *Percussion* of the one towards the other, differeth as a Blow differeth from a Cut.

188. In *Speech* of *Man*, the *Whispering*, (which they call *Susurrus* in *Latine*,) whether it be *louder* or *softer*, is an *Interior Sound*; but the *Speaking out*, is an *Exterior sound*: And therefore you can never make a *Tone*, nor sing in *Whispering*; But in *speach* you may. So *Breathing*, or *Blowing* by the *Mouth*, *Bellowes*, or *Wind*, (though loud) is an *Interior sound*; but the blowing thorow a *Pipe*, or *Concave* (though soft) is an *Exterior*. So likewise, the greatest *Winds*, if they have no coarctation, or blow not hollow, give any *Interior sound*; The whistling or hollow *Wind*, yieldeth a singing, or *Exterior sound*; the former being pent by some other Body, the latter being pent in by his own Density: And therefore we see, That when the wind bloweth hollow, it is a sign of Rain; the flame, as it moveth within it self, or is blown by a Bellows giveth a murmur or *Interior sound*.

189. There is no *hard Body*, but struck against another *hard Body*, will yield a n *Exterior sound*, greater or lesser insomuch, as if the *Percussion* be over-soft, it may induce a nullity of *sound*, but never an *Interior sound*; as when one treadeth so softly, that he is not heard.

190. Where the *Air* is the *Percutient* pent or not pent, against a *hard Body*, it never giveth an *Exterior sound*; as if you blow strongly with a Bellows against a Wall.

191. *Sounds* (both *Exterior* and *Interior*) may be made as well by *Suction* as by *Emission* of the *Breath*; as in *Whistling*, or *Breathing*.

192. Experiments in Consort touching *Articulation of Sounds*.

IT is evident, and it is one of the strangest secrets in *sounds*; that the *whole sound* is not in the *whole Air* onely, but the *whole Sound* is also in every small *Part* of the *Air*. So that all curious diversity of the *Articulate*

culate ſounds of the voice of Man, or Birds will enter at a ſmall crany, inconfuſed.

193. The *unequal agitation* of the *Winds*, and the like, though they be material to the carriage of the *Sounds*, further or leſs way; yet they do not confound the *Articulatian* of them at all, within that diſtance that they can be heard, though it may be, they make them to be heard leſs way, than in a ſtill, as hath been partly touched.

194. Over-great diſtance confoundeth the *Articulation* of *Sounds*, as we ſee, that you may hear the *Sound* of a Preachers voice, or the like, when you cannot diſtinguiſh what he ſaith. And one *Articulate ſound* will confound another, as when many ſpeak at once.

195. In the *Experiment* of *ſpeaking under Water*, when the voice is reduced to ſuch an extream exhility, yet the *Articulate ſounds* (wihch are the *words*) are not confounded, as hath been ſaid.

196. I conceive that an *extream ſmall*, or an *extream great ſound*, cannot be *Articulate*, but that the *Articulation* requireth a *mediocrity* of *ſound*: For that the *extream ſmall ſound* confoundeth the *Articulation* by *contracting*, and the *great ſound* by *diſperſing*; and although (as was formerly ſaid) a *Sound Articulate*, already created, will be contracted into a ſmall crany, yet the firſt *Articulation* requireth more dimenſion.

197. It hath been obſerved, that in a *Room*, or in a *Chappel*, Vaulted below, and Vaulted likewiſe in the Roof, a Preacher cannot be heard ſo well, as in the like places not ſo vaulted. The cauſe is, for that the *ſubſequent words* come on, before the the *precedent words* vaniſh; and therefore the *Articulate Sounds* are more confuſed, though the groſs of the *Sound* be greater.

198. The *Motions* of the *Tongue*, *Lips*, *Throat*, *Palate*, *&c.* which go to the making of the ſeveral *Alphabetical Letters* are worthy inquiry, and pertinent to the preſent *Inquiſition* of *Sounds*: But becauſe they are ſubtil and long to deſcribe, we will refer them over, and place them amongſt the *Experiments* of *Speech*. The *Hebrews* have been diligent in it, and have aſſigned which *Letters* are *Labial*, which *Dental*, which *Guttural*, *&c.* As for the *Latins* and *Grecians*, they have diſtinguiſhed between *Semi-vowels* and *Mutes*; and in *Mutes*, between *Mutæ*, *Tenues*, *Mediæ* and *Aſpiratæ*, not amiſs, but yet not diligently enough. For the ſpecial *ſtrokes* and *motitions* that create thoſe *Sounds*, they have little inquired; as that the Letters, *B. P. F. M.* are not expreſſed, but with the *contracting* or *ſhutting* of the *Mouth*; that the *Letters N.* and *B.* cannot be pronounced, but that the *Letter N.* will turn into *M.* as *Hecatonba* will be *Hecatomba*. That *M.* and *T.* cannot be pronounced together, but *P.* will come between; as *Emtus*, is pronounced *Emptus*, and a number of the like: So that if you enquire to the full, you will find, that to the making of the whole *Alphabet*, there will be fewer *ſimple Motions* required, then there are *Letters*.

199. The *Lungs* are the moſt ſpongy part of the Body, and therefore ableſt to contract and dilate it ſelf; and where it contracteth it ſelf, it expelleth the *Air*, which thorow the *Artire*, *Throat*, and *Mouth*, maketh the *Voice*: But yet *Articulation* is not made, but with the help of the *Tongue*, *Pallate*, and the reſt of thoſe they call *Inſtruments* of *Voice*.

There is found a Similitude between the *Sound* that is made by *Inanimate*

200.

There is found a Similitude between the *Sound* that is made by *Inanimate* Bodies, or by *Animate Bodies*, that have no *Voice Articulate*, and divers *Letters* of *Articulate Voices*; and commonly Men have given such names to those *Sounds* as do allude unto the Articulate Letters. As *Trembling* of *Water* hath resemblance with the *Letter L.* *Quenching* of *Hot Metals* with the *Letter Z.* *Snarling* of *Dogs* with the *Letter R.* The *Noise* of *Scritch-Owls* with the *Letters Sh.* *Voice* of *Cats* with the *Dipthong En.* *Voice* of *Cuckows* with the *Dipthong Ou*, *Sounds* of *Strings* with the *Letters Ng.* So that if a Man (for curiosity or strangeness sake) would make a *Puppet*, or other dead Body, to pronounce a *Word*: Let him consider on the one part, the motion of the *Instruments* of *Voice*; and on the other part, the like *Sounds* made in *Inanimate Bodies*; and what Conformity there is, that causeth the Similitude of *Sounds*; and by that he may minister light to that effect.

NATURAL

NATURAL

NATURAL HISTORY;

Century III.

ALL *Sounds* (whatsoever) move round, that is to say, On *all sides*, *Upwards*, *Downwards*, *Forwards* and *Backwards*: This appeareth in all *Instances*.

201. Experiments in Consort, touching the *Motions of Sound*, in what Lines they are *Circular*, *Oblick*, *Straight*, *Upwards*, *Downwards*, *Forwards*, *Backwards*.

Sounds do not require to be conveighed to the *Sense* in a *Right line*, as *Visibles* do, but may be *arched*, though it be true they move strongest in a *Right line*; which nevertheless is not caused by the *Rightness* of the *Line*, but by the shortness of the distance *Linea rectea brevissima*. And therefore, we see if a *Wall* be between, and you speak on the one side, you hear in the other; which is not because the *ound* passeth thorow the *Wall*, but *arched* over the *Wall*.

202.

If the *Sound* be *Stopped* and *Repercussed*, it cometh about on the other side, in an *Oblick Line*: So, if in a *Coach*, one side of the Boot be down, and the other up, and a Begger beg on the close side, you would think that he were on the open side. So likewise, if a *Bell* or *Clock*, be (for example) on the North-side of a Chamber, and the Windows of that Chamber be upon the South: he that is in the Chamber, will think the *Sound* came from the South.

203.

Sounds, though they *spread round*, (so that there is an *Orb*, or *spherical Area* of the *Sound*) yet they move strongest, and go furthest in the *Fore-Lines*, from the first Local Impulsion of the Air. And therefore in *Preaching*, you shall hear the *Preachers* voice better before the Pulpit than behind it, or on the sides, though it stand open. So a *Harquebuz* or *Ordnance* will be further heard forwards, from the mouth of the *Piece*, than backwards, or on the sides.

204.

It may be doubted, that *Sounds* do move better downwards, than upwards. *Pulpits* are placed high above the people: And when the Ancient

205.

Generals

Generals ſpake to their Armies, they had ever a Mount of Turff caſt up, whereupon they ſtood. But this may be imputed to the ſtops and obſtacles which the voice meeteth with, when one ſpeaketh upon the level. But there ſeemeth to be more in it; for it may be, that *Spiritual Species*, both of *things viſible*, and *Sounds*, do move better *downwards* than *upwards*. It is a ſtrange thing, that two Men ſtanding below on the ground, thoſe that be on the top of *Pauls*, ſeem much leſs than they are, and cannot be known: But to Men above, thoſe below ſeem nothing ſo much leſſened, and may be known; yet it is true, That all things to them above, ſeem alſo ſomewhat contracted and better collected into figure; as *Knots* in *Gardens* ſhew beſt from an upper Window or Tarras.

206. But to make an exact tryal of it, let a Man ſtand in a *Chamber*, not much above the Ground, and ſpeak out at the Window thorow a *Trunck*, to one ſtanding on the Ground, as ſoftly as he can, the other laying his Ear cloſe to the *Trunck*: Then *Vice Verſa*, let the other ſpeak below, keeping the ſame proportion of ſoftneſs; and let him in the Chamber lay his Ear to the Trunck. And this may be the apteſt means to make a Judgment, whether Sounds deſcend or aſcend better.

207. Experiments in Conſort, touching the *Laſting and Periſhing of Sounds*; *and touching the time they require to their Generation or Delation.*

AFter that *Sound* is created (which is in a moment) we find it continueth ſome ſmall time, melting by little and little. In this there is a wonderful error amongſt Men, who take this to be a *Continuance* of the firſt Sound; whereas (in truth) it is a *Renovation*, and not a *Continuance*: For the *Body percuſſed*, hath by reaſon of the *Percuſſion*, a *Tripidation* wrought in the *minute parts*, and ſo reneweth the *Percuſſion* of the *Air*. This appeareth manifeſtly, becauſe that the Melting *Sound* of a Bell, or of a ſtring ſtrucken, which is thought to be a *Continuance*, ceaſeth as ſoon as the Bell or ſtring are touched. As in a Virginal, as ſoon as ever the Jack falleth, and toucheth the ſtring, the ſound ceaſeth; and in a Bell, after you have chimed upon it, if you touch the Bell, the *Sound* ceaſeth. And in this you muſt diſtinguiſh, that there are two *Trepidations*, The one Manifeſt and Local; as of the Bell, when it is Penſile; the other Secret, of the Minute parts, ſuch as is deſcribed in the ninth Inſtance. But it is true, that the *Local* helpeth the *Secret* greatly. We ſee likewiſe, that in Pipes, and other Wind Inſtruments, the *Sound* laſteth no longer than the breath bloweth. It is true, that in Organs there is a confuſed murmur for a while, after you have played, but that is but while the Bellows are in falling.

208. It is certain, that in the *noiſe* of great *Ordnance*, where many are ſhot off together, the *Sound* will be carried (at the leaſt) twenty miles upon the Land, and much further upon the Water, but then it will come to the Ear; not in the inſtant of the ſhooting off, but it will come an hour, or more later: This muſt needs be a *Continuance* of the *Firſt ſound*; for there is no *Trepidation* which ſhould renew it. And the touching of the Ordnance would not extinguiſh the ſound the ſooner: So that in great Sounds, the continuance is more than momentany.

209. To try exactly the time wherein Sound is delated, Let a Man ſtand in a Steeple, and have with him a Taper, and let ſome Veil be put before the Taper, and let another Man ſtand in the Field a mile off: then let him in the Steeple ſtrike the Bell, and in the ſame inſtant withdraw the Veil, and ſo let him in the Field tell by his Pulſe, what diſtance of time there is between the Light ſeen, and the Sound heard: For it is certain, That the Delation of

Light

Light is an instant. This may be tried in far greater distances, allowing greater *Lights* and *Sounds*.

210. It is generally known and observed, that *Light*, and the *Object* of *Sight*, move swifter than *Sound*; for we see the *flash* of a piece is seen sooner than the *noise* is heard. And in hewing Wood, if one be some distance off, he shall see the Arm lifted up for a second stroke, before he hear the *noise* of the first; and the greater the distance, the greater is the prevention: As we see in Thunder, which is far off, where the Lightning preceedeth the crack, a good space.

211. *Colours*, when they represent themselves to the Eye, fade not, nor melt not by degrees, but appear still in the same strength; but *Sounds* melt, and vanish by little and little. The cause is, for that *Colours* participate nothing with the *Motion* of the *Air*, but *Sounds* do. And it is a plain argument that *Sound* participateth of some *Local Motion* of the *Air*, (as a cause *Sine quâ non*) in that it perisheth so suddenly: For in every Section, or impulsion of the *Air*, the *Air* doth suddenly restore and reunite it self, which the *Water* also doth, but nothing so swiftly.

Experiments in Consort touching the *Passage* and *Interceptions* of *Sounds*.

IN the tryals of the *Passage*, or not *Passage* of *Sounds*, you must take heed you mistake not the *passing* by the sides of a Body, for the *passing* thorow a Body; and therefore you must make the *Intercepting* Body very close; for *Sound* will pass thorow a small chink.

212. Where *Sound* passeth thorow a *hard*, or *close* Body (as thorow *Water*; thorow a *Wall*, thorow *Metal*, as in hawks Bells stopped, &c.) the *hard* or *close* Body, must be but thin and small; for else it deadeth and extinguisheth the *Sound* utterly. And therefore, in the *Experiment* of *Speaking* in *Air under Water*, the voice must not be very deep within the Water: for then the *Sound* pierceth not. So if you speak on the further side of a *Close Wall*, if the *Wall* be very thick, you shall not be heard: And if there were an Hogs head empty, whereof the sides were some two foot thick, and the Bunghole stopped. I conceive, the resounding sound by the *Communication* of the *outward Air*, with the *Air within*, would be little or none, but onely you shall hear the *noise* of the outward knock, as if the Vessel were full.

213. It is certain, that in the *passage* of *Sounds* thorow *hard Bodies*, the Spirit or Pneumatical part of the hard Body it self doth co-operate; but much better; when the sides of the *hard Body* are struck, than when the percussion is onely within, without touch of the sides. Take therefore a Hawks-Bell, the holes stopped up, and hang it by a thred within a Bottle-Glass, and stop the Mouth of the Glass very close with Wax, and then shake the Glass, and see whether the Bell give any *Sound* at all, or how weak? But note, that you must instead of the Thred take a *Wire*, or else let the Glass have a great Belly, lest when you shake the Bell, it dash upon the sides of the Glass.

214. It is plain that a very *long* and *down-right* arch for the *Sound* to pass, will extinguish the *Sound* quite, so that that *Sound*, which would be heard over a Wall, will not be heard over a Church; nor that *Sound*, which will be heard, if you stand some distance from the VVall, will be heard if you stand close under the VVall.

215. *Soft* and *Foraminous bodies*, in the first *creation* of the *Sound*, will dead it; for the striking against Cloth and Fur, will make little *Sound*, as hath been said: But in the *passage* of the *Sound*, they will admit it better than *harder bodies*, as we see that Curtains and hangings will not stay the *Sounds* much; but Glass windows, if they be very close, will check a sound more, than the like thickness of Cloth. VVe see also in the rumbling of the Belly, how easily the *Sound* passeth thorow the Guts and Skin,

216. It is worthy the inquiry, whether *Great ſounds* (as of Ordnance or Bells) become not more *Weak* and *Exile*, when they paſs thorow *ſmall Cranies*. For the *Subtilties* of *Articulate ſounds*, (it may be) may paſs thorow *ſmall Cranies*, not confuſed; but the *magnitude* of the *Sound* (perhaps) not ſo well.

217. Experiments in Conſort touching the *Medium of Sound*. THe *Mediums* of *Sounds*, are *Air*, *ſoft* and *Porous bodies*; alſo *Water*, and *hard Bodies* refuſe not altogether to be *Mediums* of *Sounds*. But all of them are dull and unapt *Differents*, except the *Air*.

218. In *Air*, the thinner or drier *Air*, carrieth not the *Sound* ſo well, as the more denſe; as appeareth in *Night ſounds*, and *Evening ſounds*, and *Sounds* in moiſt Weather, and Southern Winds. The reaſon is already mentioned in the *Title* of *Majoration* of *Sounds*; being, for that *thin Air* is better pierced, but *thick Air* preſerveth the *Sound* better from waſt: Let further tryal be made by hollowing in Miſts, and gentle ſhowers; for (it may be) that will ſomewhat dead the *Sound*.

219. How far forth *Flame* may be a *Medium* of *Sound* (eſpecially of ſuch *Sounds* as are created by *Air*, and not betwixt *hard Bodies*) let it be tried in *ſpeaking*, where a *Bonefire* is between; but then you muſt allow for ſome diſturbance, the *noiſe* that the *Flame* it ſelf maketh.

220. Whether any other *Liquors*, being made *Mediums*, cauſe a diverſity of *Sound* from *Water*, it may be tryed: As by the knapping of the Tongs, or ſtriking of the bottom of a Veſſel filled either with Milk or with Oyl; which, though they be more light, yet are they more unequal Bodies than Air.

Of the Natures *of the* Mediums, *we have now ſpoken; as for the* Diſpoſition *of the ſaid* Mediums, *it doth conſiſt in the Penning, or not Penning of the* Air; *of which, we have ſpoken before in the* Title *of* Delation *of* Sounds. *It conſiſteth alſo in the* Figure *of the* Concave, *through which it paſſeth. Of which, we will ſpeak next.*

Experiments in Conſort, *what the Figures of the Pipes or Concaves, or the Bodies different conduce to the Sounds* HOw the *Figures* of *Pipes* or *Concaves*, through which *Sounds* paſs, or of other *Bodies different*; conduce to the variety and alteration of the *Sounds*; either in reſpect of the *Greater quantity*, or *leſs quantity* of *Air*, which the *Concaves* receive; or in reſpect of the *carrying* of *Sounds* longer or ſhorter way; or in reſpect of many other *Circumſtances*, they have been touched, as falling into other *Titles*. But thoſe *Figures* which we now are to ſpeak of, we intend to be, as they concern the *Lines*, through which *Sound* paſſeth: As *Straight*, *Crooked*, *Angular*, *Circular*, &c.

221. The *Figure* of a *Bell* partaketh of the *Pyramis*, but yet coming off, and dilating more ſuddenly. The *Figure* of a *Hunters horn*, and *Cornet*, is oblick, yet they have likewiſe *ſtraight Horns*; which, if they be of the ſame bore with the *Oblick*, differ little in *Sound*, ſave that the ſtraight require ſomewhat a ſtronger blaſt. The *Figures* of *Recorders*, and *Flutes*, and *Pipes*, are ſtraight; but the *Recorder* hath a leſs bore and a greater, above and below. The *Trumpet* hath the *Figure* of the *Letter* S, which maketh that Purling *Sound*, &c. Generally, the *Straight line* hath the cleaneſt and roundeſt *Sound*, and the *Crooked* the more hoarſe, and Jarring.

222. Of a *Sinuous Pipe*, that may have ſome four Flexions, tryal would be made. Likewiſe of a *Pipe* made like a *Croſs*, open in the midſt: and ſo likewiſe

likewise of an *Angular Pipe*; and see what will be the effects these several *Sounds*. And so again of a *Circular pipe*: As if you take a *Pipe* perfect round, and make a hole whereinto you shall blow, and another hole not far from that; but with a traverse or stop between them: So that your breath may go the Round of the *Circle*, and come forth at the second hole. You may try likewise *Percussions* of *Solid Bodies* of several *Figures*: As *Globes*, *Flats*, *Cubes*, *Crosses*, *Triangles*, &c. And their *Combinations*; as *Flat* against *Flat*, and *Convex* against *Convex*, and *Convex* against *Flat*, &c. And mark well the diversities of the *Sounds*. Try also the difference in *Sound* of several *Crassitudes* of *Hard bodies* percussed, and take knowledge of the diversities of the Sounds. I my self have tried, That a *Bell* of *Gold* yieldeth an excellent *Sound*, not inferior to that of *Silver* or *Brass*, but rather better. Yet we see that a piece of money of *Gold*, soundeth far more flat than a piece of money of *Silver*.

223. The *Harp* hath the *Concave*, not along the *strings*, but a cross the *strings*; and no *Instrument* hath the *Sound* so melting and prolonged, as the *Irish Harp*. So as I suppose that if a *Virginal* were made with a double *Concave*; the one all the length as the *Virginal* hath, the other at the end of the *strings*, as the *Harp* hath; it must needs make the *Sound* perfecter, and not so shallow, and jarring. You may try it without any Sound-board along; but onely Harp-wise, at one end of the *strings*; or lastly, with a double *Concave*, at each end of the *strings* one.

224. Experiments in Consort touching the *mixture of Sounds*.

THere is an apparent diversity between the *Species Visible* and *Audible*, in this. That the *Visible* doth not *mingle* in the *Medium*, but the *Audible* doth. For if we look abroad, we see Heaven, a number of Stars, Trees, Hills, Men, Beasts, at once; and the *Species* of the one, doth not confound the other: But if so many *Sounds* come from several parts, one of them would utterly confound the other. So we see, that *Voices* or *Consorts* of *Musick* do make a harmony by *mixture*, which *Colours* do not. It is true nevertheless, that a great *Light* drowneth a smaller, that it cannot be seen; as the *Sun* that of a *Glowworm*, as well as a great *Sound* drowneth a lesser. And, I suppose likewise, that if there were two Lanthorns of Glass, the one a Crimsin, and the other an Azure, and a Candle within either of them, those Coloured Lights, would mingle and cast upon a White Paper, a Purple Colour. And even in *Colours*, they yield a faint and weak *mixture*: for White Walls make rooms more lightsome, than Black, &c. But the cause of the *Confusion* in *Sounds*, and the *Inconfusion* in *Species Visible*, is, For that the *Sight* worketh in right Lines, and maketh several *Cones*; and so there can be no Coincidence in the eye, or Visual Point: But *Sounds* that move in oblick and arcuate Lines, must needs encounter, and disturb the one the other.

225. The sweetest and best *Harmony* is, when every *Part* or *Instrument* is, not heard by it self, but a conflation of them all, which requireth to stand some distance off. Even as it is in the *mixture* of perfumes, or the taking of the smells of several *Flowers* in the *Air*.

226. The *disposition* of the *Air*, in other *qualities*, except it be joyned with *Sound*, hath no great operation upon *Sounds*: For whether the *Air* be lightsome or dark, hot or cold, quiet or stirring, (except it be with *noise*) sweet smelling, or stinking, or the like; it importeth not much. Some petty alteration or difference it may make.

227. But *Sounds* do disturb and alter the one the other: Sometimes the one drowning the other, and making it not heard: sometimes the one jarring and discording with the other, and making a confusion: sometimes the one mingling and compounding with the other, and making an harmony.

228. Two *Voices* of like *Loudness*, will not be heard twice as far, as one of them alone; and two *Candles* of like light, will not make things seem twice as far off, as one. The cause is profound, but it seemeth, that the *Impressions* from the *Objects* of the *Senses* do *Mingle* respectively, every one with his kind; but not in proportion, as is before demonstrated: And the reason may be, because the first *Impression*, which is from *Privative* to *Active*, (as from *Silence* to *Noise*, or from *Darkness* to *Light*) is a greater degree, than from *Less Noise*, to *More Noise*, or from *Less Light*, to *More Light*. And the reason of that again may be, For that the *Air*, after it hath received a charge doth not receive a surcharge, or greater charge, with like appetite, as it doth the first charge. As for the increase of Vertue generally, what proportion it beareth to the increase of the Matter, it is a large Field, and to be handled by it self.

229. Experiments in Consort touching the *Melioration of Sounds.*

ALL *Reflexions Concurrent*, do make *Sounds* Greater; but if the Body that createth, either the original *Sound*, or the *Reflexion*, be clean and smooth, it maketh them sweeter. Tryal may be made of a *Lute* or *Viol*, with the Belly of polished Brass instead of Wood. We see, that even in the open Air, the *Wire-string* is sweeter than the *String of Guts*. And we see, that for *Reflection Water* excelleth, as in *Musick* near the *Water*, or in *Eccho's*.

230. It hath been tryed, that a *Pipe*, a little moistned on the inside, but yet so as there be no drops left, maketh a more solemn *Sound*, than if the *Pipe* were dry; but yet with a sweet degree of *Sibilation* or *Purling*, as we touched it before in the Title of *Equality*. The cause is, for that all things porous, being superficially wet, and (as it were) between dry and wet, become a little more even and smooth; but the Purling (which must needs proceed of Inequallity) I take to be bred between the smoothness of the inward Surface of the *Pipe* which is wet, and the rest of the Wood of the *Pipe*, unto which the wet cometh not, but it remaineth dry.

231. In *Frosty weather*, *Musick* within doors soundeth better; which may be, by reason not of the disposition of the *Air*, but of the *Wood* or *String* of the *Instrument*, which is made more crisp, and so more porous and hollow, and we see that *Old Lutes* sound better than *New*, for the same reason: And so do *Lute-strings* that have been kept long.

232. *Sound* is likewise *Meliorated* by the *Mingling* of *open Air* with *pent Air*: Therefore tryal may be made of a *Lute* or *Viol* with a double Belly, making another Belly with a knot over the string; yet so, as there be room enough for the strings, and room enough to play below that Belly. Tryal may be made also of an *Irish Harp*, with a concave on both sides, whereas it useth to have it but on one side. The doubt may be, lest it should make too much resounding, whereby one Note would overtake another.

233. If you sing into the hole of a *Drum*, it maketh the *singing* more sweet. And so I conceive it would, if it were a *Song* in Parts sung into several *Drums* and for handsomness and strangeness sake, it would not be amiss to have a Curtain between the place where the *Drums* are, and the *hearers*.

234 When a *Sound* is created in the *Wind-Instruments*, between the *Breath* and *Air*, yet if the *Sound* be communicate with a more equal Body of the *Pipe*, it

it *melioratеth* the *Sound*. For (no doubt) there would be a differing *Sound* in a Trumpet or *Pipe* of *Wood*, and again, in a *Trumpet* or *Pipe* of *Brass*. It were good to try *Recorders* and *Hunters Horns* of *Brass*, what the *Sound* would be.

Sounds are *meliorated* by the *Intension* of the *Sense*, where the *common Sense* is collected most to the *particular Sense* of *Hearing*, and the *Sight* suspended: and therefore *Sounds* are sweeter (as well as greater,) in the *Night* than in the *Day*; and, I suppose, they are sweeter to blind men, than to others: And it is manifest, that between *sleeping* and *waking*, (when all the *Senses* are bound and suspended) *Musick* is far sweeter than when one is *fully waking*. 235.

IT is a thing strange in nature, when it is attentively considered; How *Children* and some *Birds* learn to *imitate Speech*. They take no mark at all of the *Motion* of the *Mouth* of him that speaketh, for *Birds* are as well taught in the dark, as by light. The *Sounds* of *Speech* are very curious and exquisite; so one would think it were a Lesson hard to learn. It is true, that it is done with time, and by little and little, and with many Essays and proffers: But all this discharged not the wonder. It would make a Man think (though this, which we shall say, may seem exceeding strange) that there is some *Transmission* of *Spirits*, and that the *Spirits* of the *Teacher* put in motion, should work with the *Spirits* of the *Learner*, a pre-disposition to offer to *imitate*, and so to perfect the *imitation* by degrees. But touching *Operations* by *Transmissions* of *spirits* (which is one of the highest secrets in Nature) we shall speak in due place, chiefly when we come to enquire of *Imagination*. But as for *Imitation*, it is certain, That there is in Men, and other Creatures, a pre-disposition to *Imitate*. We see how ready Apes and Monkies are to *Imitate* all motions of Man: And in the catching of Dottrels, we see how the foolish Bird playeth the Ape in gestures: And no Man (in effect) doth accompany with others, but he learneth (ere he is aware) some Gesture, or Voice, or Fashion, of the other. 236. Experiments in Consort touching the *Imitation of Sounds*.

In *Imitation of Sounds*, that *Man* should be the *Teacher*, is no part of the matter: For *Birds* will learn one another, and there is no reward by feeding, or the like, given them for the *imitation*; And besides, you shall have Parrots that will not onely *imitate* Voices, but Laughing, Knocking, Squeaking of a Door upon the Hinges, or of a Cart wheel, and (in effect) any other *noise* they hear. 237.

No *Beast* can *imitate* the *speech* of *Man*, but *Birds* onely: For the Ape it self, that is so ready to *imitate* otherwise, attaineth not any degree of *imitation* of Speech. It is true, that I have known a Dog, that if one howled in his ear, he would fall a bowling a great while. What should be the aptness of *Birds*, in comparison of *Beasts*, to *imitate* the *Speech* of *Man*, may be further inquired. We see that *Beasts* have those parts, which they count the *Instruments* of *Speech*, (as *Lips*, *Teeth*, &c) liker unto *Man* than *Birds*. As for the *Neck*, by which the *Throat* passeth, we see many *Beasts* have it for the length, as much as *Birds*. What better *Gorge*, or Attire, *Birds* have, may be further inquired. The *Birds* that are known to be speakers, are, *Parrots*, *Pyes*, *Jaws*, *Daws*, and *Ravens*: Of which, *Parrots* have an adunque Bill, but the rest not. 238.

But I conceive, that the *aptness* of *Birds* is not so much in the *conformity* of the *Organs* of *Speech*, as in their *Attention*. For *Speech* must come by *Hearing* and *Learning*; and *Birds* give more heed, and mark *Sounds* more 239.

more than *Beasts*; because naturally they are more delighted with them, and practise them more, as appeareth in their *Singing*. We see also, that those that teach *Birds* to *sing*, do keep them waking, to increase their *attention*. We see also, that *Cock-birds*, among *Singing-birds*, are ever the better *singers*, which may be, because they are more lively and listen more.

240. *Labor* and *Intention* to *Imitate voices*, doth conduce much to *Imitation*: And therefore we see, that there be certain *Pantomimi*, that will represent the Voices of *Players* of *Interludes*, so to life, as if you see them not, you would think they were those *Players* themselves, and so the *Voices* of other men that they hear.

241. There have been some that could counterfeit the *distance* of *Voices*, (which is a *secondary object* of *Hearing*) in such sort; as when they stand fast by you, you would think the *Speech* came from afar off, in a fearful manner. How this is done, may be further enquired; but I see no great use of it, but for Imposture, in counterfeiting ghosts or spirits.

Experiments in Consort touching the *Reflexion of Sounds.*

THere be three kinds of *Reflections* of *Sounds*; a *Reflection concurrent*, a *Reflection Iterant*, which we call *Eccho*, and a *Super-reflection*, or an *Eccho* of an *Eccho*, whereof the first hath been handled in the *Title* of *Magnitude* of *Sounds*. The latter two we will now speak of.

242. The *Reflection* of *Species Visible* by *Mirrors*, you may command, because passing in Right Lines they may be guided to any point: but the *Reflection* of *Sounds*, is hard to master, because the *Sound* filling great spaces in Arched Lines, cannot be so guided. And therefore, we see, there hath not been practised any means to make *Artificial Eccho's*. And no *Eccho* already known, returneth in a very narrow room.

243. The natural *Eccho's* are made upon *Walls*, *Woods*, *Rocks*, *Hills*, and *Banks*: As for *Waters* being near, they make a *Concurrent Eccho*; but being further off, (as upon a large *River*) they make an *Iterant Eccho*: For there is no difference between the *Concurrent Eccho*, and the *Iterant*, but the quickness or slowness of the return. But there is no doubt, but *Water* doth help the *Delation* of *Eccho*, as well as it helpeth the *Delation* of *Original Sounds*.

244. It is certain (as hath been formerly touched,) that if you speak thorow a *Trunk*, stopped at the further end, you shall find a blast return upon your mouth, but no *Sound* at all. The *Cause* is, for that the *Closeness*, which preserveth the *Original*, is not able to preserve the *Reflected Sound*: besides that *Eccho's* are seldome created, but by loud *Sounds*. And therefore there is less hope of *Artificial Eccho's* in Air, pent in a narrow concave. Nevertheless it hath been tryed, that one leaning over a *Well* of Twenty five fathom deep, and speaking, though but softly, (yet not so soft as a whisper) the *Water* returned a good *audible Eccho*. It would be tryed, whether speaking in *Caves* where there is no issue, save where you speak, will not yield *Eccho's* as *Wells* do.

245. The *Eccho* cometh as the *Original Sound doth* in a round Orb of Air: It were good to try the creating of the *Eccho*, where the Body repercussing maketh an Angle: As against the Return of a Wall, &c. Also we see that in *Mirrors*, there is the like Angle of Incidence, from the Object to the Glass, and from the Glass to the Eye. And, if you strike a *Ball* side-long, not full upon the Surface, the rebound will be as much the contrary way; whether

ther there be any such *reflience* in *Eccho's* (that is, Whether a Man shall hear better, if he stand aside the Body repercussing, than if he stand where he speaketh, or any where in a right line between) may be tried; Tryal likewise would be made, by standing nearer the place of repercussing, than he that speaketh; and again, by standing further off, than he that speaketh, and so knowledge would be taken, whether *Eccho's*, as well as *Original sounds*, be not strongest near hand.

246. There be many places, where you shall hear a number of *Eccho's* one after another; and it is, when there is variety of *Hills* or *Woods*, some nearer, some further off: So that the return from the further, being last created, will be likewise last heard.

247. As the *Voice* goeth round, as well towards the back, as towards the front of him that speaketh; so likewise doth the Eccho, for you have many Back-*Eccho's* to the place where you stand.

248. To make an *Eccho* that will report three, or four, or five words distinctly, it is requisite, that the *Body repercussing* be a good distance off: For if it be near, and yet not so near, as to make a *Concurrent Eccho*, it choppeth with you upon the sudden. It is requisite likewise, that the *Air* be not much *pent*: For *Air*, at great distance, *pent* worketh the same effect with *Air*, *at large*, in a small distance. And therefore in the *Tryal* of *Speaking* in the *Well*, though the *Well* was deep, the *Voice* came back suddenly, and would bear the report but of two words.

249. For *Eccho's* upon *Eccho's*, there is a rare instance thereof in a place, which I will now exactly describe. It is some Three or four Miles from *Paris*, near a Town called *Pant-Charenton*; and some Bird-bolt shot or more from the River of *Sean*. The Room is a *Chappel*, or small *Church*; the Walls all standing, both at the sides, and at the ends; two rows of Pillars after the manner of Isles of *Churches*, also standing; the Roof all open, not so much as any Embowment near any of the Walls left. There was against every Pillar, a stack of Billets above a Mans height, which the Watermen, that bring Wood down the *Sean*, in Stacks, and not in Boats, laid there (as it seemeth) for their ease. Speaking at the one end, I did hear it return the Voice Thirteen several times; and I have heard of others, that it would return Sixteen times; for I was there about three of the Clock in the afternoon; and it is best, (as all other *Eccho's* are) in the Evening. It is manifest, that it is not *Eccho's* from several places, but a *tossing* of the *Voice*, as a Ball too and fro; like to *Reflections* in *Looking-Glasses*; where if you place one *Glass* before, and another behind, you shall see the *Glass* behind with the *Image*, within the *Glass* before; and again, the *Glass* before in that: Aud divers such *Super-Reflections*, till the *Species speciei* at last die: For it is ever yreturn weaker, and more shady. In like manner, the *Voice* in that *Chappel*, createth *Speciem speciei*, and maketh succeeding *Super-Reflections*; for it melteth by degrees, and every *Reflection* is weaker than the former: So that, if you speak three words; it will (perhaps) some three times report you the whole three words, and then the two latter words for sometime, and then e last word alone for sometime, still fading and growing weaker. th And whereas in *Eccho's* of one return, it is much to hear Four or five words. In this *Eccho* of so many Returns upon the matter, you hear above Twenty words for three.

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250. The like *Eccho* upon *Eccho*, but onely with two reports, hath been observed to be, if you ſtand between a *Houſe* and a *Hill*, and lure towards the *Hill*. For the *Houſe* will give a *Back-Eccho*; One taking it from the other, and the latter the weaker.

251. There are certain *Letters*, that an *Eccho* will hardly expreſs: As S for one, eſpecially being principal in a word. I remember well, that when I went to the *Eccho* at *Pont-Charenton*, there was an old *Pariſian* that took it to be the Work of Spirits, and of good Spirits. For (ſaid he) call *Satan*, and the *Eccho* will not deliver back the Devils name: But will ſay, *Vat'en*, which is as much in *French*, as *Apage*, or *Avoid*. And thereby I did hap to find, that an Eccho would not return S, being but a Hiſſing and an *Interior Sound*,

252. *Eccho's* are ſome more ſudden, and chop again, as ſoon as the *Voice* is delivered, as hath been partly ſaid: others are more deliberate, that is, give more ſpace between the *Voice* and the *Eccho*, which is cauſed by the Local nearneſs or diſtance: Some will report a longer train of words, and ſome a ſhorter: Some more loud (full as loud as the *Original*, and ſometimes more loud) and ſome weaker and fainter.

253. Where *Eccho's* come from ſeveral parts, at the ſame diſtance, they muſt needs make (as it were) a Quire of *Eccho's*, and ſo make the Report greater, and even a *continued Eccho*; which you ſhall find in ſome *Hills* that ſtand encompaſſed. Theatre-like,

254. It doth not yet appear, that there is *Refraction* in *Sounds*, as well as in *Species Viſible*. For I do not think, that if a *Sound* ſhould paſs through divers *Mediums*, as *Air*, *Cloath*, *Wood*, it would deliver the *Sound* in a differing place, from that unto which it is deferred; which is the proper effect of Refraction. But *Majoration*, which is alſo the VVork of *Refraction*, appeareth plainly in *Sounds*, (as hath been handled at full) but it is not by diverſity of *Mediums*.

Experiments in Conſort touching the *Conſent and Diſſent between Viſibles and Audibles*

WE have *Obiter*, for Demonſtrations ſake, uſed in divers *Inſtances*, the *Examples* of the *Sight*, and *Things Viſible*, to illuſtrate the *Nature of Sounds*. But we think good now to proſecute that *Compariſon* more ful.

Conſents of Viſibles and Audibles.

255. BOth of them *ſpread themſelves in Round*, and fill a whole Floor or Orb unto certain Limits; and are carried a great way, and do languiſh, and leſſen by degrees, according to the Diſtance of the Objects from the Senſories,

256. *Both* of them have the whole *Species in every ſmall portion of the Air* or *Medium*, ſo as the *Species* do paſs through ſmall Cranies, without confuſion: As we ſee ordinarily in *Levels*, as to the *Eye*; and in *Cranies*, or *Chinks*, as to the *Sound*.

257. *Both* of them are of a *ſudden and eaſie Generation and Delation*, and likewiſe *periſh ſwiftly* and *ſuddenly*; as if you remove the *Light*, or teach the *Bodies* that give the *Sounds*.

Both of them do *Receive* and *carry exquisite*, and *accurate differences*; as of Colours, Figures, Motions, Distances, in *Visibles*; and of Articulate Voices, Tones, Songs, and Quaverings in *Audibles*. 258.

Both of them in their Vertue and Working, do not appear to *emit any Corporal substance* into their *Mediums*, or an Orb of their Vertue; neither again to raise or stir any *evident Local Motion* in their *Mediums* as they pass; but onely to carry certain *Spiritual Species*, The perfect knowledge of the cause whereof, being hitherto scarcely attained, we shall search and handle in due place. 259.

Both of them seem not to *Generate* or *Produce* any other *Effect in Nature*, but such as appertaineth to their proper Objects and Senses, and are otherwise barren. 260.

But both of them, in their own proper action, do work three manifest *Effects*. The first, in that the *stronger Species drowneth the lesser*: As the light of the Sun, the light of a Glow-worm, the report of an Ordnance, the Voice. The second, in that an *Object of surcharge or excess, destroyeth the Sense*: As the light of the Sun the eye a violent sound (near the Ear), the Hearing. The third, in that *both of them will be reverberate*: As in *Mirrors*, and in *Eccho's*. 261.

Neither of them doth *destroy or hinder the Species of the other*, although they *encounter* in the same *Medium*: As Light or Colour hinder not *Sound*, nor *è contra*. 262.

Both of them *affect the Sense in Living Creatures*, and yield *Objects* of *Pleasure and dislike*; yet nevertheless, the *Objects* of them do also (if it be well observed) affect and work upon dead things; namely such, as have some conformity with the *Organs* of the two *Senses*: As *Visibles* work upon a *Looking-glass*, which is like the Pupil of the Eye; and *Audibles* upon the places of *Eccho*, which resemble, in some sort, the cavern and structure of the Ear. 263.

Both of them do *diversify work, as they have their* Medium *diversly disposed*. So a Trembling *medium* (as smoak) maketh the object seem to tremble; and a Rising or Falling *Medium* (as Winds) maketh the Sounds to rise or fall. 264.

To *both*, the *Medium*, which is the most propitious and conducible, is *Air*; For Glass or Water, &c. are not comparable. 265.

In *both* of them, where the *Object is fine and accurate*, it conduceth much to have the *Sense intentive, and erect*; insomuch, as you contract your *eye*, when you would see sharply, and erect your *ear*, when you would hear attentively, which in Beasts, that have ears moveable is most manifest. 266.

The *Beams* of *Light*, when they are *multiplied* and *conglomerate*, generate *heat*; which is a different action, from the action of *Sight*: And the *Multiplication* and *Conglomeration* of *Sounds*, doth generate an extream *Rarefaction* of the *Air*; which is an action materiate, differing from the action of *Sound*. If it be true (which is anciently reported) that *birds*, with great shouts, have fain down. 267.

Dissent

Diſſents of Viſibles and Audibles.

268. THe *Species of Viſibles*, ſeem to be *Emiſſions* of *Beams* from the *Object ſeen* almoſt like Odors, ſave that they are more incorporeal; but the *Species* of *Audibles*, ſeem to participate more with *Local Motion*, like *Percuſſions* or *Impreſſions* made upon the *Air*. So that whereas all Bodies do ſeem to work in two manners, Either by the *Communication* of their *Natures*, or by the *impreſſions* and *Signatures* of their *Motions*. The *Diffuſion* of *Species Viſible* ſeemeth to participate more of the former *Operation*, and the *Species Audible* of the latter.

269. The *Species* of *Audibles* ſeem to be carried more manifeſtly thorow the *Air*, than the *Species* of *Viſibles*: For (I conceive) that a contrary ſtrong Wind will not much hinder the ſight of *Viſibles*, as it will do the hearing of *Sounds*.

270. There is one *Differenee* above all others, between *Viſibles* and *Audibles*, that is the moſt remarkable; as that whereupon many ſmaller differences do depend: Namely, that *Viſibles* (except *Lights*) are *carried in Right Lines*, and *Audibles* in *Arcuate Lines*. Hence it cometh to paſs, that *Viſibles* do not intermingle and confound one another, as hath been ſaid before, but *Sounds* do. Hence it cometh, that the ſolidity of Bodies doth not much hinder the ſight, ſo that the Bodies be clear, and the Pores in a Right Line, as in Glaſs, Cryſtal, Diamonds, Water, &c. But a thin Scarf or Handkerchief, though they be Bodies nothing ſo ſolid, hinder the Sight: whereas (contrariwiſe) theſe Porous Bodies do not much hinder the Hearing, but ſolid Bodies do almoſt ſtop it, or at the leaſt attenuate it. Hence alſo it cometh, that to the *Reflection* of *Viſibles*, ſmall Glaſſes ſuffice, but to the *Reverberation* of *Audibles* are required greater ſpaces, as hath likewiſe been ſaid before.

271. *Viſibles* are ſeen further off, than *Sounds* are heard; allowing nevertheleſs the *Rate* of their *Bigneſs*: For otherwiſe, a *Great Sound* will be heard further off, than a *ſmall Body* ſeen.

272. *Viſibles* require (generally) ſome *diſtance* between the *Object*, and the *Eye* to be better ſeen; whereas in *Audibles*, the nearer the approach of the *Sound* is to the Senſe, the better; but in this, there may be a double error. The one, becauſe to *ſeeing* there is required *Light*, and any thing that toucheth the *Pupil* of the *Eye* (all over) excludeth the *Light*. For I have heard of a perſon very credible, (who himſelf was cured of a Cataract in one of his Eyes) that while the Silver-needle did work upon the Sight of his Eye, to remove the Film of the Cataract, he never ſaw any thing more clear or perfect, than that white Needle: Which (no doubt) was, becauſe the Needle was leſſer than the *Pupil* of the *Eye*, and ſo took not the Light from it. The other error may be. For that the *Object* of *Sight* doth ſtrike upon the *Pupil* of the *Eye*, directly without any interception; whereas the *Cave* of the *Ear* doth hold off the *Sound* a little from the Organ: and ſo nevertheleſs there is ſome *Diſtance* required in both.

273. *Viſibles* are ſwifter carried to the *Senſe*, than *Audibles*; as appeareth in Thunder and Lightning; Flame, and Report of a Piece; Motion of the Air, in hewing of Wood. All which have been ſet down heretofore, but are proper for this *Title*.

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274. I conceive also, that the *Species* of *Audibles*, do hang longer in the Air than those of *Visibles*: For although even those of *Visibles* do hang some time, as we see in *Rings turned*, that shew like spheres. In *Lute-strings* fillipped, a *Firebrand* carried a long, which leaveth a train of light behind it, and in the *Twilight*, and the like: Yet I conceive that *Sounds*, stay longer because they are carried up and down with the Wind; and because of the distance of the time in *Ordnance discharged*, and *heard* twenty miles off.

275. In *Visibles* there are not found objects so odious and ingrate to the *Sense*, as in *Audibles*. For foul *Sights* do rather displease, in that they excite the memory of foul things, than in the immediate Objects. And therefore in *Pictures*, those foul Sights do not much offend; but in *Audibles*, the grateing of a Saw when it is sharpned, doth offend so much, as it setteth the Teeth on edge; and any of the *Harsh Discords* in *Musicks*, the Ear doth straitwayes refuse.

276. In *Visibles*, after great light, if you come suddenly into the *Dark*, or contrariwise out of the *Dark* into a *Glaring Light*. The eye is dazeled for a time, and the *Sight* confused: but whether any such effect be after great *Sounds*, or after *a Deep silence* may be better enquired. It is an old Tradition, that those that dwell near the *Cataracts* of *Nilus*, are strucken deaf: But we find no such effect in Cannoniers, nor Millers, nor those that dwell upon Bridges.

277. It seemeth, that the *Impression* of *Colour* is so weak, as it worketh not, but by a Cone of direct *Beams*, or right Lines, whereof the Basis is in the Object and the Vertical point in the Eye. So as there is a corradiation and conjunction of *Beams*; and those *Beams* so sent forth, yet are not of any force to beget the like borrowed or second *Beams*, except it be by *Reflexion*, whereof we speak not. For the *Beams* pass and give little tincture to that Air which is adjacent; which if they did, we should see *Colours* out of a right line. But as this is in *Colours*, so otherwise it is in the *Body* of *Light*. For when there is a Skreen between the Candle and the Eye, yet the *Light* passeth to the Paper whereon one writeth, so that the *Light* is seen where the body of the *Flame* is not seen; and where any *Colour* (if it were placed where the body of the *Flame* is) would not be seen, I judge that *Sound* is of this latter nature: For when two are placed on both sides of a Wall, and the voice is heard, I judge it is not onely the *Original Sound*, which passeth in an *Arched line*; but the *Sound*, which passeth above the Wall in a Right line, begetteth the like Motion round about it, as the first did, though more weak.

278. Experiments in Consort, touching the *Sympathy* or *Antipathy* of *Sounds*, one with another.

ALl *Concords* and *Discords* of *Musick* are (no doubt) *Sympathies* and *Antipathies* of *Sounds*, and so (likewise) in that *Musick* which we call *Broken Musick*, or *Consort Musick*; some *Consorts* of *Instruments* are sweeter than others (a thing not sufficiently yet observed;) as the *Irish-Harp* and *Base Vial* agree well; the *Recorder* and *Stringed Musick* agree well; *Organs* and the *Voice* agree well; the *Virginals* and the *Lute*, or the *Welch-Harp* and *Irish-Harp*, or the *Voice* and *Pipes* alone, agree not so well: but for the *Melioration* of *Musick*, there is yet much left (in this Point of *Exquisite Consorts*) to try & enquire

279. There is a common observation, that if a *Lute* or *Vial* be laid upon the back with a small straw upon one side of the *Strings*, and another *Lute* or *Vial* be laid by it; and in the other *Lute* or *Vial* the *Unison* to that *string* be strucken, it will make the *string* move; which will appear both to the Eye, and by the *straws* falling off. The like will be if the *Diapason* or *Eight* to that *String* be strucken, either in the same *Lute* or *Vial*, or in others lying by: But in none of these there is any report of *Sound* that can be discerned, but only Motion.

280. It was deviſed, that a *Vial* ſhould have a Lay of Wire-ſtrings below, as cloſe to the Belly as a *Lute*, and then the *Strings* of Guts mounted upon a Bridge, as in ordinary *Vials*; to the end, that by this means, the upper *Strings* ſtrucken, ſhould make the lower reſound by *Sympathy*, and ſo make the *Muſick* the better; which, if it be to purpoſe, than *Sympathy* worketh as well by report of *Sound*, as by *Motion*. But this device, I conceive, to be of no uſe, becauſe the upper *Strings* which are ſtopped in great variety, cannot maintain a *Diapaſon* or *Uniſon* with the lower, which are never ſtopped. But if it ſhould be of uſe at all, it muſt be in *Inſtruments* which have no ſtops, as *Virginals* and *Harps*; wherein tryal may be made of two rows of Strings, diſtant the one from the other.

281. The *Experiment* of *Sympathy* may be transferred (perhaps) from *Inſtruments* of *Strings*, to other *Inſtruments* of *Sound*. As to try if there were in one Steeple two *Bells* of *Uniſon*, whether the ſtriking of the one would move the other, more than if it were another accord: And ſo in *Pipes*: (if they be of equal bore and *Sound*) whether a little Straw or Feather would move in the one *Pipe*, when the other is blown at an *Uniſon*.

282. It ſeemeth both in *Ear* and *Eye*, the *Inſtrument* of *Senſe* hath a *Sympathy*, or Similitude with that which giveth the *Reflexion* (as hath been touched before.) For as the *ſight* of the *Eye* is like a Chryſtal, or Glaſs, or Water; ſo is the *Ear* a ſinuous Cave with a hard Bone, to ſtop and reverberate the *Sound*: Which is like to the places that report *Eccho's*.

283. Experiment in Conſort, touching the *Hindring or Helping of the Hearing.*

WHen a Man *yawneth*, he cannot *hear* ſo well. The *cauſe* is, for that the *Membrane* of the *Ear* is extended; and ſo rather caſteth off the *Sound* than draweth it to.

284. We *hear* better when we *hold our Breath*, than contrary, inſomuch, as in all liſtening to attain a *Sound* a far off, Men *hold their Breath*. The *cauſe* is, for that in all *Expiration* the motion is outwards, and therefore rather driveth away the voice than draweth it: And beſides, we ſee that in all *Labor* to do things with any ſtrength, we *hold the Breath*; and liſtening after any *Sound* that is heard with difficulty, is a kind of *Labour*.

285. Let it be tryed, for the *Help* of the *Hearing*, (and I conceive it likely to ſucceed) to make an *Inſtrument* like a *Tunel*; the narrow part whereof may be of the bigneſs of the hole of the *Ear*; and the broader end much larger like a *Bell* at the skirts, and the length half a foot or more. And let the narrow end of it be ſet cloſe to the *Ear*. And mark whether any *Sound* abroad in the open Air, will not be heard diſtinctly from further diſtance, than without that Inſtrument; being (as it were) an *Ear ſpectacle*. And I have heard there is in *Spain* an *Inſtrument* in uſe to be ſet to the *Ear* that *helpeth* ſomewhat thoſe that are thick of Hearing.

286. If the *Mouth* be ſhut cloſe, nevertheleſs there is yielded by the Roof of the Mouth, a Murmur; ſuch as is uſed by Dumbmen: But if the *Noſtrils* be likewiſe ſtopped, no ſuch Murmur can be made, except it be in the bottom of the Pallate towards the throat. Whereby it appeareth manifeſtly, that a *Sound* in the *Mouth*; except ſuch as aforeſaid, if the *Mouth* be ſtopped, paſſeth from the *Pallate* through the *Noſtrils*.

287. Experiments in Conſort, touching the *Spiritual and Fine Nature of Sounds.*

THe *Repercuſſion of Sounds* (which we call *Eccho*) is a great argument of the *Spiritual Eſſence* of *Sounds*. For if it were *Corporeal*, the Repercuſſion ſhould be created in the ſame manner, and by like *Inſtruments* with the

the *Original Sound*: But we ſee what a number of *Exquiſite Inſtruments* muſt concur in ſpeaking of words, whereof there is no ſuch matter in the returning of them, but onely a plain ſtop, and *repercuſſion*.

288. The exquiſite *Differences* of *Articulate Sounds*, carried along in the *Air*, ſhew that they cannot be *Signatures* or *Impreſſions* in the *Air*, as hath been well refuted by the Antients. For it is true, that Seals make excellent Impreſſions, and ſo it may be thought of *Sounds* in their firſt generation: But then the *Delation* and *Continuance* of them, without any new ſealing ſhew apparently they cannot be Impreſſions.

289. All *Sounds* are ſuddenly made, and do ſuddenly periſh; but neither that, nor the *exquiſite Differences* of them, is matter of ſo great admiration: For the Quaverings, and Warblings in Lutes, and Pipes are as ſwift; and the Tongue (which is no very fine Inſtrument) doth in ſpeech, make no fewer motions, than there be letters in all the words which are uttered. But that *Sounds* ſhould not onely be ſo ſpeedily generated, but carried ſo far every way, in ſuch a momentany time, deſerveth more admiration. As for example, If a man ſtand in the middle of a Field, and ſpeak aloud he ſhall be heard a Furlong in round, and that ſhall be in *articulate Sounds*, and thoſe ſhall be entire in every little portion of Air; and this ſhall be done in the ſpace of leſs than a minute.

290. The *Sudden Generation* and *Periſhing* of *Sounds*, muſt be one of theſe two ways: Either, that the *Air* ſuffereth ſome force by *Sound*, and then reſtoreth it ſelf as Water doth; which being divided, maketh many circles, till it reſtore it ſelf to the Natural conſiſtence, or otherwiſe, that the *Air* doth willingly imbibe the *Sound* as grateful, but cannot maintain it; for that the *Air* hath (as it ſhould ſeem) a ſecret and hidden appetite of receiving the *Sound* at the firſt; but then other groſs and more materiate qualities of the Air ſtraight ways ſuffocate it, like unto *Flame* which is generated with alacrity, but ſtraight quenched by the enmity of the *Air*, or other Ambient Bodies.

There be theſe *Differences* (in general) by which *Sounds* are divided:

1. *Muſical*, *Immuſical*.
2. *Trebble*, *Baſe*.
3. *Flat*, *Sharp*.
4. *Soft*, *Loud*.
5. *Exterior*, *Interior*.
6. *Clean*, *Harſh*, or *Purling*.
7. *Articulate*, *Inarticulate*.

We have laboured (as may appear) in this *Inquiſition* of *Sounds* diligently; both becauſe *Sound* is one of the moſt hidden portions of *Nature* (as We ſaid in the beginning) and becauſe it is a *Vertue* may be called *Incorporeal* and *Immateriate*, whereof there be in *Nature* but few. Beſides, we were willing (now in theſe our firſt *Centuries*) to make a pattern or preſident of an *Exact Inquiſition*: and we ſhall do the like hereafter in ſome other ſubjects which require it. For we deſire that Men ſhould learn and perceive how ſevere a thing the true *Inquiſition* of *Nature* is; and ſhould accuſtom themſelves by the light of particulars, to enlarge their mindes to the amplitude of the World; and not to reduce the World to the narrowneſs of their Minds.

291. Experiment Solitary, touching the *Orient Colours in Diſſolution of Metals.*

Metals give *Orient* and *fine Colours* in *Diſſolution*: as *Gold* giveth an excellent Yellow, *Quick-ſilver* an excellent Green, *Tin* giveth an excellent Azure. Likewiſe in their *Putrefactions*, or *Ruſts* as *Vermilion*, *Verde-greaſe*, *Biſe*, *Cirrus*, &c. And likewiſe in their *Vitrifications*. The *Cauſe* is, for that by their ſtrength of Body, they are able to endure the Fire, or Strong-waters, and to be put into an equal poſture, and again, to retain part of their principal ſpirit: Which two things (equal poſture, and quick Spirits) are required chiefly, to make *Colours* lightſome.

292. Experiment Solitary, touching *Prolongation of Life.*

IT conduceth unto *Long Life*, and to the more placide Motion of the Spirits, which thereby do leſs prey and conſume the Juyce of the Body: either that *Mens actions be free and voluntary*, that nothing be done *in vitâ minerva*, but *ſecundum genium*; or on the other ſide, that the *Actions of Men be full of Regulation, and commands within themſelves*: For then the victory and performing of the command, giveth a good diſpoſition to the Spirits, eſpecially if there be a proceeding from degree to degree, for then the ſenſe of victory is the greater. An example of the former of theſe, is in a Country life; and of the latter, in *Monks* and *Philoſophers* and ſuch as do continually enjoyn themſelves.

293. Experiment Solitary, touching *Appetite of Union in Bodies.*

IT is certain, that in all Bodies, there is an *Appetite* of *Union*, and Evitation of Solution of Continuity, and of this *Appetite* there be many *degrees*, but the moſt remarkable, and fit to be diſtinguiſhed, are three. The firſt in *Liquors*, the ſecond in *hard Bodies*, and the third in *Bodies cleaving* or *Tenacious*. In *Liquors* this *Appetite* is weak; we ſee in *Liquors*, the *Threding* of them in *Stillicides* (as hath been ſaid) the *falling* of them in *Round Drops* (which is the form of *Union*) and the *ſtaying* of them for a little time in *Bubbles* and *Froth*. In the ſecond *degree* or *kind*, this *Appetite* is ſtrong; as in *Iron*, in *Stone*, in *Wood*, &c. In the third, this *Appetite* is in a *Medium* between the other two: For ſuch Bodies do partly follow the touch of another Body, and partly ſtick and continue to themſelves; and therefore they rope and draw themſelves in threds, as we ſee in *Pitch*, *Glew*, *Birdlime*, &c. But note, that all *ſolid Bodies* are *cleaving* more or leſs; and that they love better the touch of ſomewhat that is *Tangible*, than of *Air*. For *Water* in ſmall quantity cleaveth to any thing that is ſolid, and ſo would *Metal* too, if the weight drew it not off. And therefore *Gold Foliate*, or any *Metal Foliate*, cleaveth: But thoſe *Bodies* which are noted to be clammy, and cleaving, are ſuch as have a more indifferent *Appetite* (at once) to follow another *Body*, and to hold to themſelves. And therefore they are commonly *Bodies* ill mixed, and which take more pleaſure in a *Foreign Body*, than in preſerving their own *conſiſtence* and which have little predominance in *Drought* or *Moiſture*.

294. Experiment Solitary, touching the *like Operations of Heat and Time.*

Time and *Heat* are fellows in many effects. *Heat* drieth Bodies that do eaſily expire; as Parchment, Leaves, Roots, Clay &c. And ſo doth *Time* or *Age* areſo; as in the ſame Bodies, &c. *Heat* diſſolveth and melteth Bodies that keep in their *Spirits*, as in divers *Liquefactions*; and ſo doth *Time* in ſome Bodies of a ſofter conſiſtence: As is manifeſt in Honey, which by Age waxeth more liquid, and the like in Sugar; and ſo in old Oyl, which is ever more clear and more hot in medicinable uſe. *Heat* cauſeth the Spirits to ſearch ſome iſſue out of the Body, as in the *Volatility*

of

of *Metals*; and so doth *Time*, as in the *Rust* of *Metals*. But generally *Heat* doth that in small time, which *Age* doth in long.

295. Experiment Solitary touching the *Differing Operations of Fire, and Time.*

SOme things which pass the *Fire*, are softest at first, and by *Time* grow hard, as the Crum of Bread. Some are harder when they come from the *Fire*, and afterwards give again, and grow soft as the Crust of Bread, Bisket Sweet-Meats, Salt *&c.* The *cause* is, for that in those things which wax hard with *Time*, the work of the *Fire* is a kind of *melting*; and in those that wax soft with *Time*, (contrariwise) the work of the *Fire* is a kind of *Baking*; and whatsoever the *Fire* baketh, *Time* doth in some degree dissolve.

296. Experiment Solitary, touching *Motions by Imitation.*

Motions pass from one Man to another, not so much by exciting Imagination as by Invitation, especially if there be an Aptness or Inclination before. Therefore *Gaping* or *Yawning*, and *Stretching*, do pass from Man to Man; for that that causeth *Gaping* and *Stretching* is, when the Spirits are a little Heavy, by any Vapour, or the like. For then they strive (as it were) to wring out, and expel that which loadeth them. So Men drowzy and desirous to sleep; or before the fit of an Ague, do use to yawn and stretch, and do likewise yeild a *Voice* or *Sound*, which is an *Interjection* of *Expulsion*: So that if another be apt and prepared to do the like, he followeth by the sight of another. So the *Laughing* of another maketh to *Laugh.*

297. Experiment Solitary touching *Infectious diseases.*

THere be some known *Diseases* that are *Infectious*, and others that are not. Those that are *infectious*, are first, Such as are cheifly in the *Spirits*, and not so much in the *Humors*, and therefore pass easily from Body to Body; such are *Pestilences Lippitudes*, and such like. Secondly such as *Taint* the *Breath*, which we see paieth manifestly from Man to Man, and not invisibly as the affects of the *Spirits* do; such are *Consumptions* of the *Lungs*, &c. Thirdly such as come forth to the *Skin*, and therefore taint the *Air*, or the *Body adjacent*; especially, if they consist in an Unctuous substance, not apt to dissipate; such are *Scabs*, and *Leprosie*. Fourthly, such as are meerly in the *Humors*, and not in the *Spirits*, *Breath*, or *Exhalations*: And therefore they never infect, but by *Touch* onely; and such a *Touch* also, as cometh within the *Epidermis*, as the venome of the *French Pox*, and the biting of a *Mad-Dog*.

298. Experiment Solitary, touching the *Incorporation of Powders and Liquors.*

MOst *Powders* grow more close and coherent by *mixture* of *Water*, than by *mixture* of *Oyl*, though *Oyl* be the thicker Body; as *Meal* &c. The reason is the Congruity of Bodies, which if it be more, maketh a perfecter imbibition, and incorporation: which in most *Powders* is more between *them* and *Water*, than between *them* and *Oyl*: But *Painters colours* ground, and *Ashes*, do better incorporate with *Oyl*.

299. Experiment Solitary, touching *Exercise of the Body.*

MUch *Motion* and *Exercise* is good for some *Bodies*, and *sitting* and *Less motion*, for others. If the Body be hot, and void of superfluous Moistures, too much *Motion* hurteth; and it is an error in *Physitians*, to call too much upon *Exercise*. Likewise, Men ought to beware, that they use not *Exercise* and a *spare diet*, both; but if much *Exercise* then a *plentiful diet*; and if *sparing diet*, then little *Exercise*. The *Benefits* that come of *Exercise* are. First, that it sendeth *Nourishment* into the parts more forcibly. Secondly,

Secondly, that it helpeth to Excern by *Sweat*, and ſo maketh the Parts aſſimilate the more perfectly. Thirdly, that it maketh the *Subſtance* of the *Body* more *Solid* and *Compact*; And ſo leſs apt to be Conſumed and Depredated by the *Spirits*. The *Evils* that come of *Exerciſe*, are: Firſt, that it maketh the *Spirits* more hot and Predatory. Secondly, that it doth abor be likewiſe, and attenuate too much the Moiſture of the *Body*. Thirdly, that it maketh too great *Concuſſion*, (eſpecially if it be violent,) of the *Inward Parts*; which delight more in Reſt. But generally *Exerciſe*, if it be much, is no friend to *Prolongation* of *Life*; Which is one Cauſe, why *Women* live longer than *Men*, becauſe they ſtir leſs.

¶ 00. Experiment Solitary, touching *Meats that induce Satiety.*

Some *Food* we may uſe *long*, and *much*, without *Glutting*; As Bread, fleſh that is not fat, or rank, &c. Some other, (though pleaſant) *Glutteth* ſooner; As Sweet Meats, Fat Meats, &c. The *Cauſe* is, for that *Appetite* conſiſteth in the Emptineſs of the Mouth of the Stomack; Or poſſeſſing it with ſomewhat that is Aſtringent; And therefore Cold and Dry. But things that are *Sweet* and *Fat*, are more Filling: And do ſwim and hang more about the Mouth of the Stomack; and go not down ſo ſpeedily: And again turn ſooner to *Choler*, which is hot, and ever abateth the Appetite. We ſee alſo that another *Cauſe* of *Satiety*, is an *Over-cuſtome*, and of *Appetite* is *Novelty*: and therefore *Meats*, if the ſame be continually taken, induce *Loathing*. To give the Reaſon of the *Diſtaſt* of *Satiety*, and of the *Pleaſure* in *Novelty*; and to diſtinguiſh not onely in Meats and Drinks, but alſo in Motions, Loves, Company, Delights, Studies, what they be that *Cuſtome* maketh more grateful; And what more tedious; were a large Field. But for *Meats*, the Cauſe is *Attraction*, which is quicker, and more excited towards that which is new, than towards that whereof there remaineth a Reliſh by former uſe. (And generally) it is a Rule, that whatſoever is ſomewhat ingrate, at firſt, is made Grateful by *Cuſtome*; But whatſoever is too pleaſing at firſt, groweth quickly to *ſatiate*.

NATURAL HISTORY;

Century. IV.

ACCeleration of *Time*, in *Works* of *Nature*, may well be esteemed *Inter Magnalia Naturæ*. And even in *Divine Miracles*, *Accelerating* of the *Time*, is next to the *Creating* of the *Matter*. We will now therefore proceed to the enquiry of it; and for *Acceleration* of *Germination*, we will refer it over unto the place, were we shall handle the Subject of *Plants*, generally; and will now begin with other *Accelerations*.

Expetiments in Consort touching the *Clarification of Liquors, and the Accelerating thereof.*

Liquors are (many of them) at the first, thick and troubled; As *Must*, *Worts*, *Juices* of *Fruits*, or *Herbs* expressed, &c. And by *Time*, they settle, and clarifie. But to make them clear, before the *Time*, is a great work; for it is a spur to Nature, and putteth her out of her pace And besides, it is of good use for making *Drinks*, and *Sauces*, Potable, and Serviceable, speedily. But to know the *Means* of *Accelerating Clarification*, we must first know the *Causes* of *Clarification*. The first *Cause* is, by the *Separation* of the *grosser parts* of the *Liquor*, from the *finer*. The second, by the *equal distribution* of the *Spirits* of the *Liquor*, with the *Tangible parts*; for that ever representeth Bodies clear and untroubled. The third, by the *refining* the *Spirit it self*, which thereby giveth to the *Liquor*, more splendor, and more lustre. 301.

First, For *Separation:* It is wrought by *weight*; as in the ordinary residence or settlement of *Liquors*. By *Heat*, by *Motion*, by *Precipitation*, or *Sublimation*, (that is, a calling of the several parts, either up or down, which is a kind of *Attraction*,) by *Adhæsion*; as when a Body, more *Viscuous*, is mingled and agitated with the *Liquor*; which viscuous Body (afterwards 302.

wards severed) draweth with it the grosser parts of the *Liquor*: And lastly, by *Percolation* or *Passage*.

303. Secondly, For the *Even Distribution* of the *Spirits*, it is wrought by *gentle heat*, and by *Agitation* of *Motion*; (for of *Time* we speak not, because it is that we would anticipate and represent:) And it is wrought also by *mixture* of some other *Body*, which hath a vertue to open the *Liquor*, and to make the Spirits the better pass thorow.

304. Thirdly, For the *refining* of the *Spirits*, it is wrought likewise by *Heat*, by *Motion*, and by *Mixture* of some *Body*, which hath *Vertue to attenuate*. So therefore (having shewn the *causes*) for the *Accelerating* of *Clarification* ingeneral, and the *Enducing* of it; take these *Instances* and *Tryals*.

305. It is in common practice, to draw *Wine* or *Beer*, from the *Lees*, (which we call *Racking*) whereby it will *clarifie* much the sooner: For the *Lees*, though they keep the *Drink* in heart, and make it lasting; yet withal they cast up some spissitude: and this *Instance* is to be referred to *Separation*.

306. On the otherside, it were good to try, what, the adding to the *Liquor*, more *Lees* than his own, will work; for though the *Lees* do make the *Liquor* turbide, yet they refine the *Spirits*. Take therefore a Vessel of *New Beer*, and take another Vessel of *New Beer*, and rack the one Vessel from the *Lees*, and pour the *Lees* of the racked Vessel into the unracked Vessel, and see the effect. This *Instance* is referred to the *Refining* of the *Spirits*.

307. Take *New Beer* and put in some quantity of *Stale Beer* into it, and see whether it will not accelerate the *Clarification*, by opening the Body of the *Beer*, and cutting the grosser parts, whereby they may fall down into *Lees*. And this *Instance* again is referred to *Separation*.

308. The longer *Malt*, or *Herbs*, or the like, are infused in *Liquor* the more thick and troubled the *Liquor* is; but the longer they be decocted in the *Liquor*, the clearer it is. The reason is plain, because in *Infusion*, the longer it is, the greater is the part of the gross body that goeth into the *Liquor*: But in *Decoction* though more goeth forth, yet it either purgeth at the top or settleth at the bottom. And therefore the most exact way to *clarifie* is, first, to *Infuse*, and then to take off the *Liquor* and *Decoct* it; as they do in *Beer*, which hath *Malt* first infused in the *Liquor*, and is afterwards boiled with the Hop. This also is referred to *Separation*.

309. Take *hot Embers*, and put then about a Bottle filled with *New Beer*, almost to the very neck; let the Bottle be well stopped, lest it fie out: And continue it, renewing the *Embers* every day by the space of ten days, and then compare it with another Bottle of the same *Beer* set by. Take also Lime both *quenched* and *unquenched*, and set the Bottles in them *ut supra*. This *Instance* is referred both to the *even Distribution*, and also to the *Refining* of the *Spirits* by *Heat*.

310. Take *Bottles* and *Swing* them or *Carry* them in a *Wheel-Barrow* upon *rough Ground*, twice in a day: But then you may not fill the *Bottles* full, but leave some Air; for if the *Liquor* come close to the stopple, it cannot play nor flower: And when you have shaken them well either way, pour the *Drink* into another Bottle, stopped close after the usual manner: for if it stay with much Air in it, the *Drink* will pall, neither will it settle so perfectly in all the parts. Let it stand some Twenty four hours, then take it, and put it again into a *Bottle* with *Air ut supra*; and thence into a *Bottle stopped ut supra*; and so repeat the same *opperation* for seven dayes. Note that in the emptying of one Bottle into another; you must do it swiftly, lest the *Drink* pall.

pall: it were good also to try it in a *Bottle* with a little Air below the Neck without emptying. This *Instance* is referred to the *even Distribution* and *Refining* of the *Spirits* by *Motion*.

311. As for *Percolation, inward*, and *outward* (which belongeth to *Separation*,) Tryal would be made of *Clarifying* by *Adhesion*, with Milk put into *New Beer*, and stirred with it: For it may be, that the grosser part of the *Beer* will cleave to the *Milk*; the doubt is, whether the *Milk*, will serve well again which is soon tried. And it is usual in *Clarifying Ippocrasse* to put in *Milk*, which after severeth and carrieth with it the *grosser parts* of the *Ippocrass*, as hath been said elsewhere. Also for the better *Clarification* by *Percolation*; when they Tun *New Beer*, they use to let it pass through a *Strainer*, and it is like the finer the *Strainer* is, the clearer it will be.

312. Experiment in Consort touching *Maturation*, and the *Accelerating* thereof. *And first touching the Maturation and Quickning of drinks and next touching the Maturation of Fruits.*

THe *Accelerating* of *Maturation*, we will now enquire of, and of *Maturation* it self, It is of three natures, the *Maturation* of *Fruits*, the *Maturation* of *Drinks*, and the *Maturation* of *Imposthumes* and *Ulcers*. This last we refer to another place, where we shall handle *Experiments Medicinal*. There be also other *Maturations*, as of *Metals*, &c. Whereof we will speak as occasion serveth. But we will begin with that of *Drinks*, because it hath such affinity with the *Clarification* of *Liquors*.

For the *Maturation* of *Drinks*, it is wrought by the *Congregation* of the *Spirits* together, whereby they digest more perfectly the grosser parts, and it is effected, partly by the same means that *Clarification* is (whereof we speak before:) But then note, that as extream *Clarification* doth spread the *Spirits* so smooth, as they become dull; and the *Drink* dead, which ought to have a Flowting. And therefore all your clear *Amber drink* is flat.

313. We see the degrees of *Maturation* of *Drinks*, in *Must* in *Wine*, as it is drunk, and in *Vinegar*. Whereof *Must* hath not the *Spirits* well congregated. Wine hath them well united, so as they make the parts somewhat more Oyly. *Vinegar* hath them congregated, but more Jejune, and in smaller quantity; the greatest and finest Spirit and part being exhaled: For we see *Vinegar* is made by setting the Vessel of *Wine* against the hot Sun. And therefore *Vinegar* will not burn, for that much of the finer part is exhalted.

314. The *Refreshing* and *Quickning* of *Drink* palled or dead, is by *Enforcing* the *Motion* of the *Spirit*. So we see that open weather relaxeth the *Spirit*, and maketh it more livelier in *Motion*. We see also *Bottling* of *Beer* or *Ale*, while it is new and full of *Spirit* (so that it spirteth when the stopple is taken forth) maketh the *Drink* more quick and windy. A *Pan* of *Coals* in the *Cellar* doth likewise good, and maketh the *Drink* work again. *New Drink* put to *Drink* that is *Dead*, provoketh it to work again: Nay, which is more (as some affirm) *A Brewing* of *New Beer*, set by *Old Beer*, maketh, it work again: it were good also to *enforce* the *Spirits* by some *Mixture*, that may excite and quicken them, as by the putting into the *Bottles*, *Nitre*, *Chalk*, *Lime*, &c. We see *Cream* is *Matured*, and made to rise more speedily by putting in *cold Water*; which, as it seemeth, getteth down the *Whey*.

315. It is tryed, that the *Burying* of *Bottles* of *Drink* well stopped, either in *dry Earth*, a good depth; Or in the *bottome* of a *Well within Water*; And best of

of all, the *hanging* of them in a *deep Well* ſomewhat *above the Water*, for ſome fortnights ſpace, is an excellent *means* of making *Drink* freſh and quick, For the *cold* doth not cauſe any exhaling of the *Spirits* at all, as *heat* doth, though it rarifieth the reſt that remain: But *cold* maketh the *Spirits* vigorous, and irritateth them, whereby they incorporate the parts of the *Liquor* perfectly.

316. As for the *Maturation* of *Fruit*, it' is wrought by the *calling forth of the Spirits of the Body outward*, and ſo *ſpreading* them more *ſmoothly*, and likewiſe by *digeſting*, in ſome degree, the *groſſer parts*: And this is effected by *Heat*, *Motion*, *Attraction*, and by a *Rudiment* of *Putrefaction*: For the Inception of *Putrefaction* hath in it a *Materation*.

317. There were taken *Apples* and laid in *Straw*, in *Hay*, in *Flower*, in *Chalk*, in *Lime*, covered over with *Onions*, covered over with *Crabs*, cloſed up in *Wax*, ſhut in a *Box*, &c. There was alſo an *Apple* hanged up in *ſmoak*. Of all which the *Experiments* ſorted in this manner.

318. After a moneths ſpace, the *Apple*, encloſed in *Wax*, was as Green and freſh as at the firſt putting in, and the *Kernels* continued White. The *cauſe* is, for that all *excluſion* of *open Air*, (which is ever predatory) maintaineth the Body in his firſt freſhneſs and moiſture; but the inconvenience is, that it taſteth a little of the *Wax*, which, I ſuppoſe, in a *Pomegranate*, or ſome ſuch thick coated *fruit*, it would not do.

319. The *Apple* hanged in the *ſmoak*, turned like an old *Mellow-Apple* wrinkled, dry, ſoft, ſweet yellow within. The *cauſe* is, for that ſuch a degree of *heat*, which doth neither melt nor ſcorch (for we ſee that in a greater heat, a *roaſt Apple* ſoftneth and melteth, and *Pigs feet* made of quarters of *Wardens*, ſcortch and have a skin of coal) doth Mellow, and not adure: The *ſmoak* alſo maketh the *Apple* (as it were) ſprinkled with *Soot*, which helpeth to *Mature*. We ſee that in *drying* of *Pears* and *Prunes*, in the Oven, and removing of them often as they begin to ſweat, there is a like operation: but that is with a far more intenſe degree of heat.

320. The *Apples* covered in the *Lime* and *Aſhes* were well *matured* as appeared both in their yallowneſs and ſweetneſs. The cauſe is, for that that *Degree* of *Heat*, which is in *Lime* and *Aſhes*, (being a ſmoothering *heat*) is of all the reſt moſt proper; for it doth neither Liqueſie nor Areſie, and that is true *Maturation*. Note, that the taſte of thoſe *Apples* was good, and therefore it is the *Experiment* fitteſt for uſe.

321. The *Apples covered* with *Crabs* and *Onions*, were likewiſe well *Matured*. The cauſe is not any *heat*, but for that the *Crabs* and the *Onions* draw fourth the *Spirits* of the *Apple*, and ſpread them equally thorowout the Body; which taketh away hardneſs. So we ſee one *Apple* ripeneth againſt another: And therefore in making of *Cider*, they turn the *Apples* firſt upon a heap; ſo one *Cluſter* of *Grapes* that toucheth another whileſt it groweth, ripeneth faſter *Botrus contra Botrum citius matureſcit*.

322. The *Apples* in *Hay* and the *Straw*, ripened apparently, though not ſo much as the other, but the *Apple* in the *Straw* more. The cauſe is, for that the *Hay* and *Straw* have a very low degree of *Heat*, but yet cloſe and ſmoothering, and which dryeth not.

322. The *Apple* in the *cloſe Box* was ripened alſo. The *cauſe* is, for that all Air kept cloſe, hath a degree of warmth; as we ſee in *Wool*, *Fur*, *Pluſh*, &c.

Note,

Note, that all these were compared with another Apple *of the same kind that lay of it self; and in comparison of that, were more sweet, and more yellow, and so apeared to be more ripe.*

324. Take an *Apple*, or *Pear*, or otherlike *Fruit*, and *Roul* it upon a Table hard: We see in common experience, that the *Rouling* doth soften and sweeten the *Fruit* presently, which is nothing but the *smooth distribution* of the *Spirits* into the parts; for the *unequal distribution* of the *Spirits* maketh the harrishness: But this hard *Rouling* is between *Concoction* and a *simple Maturation*; therefore, if you should *Roul* them but gently perhaps twice a day, and continue it some seven days, it is like they would *Mature* more finely, and like unto the *Natural* Maturation.

325. Take an *Apple*, and cut out a piece of the top, and cover it, to see whether that *Solution of Continuity* will not hasten a *Maturation*. We see that where a *Wasp*, or a *Fly*, or a *Worm*, hath bitten in a *Grape*, or any *Fruit* it will sweeten hastily.

326. Take an *Apple* &c. and prick it with a *Pin* full of *Holes*, not deep, and smear it a little with *Sack*, or *Cinnamon Water*, or *Spirit of Wine*, every day for ten days, to see if the *Virtual Heat of the Wine* or *Strong-Waters*, will not *Mature* it.

In these Tryals *also, as was used in the first, set another of the same* Fruit *by, to compare them, and try them by their* Yellowness, *and by their* Sweetness.

Experiments Solitary, touching the *Making of Gold*.

THe World hath been much abused by the opinion of *Making of Gold*. The *Work* it self, I judge to be possible: but the *Means* (hitherto propounded) to effect it, are in the Practice, full of Error and imposture; and in the Theory, full of unsound Imaginations. For to say that *Nature* hath an intention to make all Metals *Gold*; and that if she were delivered from Impediments, she would perform her own work; and that if the Crudities, Impurities, and Leprosies of *Metals* where cured, they would become *Gold*, and that a little *Quantity* of the *Medicines* in the work of *Projection*, will turn a Sea of the *baser* Metal into *Gold* by *Multiplying*. All these are but dreams, and so are many other Grounds of *Alchymy*. And to help the matter, the *Alchymists* call in likewise many vanities, out of *Astrology*, *Natural Magick*, Superstitious Interpretations of *Scriptures*, Auricular *Traditions*, Feigned Testimonies of *Ancient Authors*, and the like. It is true, on the other side they have brought to light not a few profitable *Experiments*, and thereby made the world some amends: But we, when we shall come to handle the *Version* and *Transmutation* of *Bodies*, and the *Experiments* concernnig *Metals* and *Minerals*; will lay open the true Ways and Passages of *Nature* which may lead to this great effect. And we commend the wit of the *Chineses*, who dispair of making of *Gold*, but are mad upon the making of *Silver*. For certain it is, that it is more difficult to make *Gold* (which is the most ponderous and materiate amongst *Metals*) of other *Metals*, less pondrous and less materiate, than (*Via versa*) to make *Silver*, of *Lead*, or *Quick-silver*; both which are more pondrous than *Silver*: So that they need rather a further degree of *Fixation*, than any *Condensation*. In the mean time, by occasion of handling the *Axioms* touching *Maturation* we will direct a *Tryal* touching the *Maturing* of *Metals*, and thereby turning some of them into *Gold*; for we conceive indeed, that a perfect good *Concoction*, or *Digestion*, or *Maturation* of some *Metals* will produce *Gold*. And here we call to mind, that we knew a *Dutch-man* that had wrought himself into the belief of a great

great person, by undertaking, that he could make *Gold*: VVhose discourse was, That *Gold* might be made, but that the *Alchymists* over-fired the work: For (he said) the *making* of *Gold* did require a very temperate *Heat*, as being in *Nature* a subterrany work, where little *Heat* cometh; but yet more to the *making* of *Gold*, than of any other *Metal*: And therefore, that he would do it with a great Lamp, that should carry a temperate and equal Heat, and that it was the work of many Moneths. The devise of the Lamp was folly, but the over-firing now used, and the equal Heat to be required, and the making it a work of some good time, are no ill discourses.

We resort therefore to our *Axioms* of *Maturation*, in effect touched before.

The first is, That there be *used a Temperate Heat*; for they are ever *Temperate Heats* that *Digests*, and *Mature*; wherein we mean *Temperate*, according to the *Nature* of the *Subject*: For that may be *Temperate* to *Fruits* and *Liquors*, which will not work at all upon *Metals*.

The Second is, That the *Spirit of the Metal be quickned*, and the *Tangible Parts opened*: For without those two operations, the *Spirit* of the *Metal*, wrought upon, will not be able to digest the Parts.

The third is, That the *Spirits do spread themselves even*, and *move not subsultorily*, for that will make the parts close and pliant. And this requireth a Heat that doth not rise and fall, but continue as *equal* as may be.

The fourth is, That *No part of the Spirit be emitted but detained*; For if there be *Emission* of *Spirit*, the Body of the *Metal* will be hard and churlish. And this will be performed, partly by the temper of the Fire, and partly by the closeness of the Vessel.

The fifth is, That there be *choice made of the likeliest and best prepared Metal for the Version*; for that will facilitate the VVork.

The sixth is, that you give time enough for the VVork, not to prolong hopes (as the Alchymists do,) but indeed to give *Nature* a convenient space to work in.

These principles are most certain and true, we will now derive a direction of *Tryal* out of them, which may (perhaps) by further Meditation be improved.

327. Let there be a *small Furnace* made of a *Temperate Heat*; let the *Heat* be such as may keep the *Metal perpetually molten*, and no more; for that above all, importeth to the Work: For the Material, take *Silver*, which is the *Metal*, that in Nature, symbolizeth most with *Gold*; put in also, with the *Silver* a tenth part of *Quick-silver*, and a twelfth part of *Nitre* by weight: Both these to quicken and open the Body of the *Metal*: and so let the VVork be continued by the *space of six months*, at the least. I wish also, That there be at sometimes an Injection of some *Oyled* Substance; such as they use in the recovering of *Gold*, which by vexing with Separations hath been made churlish: And this is, to lay the parts more close and smooth, which is the main work. For *Gold* (as we see) is the closest (and therefore the heaviest) of *Metals*; and is likewise the most flexible and tensible. Note, that to think to make *Gold* of *Quick-silver*, because it is the heaviest, is a thing not to be hoped; for *Quick-silver* will not endure the manage of the *Fire*: Next to *Silver*, I think *Copper* were fittest to be the *Material*.

Gold

328. Experiment Solitary, touching *Nature of Gold.*

Gold hath these *Natures: Greatness of Weight, Closeness of Parts, Fixation, Pliantness* or *Softness, Immunity from Rust, Coleur* or *Tincture of Yellow.* Therefore the sure way (though most about) to make *Gold*, is to know the *Causes* of the several *Natures* before rehearsed, and the *Axioms* concerning the same. For if a Man can make a *Metal* that hath all these *Properties*, let Men dispute, whether it be *Gold*, or no?

Experiment in Consort touching *Inducing and Accelerating of Putrefaction.*

The *Inducing* and *Accelerating of Putrefaction*, is a subject of a very Universal Enquiry. For *Corruption* is a Reciprocal to *Generation*; and they two are as *Natures* to *Terms* or *Boundaries*, and the *Guides* to *Life* and *Death*; *Putrefaction* is the Work of the *Spirits of Bodies*, which ever are unquiet to *Get forth*, and *Congregate* with the *Air*, and to enjoy the *Sun-beams.* The *Getting forth*, or spreading of the *Spirits*, which is a degree of *Getting forth*) have five differing *Operations.* If the *Spirits* be detained within the Body, and move more violently, there followeth *Colliquation*; as in *Metals*, &c. If more mildely, there followeth *Digestion*, or *Maturation*; as in *Drinks* and *Fruits.* If the *Spirits* be not meerly detained, but Protrude a little, and that Motion be confused, and inordinate there followeth *Putrefaction*; which ever dissolveth the Consistence of the Body into much inequality; as in *Flesh*, *Rotten Fruits*, *Shining Wood*, &c, and also in the *Rust* of *Metals.* But if that Motion be in a certain order there followeth *Vivification* and *Figuration*; as both in *Living Creatures* bred of *Putrefaction*, and in *Living Creatures perfect.* But if the *Spirits* issue out of the Body, there followeth *Desiccation*, *Induration*, *Consumption*, &c. As in Brick, evaporation of *Bodies Liquid*, &c.

319. The *Means* to *induce* and *accelerate Putrefaction*, are, First, By *adding some crude or Watry moisture*; as in Wetting of any Flesh, Fruit, Wood, with Water, &c. For contrariwise, *Unctuous* and *Oyly Substances* preserve.

330. The second is, By *Invitation or Excitation*; as when a *rotten Apple* lieth close to another Apple that is *Sound*; or when *Dung* (which is a substance already putrified) is added to other Bodies. And this is also notably seen in *Church-yards*, where they bury much; where the Earth will consume the *Corps*, in far shorter time than other earth will.

331. The third is, By *Closeness* and *Stopping*, which detaineth the *Spirits* in *Prison*, more then they would, and thereby irritateth them to seek issue; as in Corn and Cloaths which wax musty; and therefore open Air (which they call *Aer perstabilis*) doth preserve: And this doth appear more evidently in *Agues*, which come (most of them) of *obstructions* and *Penning Humours*, which thereupon *Putrefie.*

332. The fourth is, By *Solution of Continuity*; as we see an Apple will rot sooner, if it be cut or pierced, and so will Wood, &c. And so the flesh of Creatures alive, where they have received any wound.

333. The fifth is, Either by the *Exhaling*, or by the *driving back* of the *Principal Spirits*, which preserve the consistence of the *Body*, so that when their Government is dissolved, every *part* returneth to his Nature, or Homogeny. And this appeareth in *Urine* and *Blood*, when they cool and thereby break. It appeareth also in the *Gangreen* or *Mortification* of *Flesh*, either by *Opiates*, or by *Intense Cold.* I conceive also, the same effect

is in *Pestilences*, for that the *malignity* of the infecting vapour, daunteth the *Principal Spirits*, and maketh them flie, and leave their *Regiment*; and then the *Humours*, *Flesh*, and *Secondary Spirits*, do dissolve, and break, as in an *Anarch*.

334. The sixth is, when a *Forreign Spirit, stronger and more eager than the Spirit of the Body, entreth the Body*, as in the stinging of the Serpents: this is the *Cause* (generally) that upon all *Poysons* followeth *swelling*; and we see *Swelling* followeth also, when the *Spirits* of the Body it self congregate too much; as upon *Blows* and *Bruises*, or when they are *pent in too much*, as in *Swelling* upon *Cold*. And we see also, that the *Spirits* coming of *Putrefaction* of *Humors* in *Agues*, &c. which may be counted as *Forreign Spirits*, though they be bred within the Body, do extinguish and suffocate the *Natural Spirits* and *heat*.

335. The seventh is, By such a *Weak degree of heat, as setteth the spirits in a little Motion, but is not able either to digest the parts, or to issue the Spirits*, as is seen in flesh kept in a room that is not cool; whereas in a cool and wet Larder it will keep longer. And we see, that *Vivification* (whereof *Putrefaction* is the *Bastard Brother*) is effected by such soft heats; as the hatching of Eggs, the heat of the Womb, &c.

336. The eight is, By the *Releasing of the Spirits* which before were close kept by the solidness of their coverture, and thereby their appetite of issuing checked; as in the *Artificial Rusts* induced by Stong waters in *Iron*, *Lead*, &c. And therefore *Wetting* hastneth *Rust* or *Putrefaction* of any thing, because it softneth the Crust for the *Spirits* to come forth.

337. The ninth is by the *Enterchange of heat and cold*, or *wet and dry*; as we see in the Mouldring of earth in Frosts, and Sun; and in the more hasty rotting of Wood, that is sometimes wet, sometimes dry.

338. The tenth is, By *time, and the work, and procedure of the Spirits themselves*, which cannot keep their station; especially, if they be left to themselves, and there be not Agitation or Local Motion. As we see in Corn not stirred, and Mens Bodies not exercised.

339. All *Moulds* are inceptions of *Putrefaction*; as the *Moulds* of *Pyes* and *Flesh*, the *Moulds* of *Orenges* and *Lemmons*, which *Moulds* afterwards turn into Worms, or more odious *Putrefactions*: And therefore (commonly) prove to be of ill odor. And if the Body be liquid, and not apt to putrefie totally, it will cast up a *Mother* in the top; as the *Mothers* of *distilled waters*.

340. *Moss* is a kind of *Mould* of the Earth and Trees: But it may be better sorted as a *Rudiment* of *Germination*, to which we refer it.

Experiments in Consort, touching *Prohibiting and preventing Putrefaction.*

IT is an *Enquiry* of excellent use to enquire of the *Means* of *Preventing* or *Staying Putrefaction*; for therein consisteth the *Means* of *Conservation* of *Bodies*: For *Bodies* have two kinds of *Dissolutions*, the one by *Consumption* and *Desiccation*, the other by *Putrefaction*. But as for the *Putrefactions* of the *Bodies* of *Men* and *Living Creatures* (as in Agues, Worms, Consumptions of the Lungs, Imposthumes, and Ulcers, both inwards and outwards) they are a great *part of Physick* and *Surgery*: And therefore we will reserve the *Enquiry* of them to the proper place, where we shall handle *Medicinal Experiments* of all sorts. Of the rest, which will now enter into an enquiry, wherein much light may be taken from that which hath been said of the *Means* to *Enduce* or *Accelerate Putrefaction*: For the removing that which caused *Putrefaction*, doth prevent and avoid *Putrefaction*.

341. The first *Means of prohibiting or checking Putrefaction is cold*; for so we see that Meat and Drink will last longer, unputrified, or unsowred, In Winter than in Summer: And we see that Flowers, and Fruits; put in conservatories of Snow, keep fresh. And this worketh by the *Detention* of the *Spirits*, and *constipation* of the *Tangible parts*.

342. The second is *Astriction*: For *Astriction* prohibiteth *Dissolution*; as we see (generally) in *Medicines*, whereof such as are *Astringents* do inhibit *Putrefaction*: And by the same reason of *Astringency*, some small quantity of Oyl of Vitriol, will keep fresh water long from *putrifying*. And this *Astriction* is in a substance that hath a *Vertual cold*, and it worketh (partly) by the same means that cold doth.

343. The third is, The excluding of the *Air*, and again, the *exposing* to the *Air*: For these contraries, (as it cometh often to pass) work the same effect, according to the nature of the Subject matter. So we see, that *Beer* or *Wine* in Bottles close stopped, last long; that the *Garners under Ground* keep Corn longer, than those above Ground; and that *Fruit closed in Wax*, keepeth fresh: And likewise, *Bodies* put in *Honey*, and *Flower*, keep more fresh: And *Liquors*, *Drinks*, and *Juyces*, with a little *Oyl* cast on the top, keep fresh. Contrariwise, we see that Cloath and *Apparel*, not *aired*, do breed Moths and Mould; and the Diversity is, that in *Bodies* that need *Detention of Spirits*, the *Exclusion of the Air* doth good; as in *Drinks*, and *Corn*: But in *Bodies* that need *Emission of Spirits*, to discharge some of the superfluous moisture, it doth hurt, for they require *airing*.

344. The fourth is *Motion*, and *Stirring*; for *Putrefaction* asketh *Rest*: For the subtil *Motion* which *Putrefaction* requireth is disturbed by any *Agitation*, and all *Local* *Motion* keepeth *Bodies* integral, and their parts together: As we see, that turning over of Corn in a Garner, or Letting it run like an Hour-Glass, from an upper Room into a Lower, doth keep it sweet: And running Waters putrifie not; and in mens Bodies exercise hindreth *Putrefaction*; and contrariwise *Rest*, and want of *Motion* or stoppings (whereby the running of Humors, or the *Motion* of Perspiration, is stayed) further *Putrefaction*, as we partly touched a little before.

345. The fifth is, The *Breathing forth of the Adventitious Moisture in Bodies*, for as *wetting* doth hasten *Putrefaction*: so *convenient drying* (whereby the more *Radical* *Moisture* is onely kept in) putteth back *Putrefaction* So we see that *Herbs* and *Flowers*, if they be dried in the shade, or dried in the hot Sun, for a small time keep best. For the *Emission* of the *loose* and *adventitious* *Moisture*, doth betray the *Radical* *Moisture*, and carryeth it out for company.

346. The sixth is, The *strengthening of the Spirits of Bodies*; for as a *Great Heat* keepeth Bodies from *Putrefaction*; but a *tepide heat* enclineth them to *Putrefaction*: So a strong *Spirit* likewise preserveth, and a weak or faint *Spirit* disposeth to *corruption*. So we find, that Salt-water corrupteth not so soon as fresh; and salting of Oysters, and powdring of Meat, keepeth them from *Putrefaction*. It would be tryed also, whether *Chalk* put into *Water*, or *Drink*, doth not preserve it from *Putrefying*, or speedy Souring. So we see that *Strong-Beer* will last longer than small, and all things, that are hot and aromatical, do help to preserve Liquors, or Powders, &c. which they do as well by strengthning the *Spirits*, as by soaking out the loose *Moisture*.

347. The seventh is, *Separation of the cruder Parts*, and thereby *making the Body more equal*; for all unperfect mixture is apt to *Putrifie*, and Watry substances are more apt to *Putrifie*, than oyly. So we see distilled Waters will last longer than raw Waters, and things that have passed the Fire, do last longer than those that have not passed the Fire; as dried Pears, &c.

348. The eighth is, The *drawing forth continually of that part, where the Putrefaction beginneth:* Which is (commonly) *the loose and watry moisture*, not only for the reason before given, that it provoketh the radical moisture to come forth with it; but because being detained in the Body, the *Putrefaction* taking hold of it, infecteth the rest: As we see in the *Embalming* of *Dead Bodies*. And the same reason is, of *Preserving Herbs*, or *Fruits*, or *Flowers*, in *Bran* or *Meal*.

349. The ninth is, The *commixture of any thing that is more oyly or sweet*: For such *Bodies* are least apt to *putrifie*, the *Air* working little upon them, and they not putrifying preserve the rest. And therefore we see Syrrups and *Oyntments* will last longer than *Juyces*.

350. The tenth is, The *commixture of somewhat that is dry*; for *Putrefaction* beginneth first from the *Spirits*, and then from the *moisture*; and that that is dry, is unapt to putrifie. And therefore smoak preserveth flesh as we see in Bacon, and Neats-Tongues, and Martlemas-Beef, *&c.*

351. The opinion of some of the *Ancients*, That *blown Airs* do preserve Bodies longer than other *Airs*, seemeth to me probable; for that the *blown Airs*, being over-charged and compressed, will hardly receive the exhaling of any thing, but rather repulse it. It was tryed in a *blown Bladder*, whereinto flesh was put, and likewise a Flower, and it sorted not: For *dry Bladders* will not *blow*, and *new Bladders* rather further *Putrefaction*. The way were therefore, to blow strongly with a pair of Bellows, into a Hogshead, putting into the Hogshead (before) that which you would have preserved; and in the instant that you withdraw the Bellows, stop the hole close.

352. Experiment solitary, touching *Wood shining in the dark*.

THe *Experiment* of *Wood* that *shineth* in the *dark*, we have diligently driven and pursued: The rather, for that of all things that give light here below, it is the most durable, and hath least apparent motion. Fire and *Flame* are in continual expence; *Sugar* shining onely while it is in scraping; and *Salt-water* while it is in dashing; *Glo-worms* have their shining while they live, or a little after; onely *Scales* of *Fishes* (putrified) seem to be of the same nature with *shining Wood*. And it is true, that all *Putrefaction* hath with it an inward motion, as well as *Fire* or *Light*. The *tryal* sorted thus.

1. The *shining* is in some pieces more *bright*, in some more *dim*: but the most *bright* of all doth not attain to the *light* of a *Glo-worm*; 2. The Woods that have been tryed to shine, are chiefly *Sallow* and *Willow*; also, the *Ash* and *Hasle*, it may be it holdeth in others. 3. Both, *Roots*, and *Bodies* do shine, but the *Roots* better. 4. The *colour* of the *shining part* by day-light, is in some pieces *White*, in some pieces inclining to red; which in the Country they call the *White* and *Red Carret*. 5. The part that shineth, is (for the most part) somewhat *Soft*, and *moist* to feel to; but some was found to be *Firm* and *hard*; so as it might be figured into a Cross, or into Beads, &c. But you must not look to have an Image, or the like, in any thing that is Lightsom, for even a Face in Iron red hot, will

will not be seen, the light confounding the small differences of lightsome and darksome, which shew the figure. 6. There was the *shining part pared off*, till you came to that, that did not shine, but within two days the *part contiguous* began also to *shine*, being laid abroad in the Dew; as it seemeth the putrefaction spreadeth. 7. There was other dead *Wood* of like kind was *Laid abroad*, which *shined* not at the first; but after a nights lying abroad, began to *shine*. 8. There was other *Wood* that did *first shine*, and being laid dry in the House within five or six days *Lost* the *shining*; and laid abroad again *recovered* the *shining*. 9. *Shining Woods* being laid in a *dry Room*, within a seven night lost their shining; but being laid in a *Celler*, or *dark Room*, kept the *shining*. 10. The *Boring of holes* in that kinde of Wood, and then laying it abroad, seemeth to conduce to make it *shine*; the *cause* is, for that all *solution* of *continuity*, doth help on *putrefaction*, as was touched before. 11. No *Wood* hath been yet tryed to *shine* that was cut *down alive*, but such as was *rotted* both in Stock and Root while it grew. 12. Part of the *Wood*, that *shined*, was *steeped in Oyl* and retained the *shining* a fortnight. 13. The like succeeded in some *steeped* in *Water* and much better. 14. How long the *shining* will contiue, if the *Wood* be *Laid abroad every night*, and *taken in* and *sprinkled* with *Water* in the *day*, is not yet tryed. 15. Tryal was made of *Laying it abroad in frosty weather*, which hurt it not. 16. There was a great *piece* of a *Root*, which did shine, and the *shining part* was *cut off*, till no more shined; yet after two nights, though it were kept in a dry Room, it got a *shining*.

353. Experiment Solitary touching the *Acceleration of Birth.*

THe *Bringing forth* of *Living Creatures* may be *Accelerated* in two respects: The one, if the *Embryon ripeneth* and perfecteth sooner; the other, if there be some cause from the *Mothers Body* of *Expulsion* or putting it down, Whereof the former is good and argueth strength, the latter is ill, and cometh by accident or disease. And therefore the Ancient *Observation* is true, that the *Child born in the seventh month*, doth commonly well; but *Born in the Eighth Month*, doth (for the most part) die. But the *cause* assigned is fabulous, which is, That in the Eighth Moneth should be the turn of the reign of the *Planet Saturn*, which (as they say) is a Planet malign; whereas in the Seventh is the reign of the *Moon*, which is a Planet propitious. But the true *cause* is, for that where there is so great a prevention of the ordinary time, it is the *Lustiness* of the *Child*. but when it is less, it is some *indisposition* of the *Mother*.

354. Experiment Solitary, touching the *Acceleration of Growth and Stature.*

TO *Accelerate Growth* or *Stature*, it must proceed, either from the *Plenty* of the *Nourishment*, or, from the *Nature* of the *Nourishment*, or from the *Quickning* and *Exciting* of the *Natural heat*. For the first *Excess* of *Nurishment*, is hurtful; for it maketh the Child corpulent, and growing in bredth, rather than in height. And you may take an Experiment from *Plants*, which if they spred much, are seldome tall. As for the *Nature* of the *Nourishment*; First, it may not be too dry, and therefore Children in Dairy Countreyes do wax more tall, than where they feed more upon Bread and Flesh. There its also a received tale, that boyling of *Daise-Roots* in *Milk* (which it is certain are great dryers) will make *Dogs* little. But so much is true, That an *over-dry Nourishment*, in Childhood putteth back Stature. Secondly, The *Nourishment* must be of an *opening*

Nature; for that attenuateth the Juyce, aud furthereth the Motion of the Spirits upwards. Neither is it without cause, that *Xenophon* in the *Nourture* of the *Persian Children*, doth so much commend their feeding upon *Cardamon*, which (he saith) made them grow better, and be of a more active habit. *Cardamon* is in Latin, *Nasturtium*, and with us *Water-cresses*; which it is certain, is an Herb, that whilst it is young, is friendly to Life. As for the *Quickning* of *Natural Heat* it must be done chiefly with *exercise*; and therefore (no doubt) much going to School, where they sit so much, hindreth the *Growth* of *Children*; whereas Country-People, that go not to School, are commonly of better stature. And again, Men must beware how they give *Children* any thing that is *cold* in operation; for even *Long sucking* doth hinder both Wit and *Stature*. This hath been tryed, that a Whelp that hath been fed with *Nitre* in *Milk*, hath become very little, but extream lively: For the *Spirit* of *Nitre* is *cold*. And though it be an excellent Medicine in strength of years for Prolongation of Life; yet it is in Children and young Creatures an enemy to *growth*; and all for the same reason, For *Heat* is requisite to Growth. But after a man is come to his middle age, *Heat* consumeth the Spirits; which the coldness of the Spirit of *Nitre* doth help to condence and correct.

Experiments in Consort touching *Sulphure and Mercury*, two of Paracelsus *Principles*.

THere be two *Great Families* of *Things*, you may term them by several names, *Sulphureous* and *Mercurial*, which are the *Chymists* words: (For as for their *Sal* which is their third Principle, it is a Compound of the other Two) *Inflamable*, and *Not Inflamable*; *Mature* and *Crude*, *Oyly* and *Watry*: For we see that in *Subterranies* there are, as the *Fathers* of their *Tribes Brimstone* and *Mercury*; In *Vegetables* and *Living* Creatures, there is *Water* and *Oyl*; in the *Inferior order* of *Pneumaticals*, there is *Air* and *Flame*; and in the *Superior*; there is the *Body* of the *Star*, and the *Pure Sky*. And these Pairs, though they be unlike in the Primitive Differences of Matter, yet they seem to have many consents; for *Mercury* and *Sulphure* are principles Materials of *Metals*; *Water* and *Oyl* are principal Materials of *Vegetables* and *Animals*, and seem to differ but in *Maturation* or *Concoction*. *Flame* (in Vulgar Opinion) is but *Air incensed*, and they both have quickness of Motion, and facility of Cession, much alike: And the *Interstellar Sky*. (though the opinion be vain, that the *Star* is the *Denser Part* of his *Orb*,) hath notwithstanding so much affinity with the *Star*, that there is a rotation of that, as well as of the *Star*. Therefore, it is one of the geatest *Magnalia Naturæ*, to turn *Water* or *Watry Juyce* into *Oyl* or *Oyly* Juyce: Greater in Nature, than to turn *Silver* or *Quick-silver* into *Gold*.

355. The Instances we have wherein *Crude* and *Watry* substance, turneth into *Fat* and *Oyly*, are of four kinds. First, in the *Mixture* of *Earth* and *Water*, which mingled by the help of the Sun, gather a Nitrous Fatness more than either of them have severally; As we see, in that they put forth *Plants*, which need both Juyces.

356. The second is in the *Assimilation* of *nourishment*, made in the *Bodies* of *Plants*, and *Living* Creatures; whereof *Plants* turn the Juyce of meer *Water* and *Earth*, into a great deal of *Oyly matter*: *Living Creatures*, though much of their *Fat*, and *Flesh*, are out of *Oyly Aliments*, (as *Meat*, and *Bread*) yet they assimilate also in a measure their *Drink* of *Water*,

&c.

&c. But these two ways of *Version* of *Water* into *Oyl*, (namely, by *Mixture* and by *Assimilation*) are by many Passages, and Percolations, and by long continuance of soft *Heats*, and by circuits of time.

The third is in the *Inception* of *Putrefaction*; as in *Water corrupted*, and the *Mothers* of *Waters distilled*, both which have a kind of *Fatness* or *Oyl*. 357.

The fourth is in the *Dulceration* of some *Metals* as *Saccharum Saturni*, &c. 358.

The Intension of *Version* of *Water* into a more *Oyly substance* is by *Digestion*: For *Oyl* is almost nothing else but *Water Digested*, and this *Digestion* is principally by *Heat*: which *Heat* must be either *outward* or *inward*. *Again*, It may be by Provocation or Excitation, which is caused by the mingling of Bodies already *oyly* or *digested*, for they will somewhat communicate their Nature with the rest. *Digestion* also is strongly effected by direct *Assimilation* of *Bodies Crude* into *Bodies Digested*; as in *Plants* and *Living Creatures*, whose nourishment is far more Crude than their Bodies. But this *Digestion* is by a great compass as hath been said. As for the more full handling of these two principles, whereof this is but a taste; (the enquiry of which, is one of the profoundest enquiries of Nature,) we leave it to the *Title* of *Version* of *Bodies*; and likewise to the *Title* of the *First Congregations* of *Matter*, which like a General Assembly of Estates, doth give Law to all *Bodies*. 359.

A *Chamelion* is a Creature about the bigness of an ordinary *Lizard*, his Head unproportionably big, his eyes great; he moveth his Head without the writhing of his Neck (which is inflexible) as a *Hog* doth: His Back crooked, his Skin spotted with little Tumors, less eminent nearer the Belly; his Tail slender and long; on each Foot he hath five Fingers; three on the outside, and two on the inside; his Tongue of a marvellous length, in respect of his Body, and hallow at the end, which he will lanch out to prey upon *Flies*. Of colour Green, and of a dusky Yellow, brighter and whiter toward the Belly, yet spotted with Blew, White, and Red. If he be laid upon Green, the Green predominateth, if upon Yellow, the Yellow; not so if he be laid upon Blew, or Red, or White, onely the Green spots receive a more orient lustre; laid upon Black, he looketh all Black, though not without a miæture of Green. He feedeth not onely upon Air, (though that be his principal sustenance;) for sometimes he taketh *Flies*, as was said; yet some that have kept *Chamelions* a whole year together, could never perceive that ever they fed upon any thing else but Air, and might observe their Bellies to swell after they had exhausted the Air, and closed their Jaws, which they open commonly against the Rayes of the Sun. They have a foolish Tradition in *Magick*, that if a *Chamelion* be burnt upon the top of an House, it will raise a Tempest, supposing (according to their vain Dreams of *Sympathies*) because he nourisheth with Air, his Body should have great vertue to make impression upon the Air. 360. Experiments Solitary, touching *Chamelions*.

IT is reported by one of the *Ancients*, that in part of *Media* there are *Eruptions* of *Flames* out of *Plains*, and that those *Flames* are clear, and cast not forth such smoak, and ashes, and pumice, as *Mountain Flames*, doth; The reason (no doubt) is, because the *Flame* is not pent, as it is in *Mountains*, and *Earthquakes* which cast *Flame*. There be also some *blinde Fires*, under 361. Experiments Solitary, touching *Subterrany Fires*.

under *Stones*, which flame not out, but *Oyl* being poured upon them, they flame out. The cauſe thereof is, for that it ſeemeth the *Fire* is ſo choaked, as not able to remove the Stone, it is *Heat* rather than *Flame*, which nevertheleſs is ſufficient to enflame the *Oyl*.

362. Experiment Solitary, touching *Nitre*.

IT is reported, that, in ſome *Lakes* the *Water* is ſo *Nitrous* as if foul Cloaths be put into it, it ſcoureth them of it ſelf: And if they ſtay any whit long they moulder away, And the ſcouring Virtue of *Nitre* is the more to be noted, becauſe it is a *Body cold*; and we ſee *Warm Water* ſcoureth better than *cold*. But the cauſe is, for that it hath a ſubtil Spirit, which ſevereth and divideth any thing that is ſoul, and viſcous, and ſticketh upon a Body.

363. Experiment Solitary, touching *Congealing of Air*.

TAke a *Bladder*, the greateſt you can get; fill it full of Wind, and tye it about the Neck with a Silk threed waxed: and upon that likewiſe Wax very cloſe; ſo that when the Neck of the *Bladder* drieth no *Air* may poſſibly get in nor out; Then bury it three or four foot under the *Earth* in a *Vault*, or in a *Conſervatory* of *Snow*, the *Snow* being made hollow about the *Bladder*; and after ſome fortnights diſtance, ſee whether the *Bladder* be ſhrunk: For if it be, than it is plain, that the *coldneſs* of the *Earth* or *Snow*, hath condenſed the *Air* and brought it a degree nearer to *Water*: Which is an *Experiment* of great conſequence.

364. Experiment Solitary, touching *Congealing of Water into Chryſtal*.

IT is a report of ſome good credit, that in *Deep Caves* there are *Penſile Chryſtal*, and *degrees* of *Chryſtal* that drop from above, and in ſome other (though more rarely) that riſe from below. Which though it be chiefly the work of cold, yet it may be that Water that paſſeth thorow the Earth gathereth a Nature more clammy, and fitter to congeal, and become ſolider than Water of it ſelf. Therefore tryal would be made to lay a heap of Earth in great Froſts, upon a hollow Veſſel putting a Canvaſe between, that it falleth not in; and pour Water upon it, in ſuch quantity as will be ſure to ſoak thorow, and ſee whether it will not make an harder Ice in the bottom of the Veſſel, and leſs apt to diſſolve than ordinarily. I ſuppoſe alſo that if you make the Earth narrower at the bottom than at the top, in faſhion of a Sugar Loaf reverſed it will help the Experiment. For it will make the Ice, where it iſſueth, leſs in bulk; and evermore ſmallneſs of quantity is a help to *Verſion*.

365. Experiments in Conſort, touching *Preſerving of Roſe Leaves, both in Colour and ſmell*.

TAke *Damask Roſes* and pull them, then dry them upon the top of an Houſe, upon a Lead or Tarras in the hot Sun, in a clear day, between the hours (onely) of Twelve and two or thereabouts. Then put them into a ſweet *dry Earthen Bottle* or a *Glaſs* with narrow mouths, ſtuffing them cloſe together, but without bruiſing: Stop the *Bottle* or *Glaſs* cloſe, and theſe *Roſes* will retain, not onely their ſmell perfect, but their colour freſh for a year at leaſt. Note that nothing doth ſo much deſtroy any Plant, or other Body, either by *Putrefaction*, or *Arefaction*, as the *Adventitious Moiſture*, which hangeth looſe in the Body, if it be not drawn out. For it betrayeth and tolleth forth the *Innate* and *Radical Moiſture* along with it when it ſelf goeth forth. And therefore in *Living Creatures*, moderate ſwet doth preſerve the Juyce of the Body. Note, that theſe Roſes when you take them from the *drying* have little

or

or no *Smell*; So that the Smell is a Second *Smell*, that issueth out of the *Flower* afterwards.

366. Experiment in Consort, toaching the *Continuance of Flame*.

THe *Continuance of Flame*, according unto the diversity of the *Body Enflamed*, and other Circumstances, is worthy the Enquiry; Chiefly, for that though *Flame* be (almost) of Momentany lasting, yet it receiveth the More, and the Less: we will first therefore speak (at large) of *Bodies Enflamed*, wholly, and Immediate, without any *Wick* to help the *Inflammation*. A Spoonful of *Spirit of Wine*, a little heated, was taken, and it burnt as long as came to 116. Pulses. The same Quantity of *Spirit of Wine*, Mixed with the Sixth Part of a Spoonful of *Nitre*, burnt but to the space of 94. Pulses. Mixed with the like Quantity of *Bay-salt*, 83. Pulses. Mixed with the like Quantity of *Gunpowder*, which dissolved into a Black-water, 110. Pulses. *A* Cube, or Pellet of *Yellow Wax*, was taken, as much as half the *Spirit of Wine*, and set in the Midst, and it burnt onely to the space of 87. Pulses. Mixed with the Sixth Part of a Spoonful of *Milk* it burnt to the space of 100. Pulses; And the *Milk* was crudled. Mixed with the Sixth Part of a spoonful of *Water*, it burnt to the space of 86. Pulses. With an *Equal Quantity of Water*, onely to the space of 4. Pulses. A small *Pebble* was laid in the Midst, and the *Spirit of Wine* but to the space of 94. Pulses. A piece of *Wood*, of the Bigness of an Arrow, and about a Fingers length, was set up in the Midst, and the *Spirit of Wine* burnt to the space of 94. Pulses. So that the *Spirit of Wine Simple*, indured the longest; And the *Spirit of Wine* with the *Bay-salt*, and the *Equal Quantity of Water* were the shortest.

367. Consider well, whether the more speedy *Going forth of the flame*, be caused by the *Greater Vigour* of the *Burning*; Or by the *Resistance* of the *Body mixed*, and the *Aversion* thereof to take *Flame*: Which will appear by the Quantity of the *Spirit of Wine*, that remaineth after the Going out of the *Flame*. And it seemeth clearly to be the latter; For that the Mixture of Things least apt to burn, is the speediest in going out. And note, by the way, that *Spirit of Wine* burned, till it go out of it self will burn no more; and tasteth nothing so hot in the Mouth, as it did; No nor yet sower, (as if it were a degree towards *Vineger*) which *Burnt Wine doth*; but flat, and dead.

368. Note, that in the *Experiment of Wax* aforesaid, the *Wax* dissolved in the buring, and yet did not incorporate it self, with the *Spirit of Wine*, to produce one *Flame*; but wheresoever the *Wax* floated the *Flame* forsook it, till at last it spread all over, and put the *Flame* quite out.

369. The *Experiments* of the *Mixtures* of the *Spirit of Wine enflamed*, are Things of discovery, and not use: But now we will speak of the *Continuance of Flames*, such as are used for *Candles*, *Lamps*, or *Tapers*; consisting of *Inflamable matters*, and of a *Wick* that provoketh *Inflammation*. And this importeth not only discovery, but also use and Profit; For it is great Saving in all such Lights, if they can be made as fair and bright as others, and yet last longer. *Wax pure* made into a Candle, and *Wax mixed* severally into Candle stuffe, with the particulars that follow; (viz. *Water*, *Aqua-vitæ*, *Milk*, *Bay-salt*, *Oyl*, *Butter*, *Nitre*, *Brimstone*, *Sawdust*,) Every of these bearing a Sixth part to the *Wax*; And every of these *Candles mixed*, being of the same Weight and Wick with the *Wax Pure*, proved thus in the burning and lasting. The swiftest in Consuming was that with *Sawdust*; which first burned fair, till some part of the *Candle* was consumed, and

and the dust gathered about the snaste; but then it made the snaste big, and long, and to burn duskishly, and the *Candle* wasted in half the time of the *Wax pure*. The next in swiftness, were the *Oyl* and *Butter*, which consumed by a fifth part swifter than the *pure Wax*. Then followed in swiftness the *clear Wax* it self; then the *Bay-salt*, which lasted about an eighth part longer than the *clear Wax*; then followed the *Aqua vitæ*, which lasted about a fifth part longer than the *clear Wax*; then follow the *Milk* and *Water*, with little difference from the *Aqua vitæ*, but the *Water*, slowest. And in these four last, the *Wick* would spit fourth little sparks: For the *Nitre*, it would not hold lighted above some twelve Pulses: But all the while it would spit out portions of *Flame*, which afterwards would go out into a vapor. For the *Brimstone*, it would hold lighted much about the same with the *Nitre*; but then after a little while, it would harden and cake about the snaste: So that the mixture of *Bay-salt* with *Wax*, will win an eigth part of the time of lasting, and the *Water* a fifth.

370. After the several *materials* were tryed, Tryal was likewise made of several *Wicks*; as of ordinary *Cotten*, *Sowing Thred*, *Rush*, *Silk*, *Straw*, and *Wood*. The *Silk*, *Straw*, and *Wood*, would flame alittle, till they came to the *Wax*, and then go out; of the other three, the *Thred* consumed fastest than the *Cotten*, by a sixth part of time; the *Cotten* next; then the *Rush* consumed slower than the *Cotten*, by at least a third part of time. For the bigness of the *Flame*, the *Cotten*, and *Thred*, cast a *Flame* much alike, and the *Rush* much less and dimmer. *Quere*, whether *Wood* and *Wicks* both, as in *Torches* consume faster, than the *Wicks Simple*?

371. We have spoken of the several *Materials*, and the several *Wicks*; but to the *lasting* of the *Flame*, it importeth also, not onely, what the *material* is, but in the same *material*, whether it be hard, soft, old, new, &c. Good *Housewives* to make their *Candles* burn the longer, use to lay them (one by one) in *Bran* or *Flower*, which make them harder, and so they consume the slower. Insomuch, as by this means they will out-last other *Candles* of the same stuff, almost half in half. For *Bran* or *Flower* have a Vertue to harden, so that both age, and lying in the Bran doth help to the lasting. And we see that *Wax Candles* last longer then *Tallow Candles*, because *Wax* is more firm and hard.

372. The *Lasting of Flame* also dependeth upon the *easie drawing* of the *Nourishment*; as we see in the *Court of England*, there is a service which they call *All-Night*; which is (as it were) a great Cake of Wax, with the *Wick* in the midst; whereby it cometh to pass, that the Wick fetcheth the Nourishment further off. We see also, that *Lamps* last longer: because the Vessel is far broader than the breadth of a Taper or Candle.

373. Take a *Turreted Lamp of Tin* made in the form of a Square; the height of the *Turret*, being thrice as much as the length of the lower, part whereupon the *Lamp* standeth; make onely one hole in it, at the end of the return furthest from the *Turret*. Reverse it, and fill it full of *Oyl*, by that hole; and then set it upright again, and put a *Wick* in at the hole, and lighten it; You shall find that it will burn slow, and a long time: Which is caused (as was said last before) for that the *Flame* fetcheth the *Nourishment afar off*. You shall find also, that as the *Oyl* wasteth and descendeth, so the top of the *Turret*, by little and little filleth with Air; which is caused by the Rarefaction of the Oyl by the heat. It were worthy the observation to make a hole, in the top of the *Turret*, and to try, when

the

the *Oyl* is almost consumed; whether the *Air* made of the *Oyl*, if you put to it a *Flame* of a Candle, in the letting of it forth, will enflame. It were good also to have the *Lamp* made, not of *Tin*, but of *Glass*; that you may see how the Vapor or Air gathereth by degrees in the top.

374. A fourth point, that importeth the *Lasting* of the *Flame*, is the *closeness* of the *Air*, wherein the *Flame* burneth. We see, that if *Wind* bloweth upon a *Candle*, it wasteth a pace; we see also it lasteth longer in a *Lanthorn*, than at *Large*. And there are Traditions of *Lamps* and *Candles*, that have burnt a very long time, in *Caves*, and *Tombs*.

375. A fifth point, that importeth the *Lasting* of the *Flame*, is the *Nature* of the *Air* where the *Flame* burneth; whether is be hot or cold, moist or dry. The *Air*, if it be very *Cold*, irritateth the *Flame*, and maketh it burn more fiercely, (as Fire scorcheth in Frosty weather) and so furthereth the *Consumption*. The *Air* once heated, (I conceive) maketh the *Flame* burn more mildly, and so helpeth the *Continuance*. The *Air*, if it be *Dry*, is indifferent; the *Air*, if it be *moist*, doth in a degree quench the *Flame*, (as we see *Lights* will go out in the *Damps* of *Mines*;) and howsoever maketh it burn more dully, and so helpeth the *Continuance*.

376. *Experiments in Consort, touching Burials or Infusions of divers Bodies in Earth.*

Burials in *Earth* serve for *Preservation*, and for *Condensation*, and for *Induration* of *Bodies*. And if you intend *Condensation* or *Induration*, you may bury the *Bodies* so, as *Earth* may touch them; as if you would make *Artificial Procellane*, &c. And the like you may do for *Conservation*, if the *Bodies* be hard and solid, as Clay, Wood, &c. But if you intend *Preservation* of *Bodies*, more soft and tender, then you must do one of these two; Either you put must them in cases, whereby they may not touch the *Earth*; or else you must *Vault* the *Earth*, whereby it may hang over them, and not, touch them: For if the *Earth* touch them it will do more hurt by the moisture, causing them to putrifie, than good by the Virtual cold, to conserve them, except the *Earth* be very dry and sandy.

377. An *Orenge*, *Lemmon*, and *Apple*, wrapt in a Linnen Cloth, being buried for a fortnights space four foot deep within the Earth, though it were in a moist place, and a rainy time; yet came forth no ways mouldy or rotten, but were become a little harder than they were, otherwise fresh in their colour, but their Juyce somewhat flatted. But with the *Burial* of a fortnight more, they became putrified.

378. A *Bottle* of *Beer*, *buried* in like manner as before, became more lively, better tasted, and clearer than it was: And a *Bottle* of *Wine*, in like manner. A *Bottle* of *Vinegar* so buried, came forth more lively and more odoriferous, smelling almost like a Violet. And after the whole Moneths *Burial*, all the three came forth as fresh and lively, if not better than before.

379. It were a profitable *Experiment*, to preserve *Orenges*, *Lemmons*, and *Pomgranates*, till Summer; for then their price will be mightily encreased. This may be done, if you put them in a Pot or Vessel well covered, that the *moisture* of the *Earth* come not at them; or else by putting them in a Conservatory of Snow. And generally, whosoever will make *Experiments* of *Cold*, let him be provided of three things, a *Conservatory* of *Snow*, a good *large Vault*, twenty foot at least under the Ground, and a *deep well*.

There

There hath been a tradition, that *Pearl*, and *Coral*, *Turchois-Stone*, that have loſt their Colours, may be recovered by *Burying* in the *Earth*; which is a thing of great profit, if it would ſort: But upon tryal of ſix weeks *Burial*, there followed no effect. It were good to try it in a *deep Well*, or in a *Conſervatory of Snow*, where the cold may be more conſtringent; and ſo make the *Body* more united, and thereby more reſplendent.

381. Experiment Solitary, touching the *Effects in mens Bodies from ſeveral Winds*

Mens Bodies are heavier and leſs diſpoſed to Motion When *Southern Winds* blow, then when *Northern*. The *cauſe* is, for that when the *Southern Winds* blow, the Humors do (in ſome degree) melt, and wax fluide, and ſo flow into the parts; as it is ſeen in *Wood*, and other *Bodies*, which when the *Southern Winds* blow, do ſwell. Beſides the Motion and Activity of the Body conſiſteth chiefly in the ſinews, which, when the *Southern Winds* blow, are more relax.

382. Experiment Solitary, touching *Winter and Summers Sicknesſes.*

IT is commonly ſeen, that more are ſick in the *Summer*, and more *dye* in the *Winter*; except it be in *Peſtilent Diſeaſes*, which commonly reign in *Summer* or *Autumn*. The reaſon is, becauſe *Diſeaſes* are bred (indeed) chiefly by *Heat*; but then they are cured moſt by *Sweat* and *Purge*, which in the *Summer* cometh on, or is provoked more eaſily: As for *Peſtilent diſeaſes*, the reaſon why moſt dye of them in *Summer*, is becauſe they are bred moſt in the *Summer*; for otherwiſe, thoſe that are touched are in moſt danger in the *Winter*.

383. Experiment Solitary, touching *Peſtilential Seaſons.*

THe general opinion is, That *Years hot* and *moiſt*, are moſt *Peſtilent* upon the ſuperficial Ground, that *Heat* and *Moiſture* cauſe *Putrefaction*. In *England* it is found not true; for many times, there have been great *Plagues* in *dry years*. Whereof the cauſe may be, for that *drought* in the Bodies of *Iſlanders*, habituate to *moiſt Airs*, doth exaſperate the Humors, and make them more apt to putrefie or Enflame; beſides it tainteth the *Waters* (commonly) and maketh them leſs wholſome. And again in *Barbary*, the *Plagues* break up in the *Summer Moneths*, when the *Weather* is *hot* and *dry*.

384. Experiment Solitary touching *An Error received about Epidemical diſeaſes.*

MAny *Diſeaſes*, (both *Epidemical* and others) break forth at *particular times*. And the *cauſe* is falſly imputed to the *conſtitution* of the *Air* at that *time*, when they *break forth* or *reign*; whereas it proceedeth (indeed) from a *Precedent Sequence*, and *Series* of the *Seaſons* of the *Year*: And therefore *Hippocrates* in his *Prognoſticks*, doth make good obſervations of the *Diſeaſes*, that enſue upon the *Nature* of the *precedent four ſeaſons of* the *Year*.

385. Experiments in Conſort touching *Alteration or Preſervation of Liquors in Wells or deep Vaults.*

TRyal hath been made with *Earthen Bottles*, well ſtopped, hanged in a *Well* of Twenty Fathom deep, at the leaſt; and ſome of the *Bottles* have been let down into the *Waters*, ſome others have hanged above within about a Fathom of the *Water*; and the *Liquors* ſo tryed have been, *Beer*, (not new, but ready for drinking) and *Wine*, and *Milk*. The proof hath been, that both the *Beer*, and the *Wine*, (as well within *Water*, as above) have not been palled or deaded at all; but as good, or ſomewhat better than Bottles of the ſame *Drinks* and ſtaleneſs, kept in a *Celler*. But thoſe which did hang above *Water*, were apparently the beſt; and that Beer did flower

flower, a little; whereas that under *Water* did not, though it were freſh. The *Milk* ſcoured, and began to putrifie. Nevertheleſs it is true, that there is a *Village* near *Blois*, wherein *deep Caves* they do thicken *Milk*, in ſuch ſort, that it becometh very pleaſant; which was ſome *cauſe* of this tryal of hanging *Milk* in the *Well*: But our proof was naught, neither do I know whether that *Milk* in thoſe *Caves* be firſt boyled. It were good therefore to try it with *Milk* ſodden, and with Cream; for that *Milk* of it ſelf, is ſuch a Compound Body of *Cream*, *Cruds*, and *Whey*, as it is eaſily turned and diſſolved. It were good alſo to try the *Beer*, when it is in *Wort*, that it may be ſeen, whether the *Hanging* in the *Well*, will accelerate the *ripening* and *Clarifying* of it.

386. Experiment Solitary, touching the *Stutting*.

Divers, wee ſee, do *Stut*. The *cauſe* may be (in moſt) the *Refrigeration* of the Tongue, whereby it is leſs apt to move; and therefore we ſee, that *Naturals* do generally *Stut*: And we ſee, that in thoſe that *Stut*, if they drink Wine moderately, they *Stut* leſs, becauſe it heateth: And ſo we ſee that they that *Stut*, *Stut* more in the firſt offer to ſpeak, than in continuance; becauſe the *Tongue* is, by motion, ſomewhat heated. In ſome alſo it may be (though rarely) the *dryneſs* of the *Tongue*, which likewiſe maketh it leſs apt to move as well as *cold*; for it is an affect that cometh to ſome *wiſe* and *great men*, as it did unto *Moſes*, who was *Linguæ Præpeditæ*: And many *Stuttors* (we find) are very *Cholerelick*, *Men*, *Choler* enducing a *dryneſs* in the *Tongue*.

387. Experiment in Conſort, touching the *Smell*.

Smells and other *Odors* are ſweeter in the Air, at ſome diſtance, than near the Noſes, that hath been partly touched heretofore. The cauſe is double. Firſt, the finer mixture or incorporation of the *Smell*. For we ſee, that in *Sounds* likewiſe, they are ſweeteſt, when we cannot hear every part by it ſelf. The other *reaſon* is, For that all *ſweet Smells* have joyned with them ſome *Earthy* or *Crude Odors*; and at ſome diſtance the *Sweet*, which is the more ſpiritual, is perceived; and the *Earthy* reacheth not ſo far.

388. *Sweet Smells* are moſt forcible in *dry Subſtances*, when they are *broken* and ſo likewiſe in *Orenges*, or *Lemmons*, the nipping off their Rinde, giveth out their *Smell* more: And generally, when *Bodies* are *moved or ſtirred*, though not *broken*, they *Smell* more, as a Sweet-bag waved. The *cauſe* is double; the one, for that there is a *greater emiſſion* of the *Spirit*, when way is made. And this holdeth in the *Breaking*, *Nipping*, or *Cruſhing*; it holdeth alſo, (in ſome degree) in the *Moving*. But in this laſt, there is a concurrence of the ſecond *cauſe*, which is the *Impulſion* of the *Air*, that bringeth the *Scent* faſter upon us.

389. The daintieſt *Smells of Flowers*, are out of thoſe *Plants* whoſe *Leaves*, *ſmell* not; as *Violets*, *Roſes*, *Wall-flowers*, *Gilly-flowers*, *Pincks*, *Wood-bine*, *Vine-flowers*, *Apple-bloom*, *Limetree-blooms*, *Bean-blooms*, *&c.* The *cauſe* is, for that where there is heat and ſtrength enough in the *Plant* to make the *Leaves odorate*, there the *Smell* of the *Flower* is rather evanide and weaker than that of the *Leaves*; as it is in *Roſemary flowers*, *Lavender-flowers*, and *Sweet-Brier Roſes*. But where there is leſs *Heat*, there the *Spirit* of the *Plant* is digeſted and refined, and ſevered from the groſſer Juyce in the *Efflo-reſcence*, and not before.

390. Most *Odors* smell best, *broken*, or *crusht*, as hath been said; but *Flowers pressed* or *beaten*, do lose the freshness and sweetness of their *Odor*. The *cause* is, for that when they are *crushed*, the grosser and more *Earthy Spirit* cometh out with the Finer, and troubleth it; whereas in stronger *Odors* there are no such degrees of the issue of the *Smell*.

391. Experiment in Consort, touching the Goodness and Choice of Water.

IT is a thing of a very good use, to discover the *goodness of Water*. The *taste* to those that drink *Water* onely doth somewhat: But other *Experiments* are more sure. First, try *Waters* by *Weight*, wherein you may find some difference, though not much: And the *lighter*, you may account the better.

392. Secondly, Try them by *boiling* upon an *equal fire*; and that which consumeth away fastest, you may account the best.

393. Thirdly, Try them in *several Bottles* or open Vessels, matches in every thing else, and see which of them *last longe*, without *stench* or *corruption*: and that which holdeth unputrified longest, you may likewise account the best.

394. Fourthly, Try them by *making Drinks*, stronger or smaller, with the same *Quantity of Malt*; and you may conclude that, that *Water*, which maketh the *stronger Drink*, is the more concocted and nourishing; though perhaps it be not so good for *Medicinal use*. and such Water (commonly) is the Water of *large* and *navigable Rivers*; and likewise in *large* and *clean Ponds of standing Water*: For upon both them, the Sun hath more power than upon Fountains, or small Rivers. And I conceive, that *Chalk water* is next them the best, for going furthest in *Drink*. For that also helpeth *concoction*, so it be out of a *deep Well*; for then it cureth the rawness of the *Water*; but *Chalky-water* towards the top of the Earth, is too fretting, as it appeareth in Laundry of Cloaths, which wear out apace, if you use such *Water*.

395. Fifthly. The Housewives do find a difference in *Waters*, for the *bearing* or not *bearing of Soap*; and it is likely, that the more *fat water* will bear *Soap* best, for the *Hungry Water* doth kill the unctuous nature of the *Soap*.

396. Sixthly, You may make a judgment of *Waters* according to the *place*, whence they spring or come. The *Rain-water* is by the *Physicians* esteemed the fines and the best; but yet it is said to putrifie soonest, which is likely, because of the fineness of the Spirit; and in *Conservatories of Rain water*, (such as they have in *Venice*, &c.) they are found, not so choice *Waters*; (the worse perhaps) because they are covered aloft, and kept from the Sun. *Snow-water* is held unwholesome, insomuch, as the people that dwell at the Foot of the *Snow mountains*, or otherwise upon the ascents (especially the Women) by drinking of *Snow-water*, have great bags hanging under their Throats. *Well Water*, except it be upon *Chalk*, or a very plentiful Spring maketh Meat red, which is an ill sign. *Springs* on the *tops of high Hills* are the best; for both they seem to have a Lightness and Appetite of Mounting; and besides, they are most pure and unmingled: And again are more percolated through a great space of Earth. For *Waters in Valleys*, joyn in effect under ground with all *Waters* of the same Level; whereas *Springs* on the *tops of Hills*, pass through a great deal of pure *Earth* with less mixture of other *Waters*.

397. Seventhly, Judgment may be made of *Waters* by the *Soyl whereupon the Water runneth*, as *Pebble* is the cleanest and best tasted; and next to that

Clay

Clay-water; and thirdly, *Water* upon *Chalk*; Fourthly, that upon *Sand*; and worſt of all, upon *Mud*. Neither may you truſt *Waters* that *taſte ſweet*, for they are commonly found in Riſing grounds of great *Cities*, which muſt needs take in a great deal of filth.

398. Experiment Solitary, touching the *Temperate Heat under the Æquinoctial.*

IN *Peru*, and divers parts of the *Weſt-Indies*, though under the *Line*, the *Heats* are not ſo intolerable, as they be in *Barbary*, and the Skirts of the *Torrid Zone*. The *cauſes* are, firſt, the great *Brizes* which the motion of the Air in great Circles (ſuch as are under the *Girdle* of the *World*) produceth, which do refrigerate; and therefore in thoſe parts, Noon is nothing ſo hot when the *Brizes* are great, as about nine or ten of the clock in the Forenoon. Another *cauſe* is, for that the lengh of the Night, and the Dews thereof, do compence the *Heat* of the day. A third *cauſe* is, the ſtay of the Sun not in reſpect of day and night (for that we ſpake of before) but in reſpect of the Seaſon: For under the *Line*, the Sun croſſeth the *Line* and maketh two Summers and two Winters; but in the ſkirts of the *Torrid Zone*, it doubleth and goeth back again, and ſo maketh one long Summer.

399. Experiment ſolitary, touching the *Coloration of Black and Tawny Moors.*

THe *Heat* of the *Sun* maketh *Men black* in ſome Countreys, as in *Æthiopia* and *Guinny*, &c. *Fire* doth it not as we ſee in *Glaſs-Men*, that are continually about the *Fire*. The reaſon may be, becauſe *Fire* doth lick up the *Spirits* and Blood of the Body, ſo as they exhale; ſo that it ever maketh *Men* look Pale and Sallow; but the *Sun* which is a gentler heat doth but draw the Blood to the outward *parts*, and rather concocteth it then ſoketh it: And therefore, we ſee that all *Æthiopes* are fleſhy, and plump, and have great Lips. All which betoken *moiſture* retained, and not drawn out. We ſee alſo, that the *Negroes* are bred in Countries that have plenty of *Water*, by *Rivers* or otherwiſe: For *Meroe*, which was the *Metropolis of Æthiopia*, was upon a great Lake and *Congo*, where the *Negroes* are, is full of Rivers. And the confines of the River *Niger*, where the *Negroes* alſo are, are well watered; and the Region about *Capo Verde* is likewiſe moiſt, inſomuch, as it is peſtilent through moiſture: But the Countreys of the *Abyſſenes*, and *Barbary*, and *Peru*, where they are Tawney and Olivaſter, and Pale, are generally more ſandy and dry. As for the *Æthiopes*, as they are plump and fleſhy, ſo (it may be) they are Sanguine and Ruddy coloured, if their Black Skin would ſuffer it to be ſeen.

400. Experiment Solitary, touching *Motion after the Inſtant of Death.*

SOme *Creatures* do move a good while after their head is off, as Birds. Some a very little time, as *Men* and all Beaſts. Some move, though cut in ſeveral pieces, as *Snakes*, *Eels*, *Worms*, *Flies*, &c. Firſt, therefore it is certain that the *immediate cauſe of Death*, is the reſolution or extinguiſhment of the *Spirits*; and that the deſtruction or corruption of the *Organs*, is but the *mediate cauſe*. But ſome *Organs* are ſo peremptorily neceſſary, that the extinguiſhment of the Spirits doth ſpeedily follow; but yet ſo, as there is an *interim* of a ſmall time. It is reported by one of the *Ancients*, of credit, That a *Sacrificed Beaſt* hath lowed after the Heart hath been ſevered; and it is a report alſo of credit, that the *Head of a Pig* hath been opened, and the Brain put into he Palm of a Mans Hand, trembling without breaking any part of it, or ſevering it from the Marrow of the Back-bone: during which time, the *Pig* hath been, in all appearance, ſtark dead, and without motion: And after a ſmall time the Brain hath been replaced

and the Skull of the *Pig* closed, and the *Pig* hath a little after gone about. And certain it is, that an *Eye* upon *Revenge*, hath been thrust forth, so as it hanged a pretty distance by the *Visual Nerve*; and during that time, the *Eye* hath been without any power of *Sight*; and yet after (being replaced) recovered *Sight*. Now the *Spirits* are chiefly in the *Head*, and *Cells* of the *Brain*, which in *Men* and *Beasts* are large; and therefore, when the *Head* is off, they move little or nothing: But *Birds* have small *Heads* and therefore the *Spirits* are a little more dispersed in the *Sinews*, whereby Motion remaineth in them a little longer; insomuch as it is extent in story, that an *Emperor* of *Rome*, to shew the certainty of his hand, did shoot a great forked Arrow at an *Estrich*, as she ran swiftly upon the Stage, and stroke off her Head; and yet she continued the race a little way with her Head off. As for *Worms*, and *Flies*, and *Eels*, the *Spirits* are diffused almost all over; and therefore they move in their several pieces.

NATURAL HISTORY;

Century V.

WE will now enquire of *Plants* or *Vegetables*; and we shall do it with diligence. They are the principal part of the *Third days Work*; they are the first *Producat*, which is the word of *Animation*: for the other words are but the words of *Essence*; and they are of excellent and general use, for Food, Medicine, and a number of Mechanical Arts.

Experiments in Consort touching the *Acceleration of Germination.*

401. There were sown in a Bed, *Turnip seed*, *Raddish-seed*, *Wheat*, *Cucumber seed* and *Pease*. The Bed we call a *Hot-bed*, and the manner of it is this. There was taken *Horse-dung*, old, and well rotted; this was laid upon a Bank, half a foot high, and supported round about with Planks; and upon the top was cast sifted Earth, some two fingers deep; and then the Seed sprinkled upon it, having been steeped all night in Water mixed with *Cow-dung*. The *Turnip-seed*, and the *Wheat*, came up half an inch above ground, within two dayes after, without any watering; the rest the third day. The *Experiment* was made in *October*, and (it may be) in the *Spring* the *Accelerating* would have been the speedier. This is a noble *Experiment*; for, without this help, they would have been four times as long in coming up. But there doth not occur to me, at this present, any use thereof for profit, except it should be for Sowing of *Pease*, which have their price very much increased by the early coming. It may be tryed also with *Cherries*, *Stramberries*, and other fruit, which are dearest, when they come early.

402. There was *Wheat* steeped in *Water* mixed with *Cow-dung*. Other in *Water* mixed with *Horse-dung*, other in *Water* mixed with *Pigeon-dung*,

other in *Urine of Man*, other in *Water* mixed with *Chalk* powdred, other in *Water* mixed with *Soot*, other in *Water* mixed with *Asbes*, other in *Water* mixed with *Bay-salt*, other in *Claret Wine*, other in *Malmsey*, other in *Spirit of Wine*. The proportion of the mixture was, a fourth part of the ingredients to the *Water*, save that there was not of the *Salt* above an eighth part. The *Urine*, and *Wines*, and *Spirit of Wine*, were simple without mixture of *Water*; the time of steeping was twelve hours; the time of the year *October*. There was also other *Wheat* sown *unsteeped*, but *watred* twice a day with *warm Water*; there was also other *Wheat* sown *simple*, to compare it with the rest. The event was, that those that were in the mixture of *Dung*, and *Urine*, *Soot*, *Chalk*, *Asbes*, and *Salt*, came up within six days: and those that afterwards proved the highest, thickest, and more lusty, were first the *Urine*, and then the *Dung*; next the *Chalk*, next the *Soot*, next the *Asbes*, next the *Salt*, next the *Wheat simple* of it self unsteeped and unwatered, next the *watered twice a day* with warm Water, next the *Claret Wine*. So that these three last were slower than the ordinary *Wheat* of it self; and this Culture did rather retard than advance. As for those that were steeped in *Malmsey*, and *Spirit of Wine*, they came not up at all. This is a rich *Experiment* for profit; for the most of the steepings are cheap things, and the goodness of the crop is a great matter of gain, if the goodness of the crop answer the earliness of the coming up, as it is like is will, both being from the vigor of the *Seed*, which also partly appeared in the former *Experiments* as hath been said. This *Experiment* would be tryed in other *Grains*, *Seeds*, and *Kernels*; for it may be some *steeping* will agree best with some *Seeds*. It would be also tryed with *Roots* steeped as before, but for *longer time*; it would be tryed also in *several seasons* of the *Year*, especially in the *Spring*.

403. *Strawberries* watered now and then (as once in three days) with *Water* wherein hath been steeped *Sheeps-dung*, or *Pigions-dung*, will prevent and come early. And it is like the same effect would follow in other *Berries*, *Herbs*, *Flowers*, *Grains*, or *Trees*; and therefore it is an *Experiment*, though vulgar in *Strawberries*, yet not brought into use generally: For it is usual to help the Ground with Muck, and likewise to recomfort it sometimes with Muck put to the Roots, but to water it with *Muck-water*, which is like to be more forcible, is not practised.

404. *Dung*, or *Chalk*, or *Blood*, applied in substance (seasonably) to the Roots of Trees, doth set them forwards. But to do it unto *Herbs*, without mixture of *Water* or *Earth*, it may be these helps are too hot.

405. The former *means* of helping *Germination*, are either by the *gooodness* and *strength* of the *Nourishment*, or by the *comforting* and *exciting* the *Spirits* in the *Plant*, to draw the *Nourishment* better. And of this latter kind concerning the *comforting* of the *Spirits* of the *Plant*, are also the Experiments that follow; though they be not applications to the *Root* or *Seed*. The *planting of Trees warm* upon a *Wall*, against the South and South-East Sun, doth hasten their coming on and ripening; and the South-East is found to be better than the South-west, though the South west be the hotter Coast. But the *cause* is chiefly, for that the heat of the morning succeedeth the cold of the night; and partly, because (many times) the South-West Sun is too parching. So likewise *planting* of them upon the *Back* of a *Chimney* where a fire is kept, doth hasten their coming on, and ripening: Nay more, the *drawing* of the *Boughs* into the *inside* of a *room*, where a Fire is continually kept, worketh the same effect, which

hath

hath been tryed with Grapes; insomuch, as they will come a Moneth earlier, then the Grapes abroad.

Besides the two *Means of Accelerating Germination*, formerly described 406.
that is to say, the *mending* of the *Nourishment*, *comforting* of the *Spirit* of the *Plant*; there is a third, which is the *making way* for the *easie coming* to the *Nourishment*, and *drawing* it. And therefore *gentle digging* and *loosning* of the *Earth* about the *Roots of Trees*, and the *removing Herbs* and *Flowers* into new *Earth* once in two years (which is the same thing, for the new Earth is ever looser) doth greatly further the *prospering* and *earliness of Plants*.

But the most admirable *Acceleration* by facilitating the *Nourishing*, is that of Water. For a *Standard* of a *Damask Rose* with the *Root*, was set in a Chamber, where no Fire was, upright in an *Earthen Pan*, full of *fair Water*, without any mixture, half a foot under the *Water*, the *Standard* being more than two foot high above the *Water*. Within the space of ten days the *Standard* did put forth a fair green *Leaf*, and some other little Buds, which stood at a stay without any shew of decay or withering, more then seven days. But afterwards that Leaf faded, but the young Buds, did sprout on, which afterward opened into fair *Leaves*, in the space of three Moneths, and continued so a while after, till upon removal we left the tryal. But note, that the *Leaves* were somewhat paler, and light-coloured then the *Leaves* use to be abroad. Note, that the first *Buds* were in the end of *October*, and it is likely, that if it had been in the *Spring* time, it would have put forth with greater strength, and (it may) be to have grown on to bear Flowers. By this means, you may have (as it seemeth) *Roses* set in the midst of a *Pool*, being supported with some stay, which is matter of rareness and pleasure, though of small use. This is the more strange, for that the like Rose *Standard* was put at the same time into *Water* mixed with *Horse-dung*, the Horse-dung about the fourth part to the *Water*, and in four moneths space (while it was observed) put not forth any *Leaf*, though divers *Buds* at the first, as the other.

A *Dutch Flower* that had *Bulbous Root*, was likewise put at the same time all under Water, some two or three fingers deep; and within seven days sprouted, and continued long after further growing. There was also put in a *Beet-root*, a *Borrage-root*, and a *Reddish-root*, which had all their *Leaves* cut almost close to the *Roots*; and within six weeks had fair *Leaves*, and so continued till the end of *November*.

Note, that if *Roots*, or *Pease*, or *Flowers*, may be *accelerated* in their 409.
coming and *ripening*, there is a double profit, the one in the high price that those things bear when they come early, the other in the *swiftness* of their *returns*: For in some Grounds which are strong, you shall have a *Raddish* &c. come in a Moneth, that in other Grounds will not come in w, and so make double *returns*.

Wheat also was put into the *Water*, and came not forth at all; so as it 410.
seemth there must be some strength and bulk in the Body, put into the *Water*, as it is in *Roots*; for *Grains*, or *Seeds*, the cold of the *Water* will mortifie. But casually some *Wheat* lay under the pan, which was somewhat moistened by the suing of the pan, which in six weeks (as aforesaid, looked mouldy to the eye, but it was sprouted forth half a fingers length.

It seemeth by these *Instances of Water*, hath for nourishment the *Water* is almost all in all, and hath the *Earth* doth but keep the *plant* upright, and save it from over-heat, and over-cold; and therefore is a comfortable *Experiment* for good *Drinkers*. It proveth also hath our former *opinion* hath

Drink

Drink incorporate with Flesh or Roots (as in *Capon*-Beer, &c.) will nourish more easily, than Meat and Drink taken severally.

412. The *Housing of Plants* (I conceive) will both *Accelerate Germination*, and bring forth *Flowers* and *Plants* in the *colder Seasons*: And as we *House hot Countrey Plants*, as *Lemmons*, *Orenges*, *Myrtles*, to save them; so we may *House* our own *Country Plants* to forward them, and make them come in the cold Seasons, in such sort, that you may have *Violets*, *Strawberries* *Pease* all Winter: So that you sow or remove them at fit times. This *Experiment*, is to be referred unto the *comforting* of the *Spirit* of the *Plant* by *warmth* as well as *Housing* their *Boughs*, &c. So then the means to *Accelerate Germination*, are in particular eight, in general three.

413. Experiments in Consort, touching the *Putting back or Retardation of Germination.*

TO make *Roses* or other *Flowers* come late, it is an *Experiment* of Pleasure. For the Ancients esteemed much of *Rosa Sera*, and indeed the *November Rose* is the sweetest, having been less exhaled by the Sun. The Means are these. First, The cutting off their tops immediately after they have done bearing, and then they will come again the same year about *November*; but they will not come just on the tops where they were cut, but out of those Shoots which were (as it were) *Water-boughs*. The *cause* is, for that the Sap, which otherwise would have fed the top (though after bearing) will, by the discharge of that, divert unto the side Sprouts, and they will come to bear, but later.

414. The second is *Pulling off the Buds of the Rose*, when they are newly knotted, for then the side Branches will bear. The *cause* is the same with the former: For *cutting off the Tops, and pulling off the Buds*, work the same effect, in Retension of the Sap for a time, and Diversion of it to the Sprouts, that were not so forward.

415. The third is the *cutting* off some few of the *Top-boughs* in the *Spring time*, but suffering the lower Boughs to grow on. The *cause* is, for that the Boughs do help to draw up the Sap more strongly; and we see that in Powling of Trees, many do use to leave a Bough or two on the top to help to draw up the Sap. And it is reported also, That if you graft upon the Bough of a Tree, and cut off some of the old Boughs, the new Cions will perish.

416. The fourth is by *laying the Roots bare about Christmas* some days. The *cause* is plain, for that it doth arrest the Sap from going upwards for a time; which arrest, is afterwards released by the covering of the Root again with Earth, and then the Sap getteth up, but later.

417. The fifth is the *removing* of the *Tree* some Moneth before it *Buddeth*. The *cause* is for that some time will be required after the *Remove*, for the Resetling, before it can draw the Juyce; and that time being lost, the blossom must needs come forth later.

418. The sixth is the *Grafting of Roses* in *May*, which commonly Gardiners do not till *July*, and then they bear not till the next year; but if you graft them in *May* they will bear the same year, but late.

419. The seventh is the *Girding* of the *Body* of the *Tree* about with some Packthred for that also in a degree restraineth the Sap, and maketh it come up more late, and more slowly.

420. The eighth is the *Planting* of them in a *Shade* or in a *Hedge*. The *cause* is, partly the keeping out of the Sun, which hasteneth the Sap to rise, and partly the robbing of them of Nourishment by the stuff in the *Hedge*.

These

these means may be practised upon other, both Trees, and Flowers, *Mutatis Mutandis*.

421. Men have entertained a conceit that sheweth prettily, namely, That if you graft a *Late coming Fruit*, upon a Stock of a *Fruit tree* that *cometh early*, the Graft will bear *Fruit-early*, as a Peach upon a Cherry. And contrariwise, if an *Early coming-Fruit* upon a Stock of a *Fruit-tree* that *cometh late*, the Graft will bear a Fruit late; as a Cherry upon a Peach. But these are but imaginations, and untrue The *cause* is, for that the Cions overruleth the Stock quite, and the Stock is but Passive onely, and giveth Aliment, but no Motion to the Graft.

Experiments in Consort, touching the *Majoration* of Fruits, Trees, and Plants.

WE will speak now, how to make *Fruits*, *Flowers*, and *Roots* larger, in more plenty and sweeter than they use to be; and how to make the *Tree* themselves more tall, more spred, and more hasty and sudden, than they use to be. Wherein there is no doubt, but the former *Experiments* of *Acceleration* will serve much to these purposes. And again, that these *Experiments* which we shall now set down, do serve also for *Acceleration*, because both Effects proceeds from the encrease of Vigor in the Tree; but yet to avoid confusion. And because some of the Means are more proper for the one effect, and some for the other. We will handle them apart.

422. It is an assured Experience, That an *heap of flint* or *Stone*, laid about the *bottom* of a *Wilde Tree*, (as in Oak, Elm, Ash, &c.) upon the first planting doth make it prosper double as much as without it. The *cause* is, for that it retaineth the moisture which falleth at any time upon the *Tree*, and suffereth it not to be exhaled by the Sun. Again, it keepeth the Tree warm from cold Blasts and Frosts, as it were in an House. It may be also, there is somewhat in the keeping of it steady at the first. *Quere*, if laying of Straw some height about the Body of a *Tree*, will not make the *Tree* forwards: For though the Root giveth the Sap, yet it is the Body that draweth it. But you must note, that if you lay *Stones* about the Stalk of Lettuce, or other Plants that are more soft, it will over moisten the Root so as the worms will eat them.

423. A *Tree* at the first *setting*, should not be *shaken*, until it hath *taken Root fully*; and therefore some have put two little Forks about the bottom of their *Trees*, to keep them upright but after a years rooting, then shaking doth the *Tree* good by loosning of the Earth, and (perhaps) by exercising (as it were) and stirring the Sap of the *Tree*.

424. Generally, the *cutting away of Boughs* and *Suckers* at the *Root* and Body, doth make *Trees* grow high: and contrariwise, the *Powling*, and *Cutting* of the top, maketh them grow, spread, and bushy: as we see in *Pollards*, &c.

425. It is reported, That to make hasty *growing Coppice wood*, the way is to take, *Willow*, *Sallow*, *Popler*, *Alder*, of some seven years growth: and to set them, not upright, but aslope, a reasonable depth under the Ground; and then instead of one Root they will put forth many, and so carry more shoots upon a Stem.

426. When you would have *many new Roots of* Fruit-*trees*, take a low *Tree*, and bow it, and lay all his Branches a flat upon the ground, and cast Earth upon them, and every twig will take Root. And this is a very profitable *Experiment* for costly *Trees*, (for the Boughs will make Stocks without charge) such as are *Apricots*, *Peaches*, *Almonds*, *Cornelians*, *Mulberries*, *Figs*, &c.

&c. The like is continually practiſed with *Vines*, *Roſes*, *Muſk-Roſes*, &c.

427. From *May* to *July* you may take off the *Bark* of any *Bough*, being of the bigneſs of Three or four Inches, and cover the bare place, ſomewhat above and below with Loam, well tempered with Horſe-dung, binding it faſt down. Then cut off the Bough about *Alhollantide* in the bare place, and ſet it in the Ground, and it will grow to be a fair *Tree* in one year. The *cauſe* may be, for that the *Bearing* from the *Bark*, keepeth the *Sap* from deſcending towards Winter, and ſo holdeth it in the Bough; and it may be alſo, that Loam and Horſe-dung applied to the bare place, do moiſten it and cheriſh it, and make it more apt to put forth the Root. Note, that this may be a general means for keeping up the Sap of *Trees* in their Boughs, which may

428. ſerve to other effects.

It hath been practiſed in *Trees*, that ſhew fair and *bear* not, to bore a *hole* thorow the *Heart* of the *Tree*, and thereupon it will bear. Which may be, for that the *Tree* before hath too much Repletion, and was oppreſſed

429. with his own Sap; for *Repletion* is an enemy to Generation.

It hath been practiſed in *Trees* that do not bear, to cleave two or three of the chief Roots, and to put into the Cleft a ſmall Pebble, which may keep it open, and then it will bear. The *cauſe* may be, for that a Root of a *Tree* may be (as it were) hide-bound, no leſs than the Body of the Tree;

430. but it will not keep open without ſomewhat put into it.

It is uſually practiſed to ſet *Trees* that require much *Sun*, upon *Walls* againſt the *South*; as *Apricots*, *Peaches*, *Plumbs*, *Vines*, *Figs*, and the like. It hath a double commodity; the one, the *heat* of the *Wall* by *reflection*; the other, the *taking away* of the *ſhade*: For when a *Tree* groweth round; the upper Boughs over ſhaddow the lower, but when it is ſpread upon a Wall,

431. the Sun cometh alike upon the upper and lower Branches.

It hath alſo been practiſed (by ſome) to pull off ſome *Leaves* from the *Trees* ſo *ſpread*, that the Sun may come upon the *Bough* and *Fruit* the better. There hath been practiſed alſo a curioſity, to ſet a *Tree* upon the *North ſide* of a Wall, and at a little hieght, to draw him through the Wall, and *ſpread* him upon the South ſide; conceiving, that the Root and lower part of the Stock ſhould enjoy the freſhneſs of the ſhade, and the upper Boughs and Fruit, the comfort of the Sun, but it ſorted not. The *cauſe* is, for that the *Root* requireth ſome comfort from the Sun, though under Earth, as well as the Body; and the lower part of the *Body* more than the upper, as we

432. ſee in compaſſing a *Tree* below with ſtraw.

The *lowneſs* of the *Bough*, where the *Fruit* cometh, maketh the *Fruit* greater, and to ripen better; for you ſhall ever ſee in *Aprecotes*, *Peaches*, or *Melo-Cotones* upon a Wall, the greateſt Fruits towards the bottom. And in *France* the *Grapes* that make the *Wine*, grow upon low Vines, bound to ſmall Stakes; and the raiſed Vines in Arbors, make but Verjuyce. It is true, that in *Italy*, and other *Countreys* where they have hotter Sun, they raiſe them upon *Elms* and *Trees*: But I conceive, that if the *French* manner of Planting low, were brought in uſe, there their *Wines* would be ſtronger and ſweeter: But it is more chargeable in reſpect of the Props. It were good to try whether a *Tree* grafted ſomewhat near the ground, and the lower Boughs onely maintained, and the higher continually proynd off would not make a larger *Fruit*.

433. To have *Fruit* in *greater plenty*, the way is to graft, not onely upon young *Stocks*, but upon divers *Boughs* of an old *Tree*; for they will bear

great

great numbers of Fruit; whereas if you graft but upon one Stock, the *Tree* can bear but few.

434. The *Digging* yearly about the *Roots of Trees*, which is a great means both to the *Acceleration* and *Melioration of Fruits*, is practiſed in nothing but in *Vines*; which, if it were transferred unto other *Trees* and *Shrubs*, (as *Roſes*, &c.) I conceive, would advance them likewiſe.

435. It hath been known, that a *Fruit-tree* hath been blown up (almoſt) by the Roots, and ſet up again, and the next year bare exceedingly. The *cauſe* of this was nothing but the *looſening* of the *Earth*, which comforteth any *Tree*, and is fit to be practiſed more than it is in *Fruit-Trees*: For *Trees* cannot be ſo fitly removed into new Grounds, as *Flowers* and *Herbs* may.

436. To revive an *old Tree*, the digging of it about the *Roots*, and applying new Mould to the Roots, is the way. We ſee alſo that *Draught-Oxen* put into Freſh Paſture, gather new and tender fleſh; and in all things, better nouriſhment than hath been uſed, doth help to renew, eſpecially, if it be not onely better but changed, and differing from the former.

437. If an *Herb* be cut off from the *Roots*, in the beginning of Winter, and then the Earth be trodden and beaten down hard with the Foot and ſpade, the Roots will become of very great magnitude in Summer. The reaſon is, for that the moiſture being forbidden to come up in the Plant, ſtayeth longer in the Root, and ſo dilateth it. And *Gardiners* uſe to tread down any looſe Ground after they have ſown *Onions*, or *Turnips*, &c.

438. If *Panicum* be laid below, and about the bottom of a Root, it will cauſe the Root to grow to an exceſſive bigneſs. The *cauſe* is, for that being it ſelf of a ſpungy ſubſtance, it draweth the moiſture of the Earth to it, and ſo feedeth the Root. This is of greateſt uſe for *Onions*, *Turnips*, *Parſnips*, and *Carrets*.

439. The *ſhifting of Ground* is a means to better the *Tree* and Fruit; but with this Caution, That all things do proſper beſt, when they are advanced to the better. Your *Nurſery of Stocks* ought to be in a more barren Ground, than the Grounds whereunto you remove them. So all *Graſiers* prefer their Cattle from meaner Paſtures to better. We ſee alſo, that hardneſs in youth lengthneth life, becauſe it leaveth a cheriſhing to the better of the Body in Age: Nay, in exerciſes it is good to begin with the hardeſt, as Dancing in thick Shoes, &c.

440. It hath been obſerved that *Hacking of Trees* in their *Bark*, both downright, and a croſs, ſo as you make them rather in ſlices, than in continued Hacks, doth great good to *Trees*, and eſpecially delivereth them from being *Hide-bound*, and killeth their Moſs.

441. *Shade* to ſome *Plants* conduceth to make them large and proſperous more than *Sun*; as in *Strawberries* and *Bays*, &c. Therefore amongſt *Strawberries*, ſow here and there ſome *Borrage-Seed*; and you ſhall find the *Strawberries* under thoſe Leaves, far more large than their fellows. And *Bays* you muſt plant to the *North*, or defend them from the *Sun* by a Hedg Row; and when you ſow the *Berries*, weed not the *Borders* for the firſt half year; for the *Weed* giveth them *Shade*.

442. To increaſe the *Crops of Plants*, there would be conſidered, not onely the *increaſing* the *Luſt* of the *Earth*, or of the *Plant*, but the ſaving alſo of that which is ſpilt. So they have lately made a tryal to *ſet Wheat*; which nevertheleſs hath been left off, becauſe of the trouble and pains; yet ſo much is true, that there is much ſaved by the *Setting*, in compariſon of that

that which is *Sowen*, both by keeping it from being picked up by Birds, and by avoiding the ſhallow lying of it, whereby much that is ſown, taketh no Root.

443. It is preſcribed by ſome of the *Ancients*, that you take *Small Trees*, upon which *Figs* or other *Fruit* grow, being yet unripe, and cover the *Trees* in the middle of *Autumn* with Dung until the Spring, and then take them up in a warm day, and replant them in good Ground; and by that means, the former years *Tree* will be ripe, as by a new Birth, when other *Trees* of the ſame kind do but bloſſom. But this ſeemeth to have no great probability.

444. It is reported, that if you take *Nitre*, and mingle it with *Water*, to the thickneſs of *Honey*, and therewith anoint the *Bud*, after the *Vine* is cut, it will ſprout forth within eight days. The *Cauſe* is like to be (if the *Experiment* be true) the opening of the *Bud*, and of the parts contiguous, by the Spirit of the *Nitre*; for *Nitre* is (as it were) the life of *Vegetables*.

445. Take *Seed* or *Kernels* of *Apples*, *Pears*, *Orenges*, or a *Peach*, or a *Plumb-Stone*, &c. And put them into a *Squill*, (which is like a great *Onion*, and they will come much earlier then the *Earth* it ſelf. This I conceive to be as a kind of *Grafting* in the *Root*; for as the Stock of a Graft yieldeth better prepared nouriſhment to the Graft, than the Crude Earth; ſo the *Squill* doth the like to the *Seed*; and, I ſuppoſe, the ſame would be done, by putting *Kernels* into a *Turnip*, or the like, ſave that the *Squill* is more vigorous and hot. It may be tryed alſo, with putting *Onion-Seed* into an *Onion-Head*, which thereby (perhaps) will bring forth a larger and earlier *Onion*.

446. The *pricking* of a *Fruit* in ſeveral places, when it is almoſt at his bigneſs, and before it ripeneth, hath been practiſed with ſucceſs, to ripen the Fruit more ſuddenly. We ſee the example of the biting of *Waſps* or *Worms* upon Fruit (whereby it manifeſtly) ripeneth the ſooner.

447. It is reported, That *Alga Marina* (*Sea-weed*) put under the *Roots of Cole-worts*, and (perhaps) of other Plants, will further their growth. The Vertue (no doubt) hath relation to *Salt*, which is a great help to Fertility.

448. It hath been practiſed to cut off the Stalks of *Cucumbers*, immediately after their *bearing*, cloſe by the Earth; and then to caſt a pretty quantity of Earth upon the *Plant* that remaineth, and they will bear the next year Fruit long before the ordinary time. The *Cauſe* may be, for that the Sap goeth down the ſooner, and is not ſpent in the Stalk or Leaf, which remaineth after the Fruit. Where note, that the *Dying*, in the *Winter*, of the *Roots* or *Plants* that are *Annual*, ſeemeth to be partly cauſed by the over-expence of the Sap into Stalk and Leaves; which being prevented, they will ſuper-annate, if they ſtand warm.

449. The *pulling off* many of the *Bloſſoms* from a *Fruit-Tree*, doth make the *Fruit* fairer. The *cauſe* is manifeſt, for that the Sap hath the leſs to nouriſh. And it is a common experience, That if you do not pull off ſome *Bloſſoms*, the firſt time a Tree bloometh, it will bloſſom it ſelf to death.

450. It were good to try what would be the effect, if all the *Bloſſoms* were pulled from a *Fruit-tree*, or the *Acorns* and *Cheſnut-buds*, &c. From a *wilde Tree*, for two years together. I ſuppoſe that the *Tree* will either put forth the third year bigger and more plentiful *Fruit*; or elſe, the ſame years, larger Leaves, becauſe of the Sap ſtored up.

It

It hath been generally received, that a *Plant watred* with *warm Water*, will come up ſooner and better, than with cold Water, or with Showers, But our *Experiment of watering Wheat* with *warm Water* (as hath been ſaid) ſucceeded not; which may be, becauſe the tryal was too late in the Year, *viz.* in the end of *October*. For the Cold then coming upon the *Seed*, after it was made more tender by the warm Water, might check it. 451.

There is nō doubt, but that *Grafting* (for the moſt part) doth *meliorate* the *Fruit*. The *cauſe* is manifeſt, for that the nouriſhment is better prepared in the *Stock*, than in the *Crude Earth*: But yet note well, that there be ſome *Trees* that are ſaid to come up more happily from the *Kernel*, than from the *Graft*; as the *Peach*, and *Melocotone*. The *cauſe*, I ſuppoſe to be, for that thoſe *Plants* require a nouriſhment of great moiſture; and though the nouriſhment of the *Stock* be finer, and better prepared, yet it is not ſo moiſt and plentiful, as the nouriſhment of the *Earth*. And indeed we ſee thoſe *Fruits* are very cold *Fruits* in their Nature. 452.

It hath been received, that a ſmaller *Pear*, grafted upon a *Stock* that beareth a greater *Pear*, will become great. But I think it is as true, as that of the *Prime-Fruit* upon the *late Stock*, and *è converſo*, which we rejected before; for the *Cions* will govern. Nevertheleſs, it is probable enough, that if you can get a *Cions* to grow upon a *Stock* of another kind, that is much moiſter than his own *Stock*, it may make the *Fruit* greater, becauſe it will yield more plentiful nouriſhment, though it is like it will make the *Fruit* baſer. But generally the *grafting* is upon a dryer *Stock*; as the *Apple* upon a *Crab*, the *Pear* upon a *Thorn*, &c. Yet it is reported, that in the *Low-Countreys* they will graft an *Apple-Cions* upon the *Stock* of a *Colewort*, and it will bear a great flaggy *Apple*; the *Kernel* of which, if it be ſet, will be a *Colewort*, and not an *Apple*. It were good to try, whether an *Apple-Cions* will proſper, if it be grafted upon a *Sallow* or upon a *Popler*, or upon an *Alder* or upon an *Elm*, or upon an *Horſe-Plum*, which are the moiſteſt of *Trees*. I have heard that it hath been tryed upon an *Elm*, and ſucceeded. 453.

It is manifeſt by experience. That *Flowers* removed, wax greater, becauſe the nouriſhment is more eaſily come by in the looſe Earth. It may be, that oft regrafting of the ſame *Cions*, may likewiſe make Fruit greater: as if you take a Cions, and graft it upon a *Stock* the firſt year; and then cut it off, and graft it upon another *Stock* the ſecond year, and ſo for a third, or fourth year, and then let it reſt, it will yield afterward, when it beareth, the greater *Fruit*. 454.

Of Grafting, *there are many* Experiments *worth the noting, but thoſe we reſerve to a proper place.*

It maketh *Figs* better, if a *Fig-tree*, when it beginneth to put forth Leaves have his top cut off. The *cauſe* is plain, for that the Sap hath the leſs to feed, and the leſs way to mount: But it may be the *Fig* will come ſomewhat later, as was formerly touched. The ſame may be tryed likewiſe in other *Trees*. 455.

It is reported, That *Mulberries* will be fairer, and the *Trees* more fruitful, if you bore the *Trunk* of the *Tree* thorow in ſeveral places, and thruſt into the places bored, Wedges of ſome hot *Trees*; as *Turpentine*, *Maſtick-tree*, *Guaiacum*, *Juniper*, &c. The *cauſe* may be, for that Adventive heat doth chear up the Native Juyce of the *Tree*. 456.

It is reported, That *Trees* will grow greater and bear better *Fruit*, if you put Salt, or *Lees of Wine*, or *Blood* to the *Root*. The *cauſe* may be the encreaſing 457.

creasing the Luſt or Spirit of the *Root*: Theſe things being more forcible than ordinary *compoſts*.

458. It is reported by one of the Ancients, that *Artichoaks* will be leſs prickly, and more tender, if the *Seeds* have their tops dulled or grated off upon a Stone.

459. *Herbs* will be tenderer, and fairer, if you take them out of *Beds* when they are newly come up, and remove them into *Pots* with better *Earth*. The remove from *Bed* to *Bed* was ſpoken of before; but that was in ſeveral years, this is upon the ſudden. The *cauſe* is the ſame with other *Removes* formerly mentioned.

460. *Coleworts* are reported by one of the *Ancients*, to proſper exceedingly, and to be better taſted, if they be ſometimes watred with *Salt-water*, and much more with *Water* mixed with Nitre, the Spirit of which is leſs Adurent than *Salt*.

461. It is reported, That *Cucumbers* will prove more tender and dainty, if their *Seeds* be *ſteeped* (a little) in *Milk*; the *cauſe* may be, for that the *Seed* being mollified with the *Milk*, will be too weak to draw the groſſer Juyce of the Earth, but only the finer. The ſame *Experiment* may be made in *Artichoaks*, and other *Seeds*, when you would take away, either their Flaſhineſs or Bitterneſs. They ſpeak alſo, that the like effect followeth of *ſteeping* in *Water* mixed with *Honey*; but that ſeemeth to me not ſo probable, becauſe *Honey* hath too quick a *Spirit*.

462. It is reported, That *Cucumbers* will be leſs *Watry*, and more *Melonlike*, if the Pit where you ſet them, you fill it (half way up) with *Chaff*, or ſmall Sticks, and then power *Earth* upon them; for *Cucumbers*, as ſeemeth, do extreamly affect moiſture, and over-drink themſelves; which this *Chaff* or *Chips* forbiddeth. Nay it is further reported, That if, when a *Cucumber* is grown, you ſet a *Pot* of water about five or ſix inches diſtance from it, it will in Four and twenty hours ſhoot ſo much out as to touch the *Pot*; which if it be true, it is an *Experiment* of an higher nature than belongeth to this Title: For it diſcovereth *Perception* in *Plants* to move towards that which ſhould help and comfort them, though it be at a diſtance. The ancient Tradition of the *Vine* is far more ſtrange: It is, that if you ſet a ſtake, or *Prop*, ſome diſtance from it, it will grow that way: Which is far ſtranger (as is ſaid) than the other: For that *Water* may work by a *Sympathy* of *Attraction*: But this of the *Stake* ſeemeth to be a Reaſonable Diſcourſe.

463. It hath been touched before, that *Terebration* of *Trees* doth make them proſper better. But it is found alſo, that it maketh the *Fruit* ſweeter, and better. The *cauſe* is, for that notwithſtanding the *Terebration*, they may receive Aliment ſufficient, and yet no more than they can well turn, and diſgeſt; and withal do ſweat out the courſeſt and unprofitableſt Juyce, even as it is in Living Creatures: which by moderate feeding, and exerciſe, and ſweat, attain the ſoundeſt habit of Body.

464. As Terebation doth *Meliorate Fruit*, ſo, upon the like reaſon, doth *Letting of Plants Blood*; as *Pricking Vines*, or other *Trees*, after they be of ſome growth, and thereby letting forth *Gum* or *Tears*, though this be not to continue, as it is in *Terebration*, but at ſome Seaſons. And it is reported, that by this Artifice, *Bitter Almonds* have been turned into *Sweet*.

465. The Ancients for the *Dulcorating* of *Fruit*, do commend *Swines-dung*, above all other *Dung*: Which may be, becauſe of the Moiſture of that Beaſt, whereby the *Excrement* hath leſs Acrimony; For we ſee *Swines* and *Pigs* Fleſh is the Moiſteſt of Fleſhes.

It

466. It is observed by some, that all *Herbs* wax sweeter, both in smell and taste, if after they be grown up some reasonable time, they be cut, and so you take the latter Sprout. The *cause* may be, for that the longer the Juyce stayeth in the Root and Stalk, the better it concocteth. For one of the chief causes, why *Grains*, *Seeds*, and *Fruits*, are more nourishing than *Leaves*, is the length of time, in which they grow to *Maturation*. It were not amiss to keep back the Sap of *Herbs*, or the like, by some fit means, till the end of Summer, whereby (it may be) they will be more nourishing.

467. As *Grafting* doth generally advance and *Meliorate Fruits*, above that which they would be, if they where set of *Kernels* or *Stones*, in regard the *nourishment* is better concocted: So (no doubt) even in *Grafting*, for the same cause, the choice of the *Stock* doth much; always provided, that it be somewhat inferior to the *Cions*. For otherwise it dulleth it. They commend much the *Grafting* of *Pears*, or *Apples*, upon a *Quince*.

468. Besides the *Means* of *Melioration* of *Fruits* before-mentioned, it is set down as tryed, that a *mixture* of *Bran* and *Swines-dung*, or *Chaff* and *Swines-dung* (especially laid up together for a moneth to rot) is a very great nourisher and comforter to a *Fruit-tree*.

469. It is delivered, that *Onions* wax greater, if they be taken out of the Earth, and laid a drying twenty days, and then set again; and yet more, if the outermost Pill be taken off all over.

470. It is delivered by some, that if one take the *Bough* of a *low Fruit-tree*, newly budded, and draw it gently, without hurting it, into an *Earthen pot* perforate at the bottom to let in the *Plant*, and then cover the *Pot* with Earth, it will yield a very large *Fruit* within the Ground. Which *Experiment* is nothing but *potting* of *Plants*, without removing and leaving the *Fruit* in the Earth. The like (they say) will be effected by an empty *Pot* without Earth in it, put over a *Fruit*, being propped up, with a *stake* as in hangeth upon the *Tree*, and the better, if some few Pertusions be made in the *Pot*. Wherein, besides the defending of the *Fruit* from extremity of Sun or Weather, some give a reason, that the *Fruit* loving and coveting the open Air and Sun, is invited by the *Pertusions* to spread and approach as near the open Air as it can, and so inlargeth in *Magnitude*.

471. All *Trees* in *high* and *Sandy Grounds*, are to be set deep; and in *Watry Grounds* more shallow. And in all *Trees* when they be removed (especially *Fruit-trees*) care ought to be taken, that the sides of the *Trees* be coasted (*North* and *South* &c.) as they stood before. The same is said also of *Stone* out of the *Quarry*, to make it more durable, though that seemeth to have less reason; because the *Stone* lyeth not so near the Sun, as the *Tree* groweth.

472. *Timber Trees* in a *Coppice-wood*, do grow better than in an *open Field*; both, because they offer not to spread so much, but shoot up still in height, and chiefly, because they are defended from too much Sun and Wind which do check the growth of all *Fruit*, and so (no doubt) *Fruit-trees*, or *Vines*, set upon a *Wall* against the Sun, between Elbows and Buttresses of Stone ripen more than upon a plain Wall.

473. It is said, that if *Potado Roots* be set in a *Pot* filled with Earth, and then the *Pot* with Earth be set likewise within the Ground, some two or three inches, the *Roots* will grow greater than ordinary. The cause may be, for that having Earth enough within the *Pot* to nourish them; and then being stopped by the bottome of the *Pot* from putting strings downward, they must needs grow greater in breadth and thickness. And it may be

that all *Seeds* or *Roots*, *Potted*, and so set into the Earth, will prosper the better.

474. The *cutting off* the *Leaves* of *Raddish*, or other *Roots*, in the beginning of Winter before they wither; and covering again the *Root*, something high with Earth, will preserve the *Root* all Winter, and make it bigger in the Spring following, as hath been partly touched before. So that there is a double use of this *cutting off* the *Leaves*: For in *Plants*, where the *Root* is the *Esculent*, as *Raddish*, and *Parsnips*, it will make the *Root* the greater; and so it will do to the *Heads* of *Onions*, and where the *Fruit* is the *Esculent*, by strengthning the *Root*, it will make the *Fruit* also the greater.

475. It is an *Experiment* of great pleasure to make the *Leaves* of *shaddy Trees*, larger than ordinary. It hath been tryed (for certain) that a *Cion* of a *Weech Elm*, grafted upon the stock of an ordinary *Elm*, will put forth Leaves, almost as broad as the brim of ones Hat. And it is very likely, that as in *Fruit Trees*, the *Graft* maketh a greater *Fruit*; so in *Trees* that bear no *Fruit*, it will make the greater *Leaves*. It would be tryed therefore in *Trees* of that kind chiefly; as *Birch*, *Ash*, *Willow*, and especially the *Shining Willow*, which they call *Swallow Tail*, because of the pleasure of the Leaf.

476. The *Barrenness* of *Trees* by *accident* (besides the *weakness* of the *Soil*, *Seed*, or *Root*, and the *injury* of the *Weather*) coming either of their *overgrowing* with Moss, or their being *hide bound*, or their *planting too deep*, or by *issuing* of the *Sap too much into the Leaves*: For all these there are *remedies* mentioned before.

Experiments in Consort, touching *Compound Fruits and Flowers*.

WE see that in *Living Creatures* that have *Male* and *Female*, there is *copulation* of several kinds, and so *Compound Creatures*; as the *Mule*, that is generated betwixt the *Horse* and *Ass*; and some other *Compounds* which we call *Monsters*, though more rare: And it is held that that *Proverb*, *Africa semper aliquid Monstri parit*, cometh, for that the Fountains of Waters there being rare, divers sorts of Beasts come from several parts to drink, and so being refreshed fall to couple, and many times with several kinds. The *compounding* or *mixture* of *Kinds* in *Plants* is not found out; which nevertheless, if it be possible is more at command than that of *Living Creatures*, for that their lust requireth a voluntary motion; wherefore it were one of the most noble *Experiments* touching *Plants*, to find it out, for so you may have great variety of new *Fruits*, and *Flowers* yet unknown. *Grafting* doth it not, that mendeth the *Fruits* or doubleth the *Flowers*, &c. But it hath not the power to make a *new kind*. For the *Cions* ever over-ruleth the *Stock*.

477. It hath been set down by one of the *Ancients*, That if you take two *Twigs* of several *Fruit-trees*, and flat them on the sides, and then bind them close together, and set them in the ground, they will come up in one Stock; but yet they will put forth in their several *Fruits* without any *commixture* in the *Fruit*. Wherein note (by the way) that *Unity* of *Continuance*, is easier to procure, than *Unity of Species*. It is reported also, That *Vines of Red* and *White Grapes*, being set in the Ground, and the upper parts being flatted, and bound close together, will put forth *Grapes* of the several colours, upon the same Branch; and *Grape stones* of several colours within the same *Grape*: But the more, after a year or two, the unity (as it seemeth) growing more perfect. And this will likewise help it from the

the first *uniting*, they be often watred, for all moisture helpeth to *Union*. And it is preseribed also to bind the *Bud*, as soon as it cometh forth, as well as the *Stock*, at the least for a time.

They report, that divers *Seeds* put into a *Clout*, and laid in Earth well dunged, will put up *Plants contiguous*; which (afterwards) being bound in their *Shoots* will *incorporate*. The like is said of *Kernels* put into a *Bottle*, with a narrow mouth, filled with Earth. 478.

It is reported, that young *Trees* of several kinds set contiguous without any binding, and very often watred in a *fruitful ground*, with the very luxury of the *Trees* incorporeate and grow together. Which seemeth to me the likelieſt means that hath been propounded; for that the *binding* doth hinder the natural swelling of the *Tree*, which, while it is in motion, doth better *unite*. 479.

Experiments 3. Consort touching the *Sympathy* and *Antipathy* of *Plants*.

THere are many ancient and received Traditions and Observations, touching the *Sympathy* and *Antipathy* of *Plants*; for that some will thrive best growing near others, which they impute to *Sympathy*; and some worse, which they impute to *Antipathy*. But these are idle and ignorant conceits, and forsake the true *indication* of the *causes*; as the most part of *Experiments*, that concern *Sympathies* and *Antipathies* do. For as to *Plants*, neither is there any such secret *Friendship*, or *Hatred*, as they imagine. And if we should be content to call it *Sympathy* and *Antipathy*, it is utterly mistaken; for their *Sympathy* is an *Antipathy*, and their *Antipathy* is a *Sympathy*: For it is thus, whersoever one *Plant* draweth such a particular Juyce out of the Earth, as it qualifieth the Earth, so as that Juyce which remaineth is fit for the other *Plant*, there the Neighborhood doth good, because the nourishments are contrary, or several: But where two *Plants* draw (much) the same Juyce, there the Neighborhood hurteth; for the one deceiveth the other.

First, therefore, all *Plants* that do draw much *nourishment* from the *Earth*, and so soak the *Earth*, and exhaust it, hurt all things that grow by them; as great *Trees*, (especially *Ashes*) and such *Trees*, as spread their *Roots* near the top of the ground. So the *Colewort* is not an enemy (though that were anciently received) to the *Vine* onely; but it is an enemy to any other *Plant*, because it draweth strongly the fattest Juyce of the Earth. And if it be true, that the *Vine*, when it creepeth near the *Colewort*, will turn way: This may be, because there it findeth worse nourishment; for though the *Root* be where it was, yet (I doubt) the *Plant* will bend as it nourisheth. 480.

Where *Plants* are of several Natures, and draw several Juyces out of the Earth, there (as hath been said) the one set by the other helpeth: As it is set down by divers of the Ancients, that *Rew* doth prosper much, and becometh stronger, if it be set by a *Fig-tree*: Which (we conceive) is caused not by reason of *Friendship*, but by *Extraction* of a contrary Juyce; the one drawing *Juyce* fit to result sweet, the other bitter. So they have set down likewise, that a *Rose* set by *Garlike* is sweeter; which likewise may be, because the more Fetide Juyce of the Earth goeth into the *Garlick*, and the more oderate into the *Rose*. 481.

This we see manifestly, That there be certain *Corn-flowers* which come seldome or never in other places, unless they be set, but onely amongst 482.

Corn: As the *blew Bottle* a kind of *Yellow Mary-Gold*. *Wilde Poppy*, and *Fumitory*. Neither can this be by reaſon of the culture of the Ground, by Ploughing or Furrowing, as ſome *Herbs* and *Flowers* will grow, but in *Ditches* new caſt, for if the *Ground* lye fallow and unſown, they will not come: So as it ſhould ſeem to be the *Corn* that qualifieth the Earth, and prepareth it for their growth.

483. This obſervation if it holdeth (as it is very probable) is of great uſe, for the *Meliorating* of *Taſte* in *Fruits*, and *Eſculent Herbs*, and of the *ſent* of *Flowers*. For I do not doubt, but if the *Fig-tree* do make the *Rew* more ſtrong and bitter, (as the Ancients have noted) good ſtore of *Rew* planted about the *Fig-tree*, will make the *Fig* more ſweet. Now the *taſts* that do moſt offend in *Fruits*, and *Herbs*, and *Roots* are *bitter*, *harriſh*, *ſowr*, and *watriſh*, or *flaſhy*. It were good therefore to make the *Tryals* following.

484. Take *Wormwood* or *Rew*, and ſet it near *Lattice*, or *Coleflory*, or *Artichoak*; and ſee whether the *Lattice*, or the *Coleflory*, &c. become not the ſweeter.

485. Take a *Service-tree* or a *Cornelian-tree*, or an *Eldertree*, which we know have *Fruits* of *harſh* and binding Juyce, and ſet them near a *Vine* or *Fig-tree*, and ſee whether the *Grapes* or *Figs* will not be the ſweeter.

486. Take *Cucumbers* or *Pumpions*, and ſet them (here and there) amongſt *Muſk-Melons*, and ſee whether the *Melons* will not be more winy, and better taſted. Set *Cucumbers* (likewiſe) amongſt *Raddiſh*, and ſee whether the *Raddiſh* will not be made the more biting.

487. Take *Sorrel* and ſet it amongſt *Raſps*, and ſee whether the *Raſps* will not be the ſweeter.

488. Take *Common Bryar*, and ſet it amongſt *Violets* or *Wall-flowers*, and ſee whether it will not make the *Violets* or *Wall-flowers* ſweeter, and leſs earth in their ſmell. So ſet *Lattice* or *Cucumbers*, amongſt *Roſemary* or *Bays*, and ſee whether the *Roſemary* or *Bays*, will not be the more oderate or aromatical.

489. Contrariwiſe, you muſt take heed how you ſet *Herbs* together that draw much the like Juyce. And therefore I think *Roſemary* will leeſe in ſweetneſs, if it be ſet with *Lavender* or *Bays*, or the like. But yet, if you will correct the ſtrength of an Herb, you ſhall do well to ſet other like Herbs by him, to take him down; and if you would ſet *Tanſey* by *Angelica*, it may be the *Angelica* would be the weaker and fitter for mixture in perfume. And if you ſhould ſet *Rew* by *Common Wormwood*, it may be, the *Wormwood* would turn to be liker *Roman Wormwood*.

490. This *Axiom* is of large extent; and therefore would be ſevered, and refined by *Tryal*. Neither muſt you expect to have a *Groſs difference* by this kind of Culture, but onely *further perfection*.

491. Tryal would be alſo made in *Herbs*, *Poyſonous*, and *Purgative*, whoſe ill quallity (perhaps) may be diſcharged or attempted, by ſetting ſtronger *Poyſons* or *Purgatives* by them.

492. It is reported, that the *Shrub* called *Our Ladies Seal*, (which is a kind of *Briony*) and *Coleworts*, ſet near together, one or both will die. The *cauſe* is, for that they be both great Depredators of the Earth, and one of them ſtarveth the other. The like is ſaid of a *Reed* and a *Brake*, both which are ſucculent; and therefore the one deceiveth the other. And the like of *Hemlock* and *Rew*, both which draw ſtrong Juyces.

493. Some of the Ancients, and likewiſe divers of the Modern Writers, that have labored in *Natural Magick*, have noted a Sympathy between the *Sun*, *Moon*,

Moon, and some principal *Stars*; and certain *Herbs*, and *Plants*. And so they have denominated some *Herbs Solar*, and some *Lunar*, and such like toys put into great words. It is manifest, that there are some *Flowers* that have *respect* to the *Sun* in two *kinds*; the one by *opening* and shutting, and the other by *bowing* and *inclining* the *Head*. For *Mary-golds*, *Tulippas*, *Pimpernel*, and indeed most *Flowers* do *open* or *spread* their Leavs abroad, when the *Sun* shineth serene and fair: And again, (in some part) close them, or gather them inward, either toward night, or when the Sky, is overcast. Of this, there needeth no such solemn Reason to be assigned, as to say, that they rejoyce at the presence of the Sun, and mourn at the absence thereof. For it is nothing else, but a little loading of the Leavs, and swelling them at the bottom, with the moisture of the Air; whereas the dry Air doth extend them. And they make it a piece of the wonder, That *Garden Claver* will hide the *Stalk*, when the *Sun* sheweth bright, which is nothing but a full expansion of the Leavs; for the *bowing* and *inclining* the *Head*, it is found in the great *Flower* of the *Sun*, in *Mary golds*, *Wartwort*, *Mallow Flowers*, and others. The *cause* is somewhat more obscure than the former: But I take it to be no other, but that the part, against which the *Sun* beateth, waxeth more faint and flaccide in the Stalk, and thereby less able to support the *Flower*.

494. What a little *Moisture* will do in *Vegetables*, even though they be dead, and severed from the Earth, appeareth well in the *Experiment* of *Juglers*. They take the *Beard* of an *Oat*, which (if you mark it well) is wreathed at the bottom, and one smooth entire straw at the top. They take onely the part that is wreathed, and cut off the other, leaving the *Beard* half the breadth of a finger in length, Then they make a little *Cross* of a Quill *long-ways*, of that part of the Quill which hath the *Pith*; and Cross ways of that piece of the Quill without *Pith*, the whole *Cross* being the breadth of a finger high: Then they prick the bottom where the *Pith* is and there into they put the Oaten-Beard, leaving half of it sticking forth of the Quill: then they take a little white Box of Wood to deceive men, as if somewhat in the Box did work the feat; in which, with a *Pin*, they make a little hole, enough to take the *Beard*, but not to let the *Cross* sink down, but to stick: Then likewise, by way of Imposture, they make a question: As, who is the faireſt Woman in the company? or who hath a Glove or Card? and cause another to name divers persons; and upon every naming, they stick the *Cross* in the Box, having first put it towards their mouth, as if they charmed it, and the *Cross* stirreth not: but when they come to the person that they would take, as they hold the *Cross* to their Mouth, they touch the *Beard* with the tip of their Tongue, and wet it, and so stick the *Cross* in the Box, and then you shall see it turn finely and softly, three or four turns, which is caused by the untwining of the *Beard* by the moisture. You may see it more evidently, if you stick the Cross between your fingers, instead of the Box: And therefore you may see, that this Motion, which is effected by so little wet, is stronger than the closing or bending of the Head of a *Mary-gold*.

495. It is reported by some, That the *Herb* called *Rosa-Solis* (whereof they make Strong-waters) will at the Noon-day, when the *Sun* shineth hot and bright, have a great Dew upon it. And therefore, that the right name is *Ros Solis*; which they impute to a delight and *Sympathy* that it hath with the Sun. Men favour wonders. It were good first to be sure, That the Dew that is found upon is, be not the Dew of the Morning preserved, when

when the Dew of other *Herbs* is breathed away: For it hath a ſmooth and thick Leaf, that doth not diſcharge the Dew ſo ſoon as other *Herbs* that are more Spungy and Porous. And it may be Purſlane, or ſome other Herb doth the like, and is not marked. But if it be ſo, that it hath more Dew at Noon than in the Morning, then ſure it ſeemeth to be an exudation of the *Herb* it ſelf. *As* Plums ſweat when they are ſet into the Oven: For you will not (I hope) think, that it is like *Gideons Fleece* of *Wooll*, that the *Dew* ſhould fall upon that, and no where elſe.

496. It is certain, that the *Honey Dewes* are found more upon *Oak Leaves*, than upon *Aſh*, or *Beech*, or the like; But whether any cauſe be from the *Leaf* it ſelf, to concoct the Dew; or whether it be onely that the *Leaf* is cloſe and ſmooth (and therefore drinketh not in the Dew, but preſerveth it) may be doubted. It would be well inquired, whether *Manna* the *Drug*, doth fall but upon certain *Herbs* or *Leaves* onely. *Flowers* that have deep *Sockets*, do gather in the bottom a kind of *Honey*; as *Honey-Suckles* (both the *Woodbine* and the *Trifoil*) *Lillies*, and the like. And in them certainly the *Flowers* beareth part with the *Dew*.

497. The Experience is, That the *Froth*, which they call *Woodfare*, (being like a kind of Spittle) is found but upon certain *Herbs*, and thoſe hot ones; as *Lavender*, *Lavender-cotten*, *Sage*, *Hiſſage*, &c. Of the *cauſe* of this enquire further, for it ſeemeth a ſecret. There falleth alſo *Mildew* upon *Corn*, and ſmutteth it: But it may be, that the ſame falleth alſo upon other *Herbs*, and is not obſerved.

498. It were good, Tryal were made, whether the great conſent between *Plants* and *Water*, which is a principal nouriſhment of them, will make an *Attraction* at *Diſtance*, and not at touch onely. Therefore take a *Veſſel*, and in the middle of it make a falſe bottom of courſe Canvas; fill it with Earth above the Canvas, and let not the Earth be watred, then ſow ſome good *Seeds* in that Earth: But under the Canvas, ſome half a foot in the bottom of the Veſſel, lay a great *Spunge*, thorowly wet in Water, and let it lie ſo ſome ten days; and ſee whether the *Seeds* will ſprout, and the *Earth* become more moiſt, and the *Spunge* more dry. The *Experiment* formerly mentioned of the *Cucumber*, creeping to the Pot of Water, is far ſtranger than this.

499. Experiments in Conſort, touching the *Making Herbs and Fruits Medicinable.*

THe *altering* of the *Sent*, *Colour*, or *Taſte* of *Fruit*, by *Infuſion*, *Mixing*, or *Letting*, into the *Bark*, or *Root* of the *Tree Herb* or *Flower*, any *Coloured*, *Aromatical*, or *Medicinal Subſtance*, are but *fancies*. The *cauſe* is, for that thoſe things have paſſed the period, and nouriſh not; and all *alteration* of Vegetables, in thoſe qualities, muſt be by ſomewhat that is apt to go into the nouriſhment of the *Plant*. But this is true; that where *Kine* feed upon *Wilde Garlick*, their *Milk* taſteth plainly of the *Garlick*. And the Fleſh of *Muttons* is better taſted where the *Sheep* feed upon *Wilde Thime*, and other wholſome *Herbs*. *Galen* alſo ſpeaketh of the curing of the *Scirrus* of the *Liver*, by *Milk* of a *Cow*, that feedeth but upon certain *Herbs*; and *Honey* in *Spain* ſmelleth (apparently) of the *Roſemary*, or *Orenge*, from whence the *Bee* gathers it: And there is an old Tradition of a *Maiden* that was fed with *Napellus*, (which is counted the ſtrongeſt poyſon of all *Vegetables*) which with uſe, did not hurt the *Maid*, but poyſon ſome that had carnal company with her. So it is obſerved by ſome, that there is a vertuous *Bezoar*, and another without vertue, which appear to the ſhew alike; but the vertuous is taken from the Beaſt, that feedeth upon the Mountains, where

there

there are *Theriacal Herbs*; and that without vertue, from those that fed in the Valleys, where no such Herbs are. Thus far I am of opinion, that as steeped Wines and Beers are very *Medicinal*, and likewise Bread tempered with divers powders; so of *Meat* also, (as *Flesh*, *Fish*, *Milk*, and *Eggs*) that they may be made of great use for *Medicine* and *Diet*, if the *Beast*, *Fowl*, or *Fish*, be fed with a special kind of food, fit for the disease. It were a dangerous thing also for secret empoysonments. But whether it may be applied unto *Plants* and *Herbs*, I doubt more, because the nourishment of them is a more common Juyce; which is hardly capable of any special quality until the *Plant* doth assimilate it.

But least our incredulity may prejudice any profitable operations in this kind (especially since many of the Ancients have set them down) we think good briefly to propound the four Means, which they have devised of making *Plants Medicinable*. The first is by *slitting* of the *Root* and *infusing* into it the *Medicine*, as *Hellebore*, *Opium*, *Scammony*, *Triacle*, &c. and then binding it up again. This seemeth to me the least probable, because the *Root* draweth imediately from the Earth, and so the nourishment is the more common and less qualified; and besides, it is a long time in going up ere it come to the *Fruit*. The second way is, to *perforate* the *Body* of the *Tree* and there to *infuse* the *Medicine*, which is somewhat better. For if any Vertue be received from the *Medicine*, it hath the less way, and the less time to go up. The third is, the *steeping* of the *Seed* or *Kernel* in some *Liquor* wherein the *Medicine* is *infused*; which I have little opinion of, because *Seed* (I doubt) will not draw the parts of the *matter* which have the *propriety*; but it will be far the more likely, if you mingle the *Medicine* with *Dung*, for that the *Seed*, naturally drawing the *moisture* of the *Dung*, may call in withal some of the *propriety*. The fourth is, the *Watring* of the *Plant* oft, with an *Infusion* of the *Medicine*. This in one respect may have more force than the rest, because the *Medication* is oft renewed, whereas the rest are applied, but at one time; and therefore the vertue may the sooner vanish. But still I doubt, that the *Root* is somewhat too stubborn to receive those fine *Impressions*; and besides (as I have said before) they have a great *Hill* to go up. I judge therefore the likeliest way to be the *Perforation* of the *Body* of the *Tree* in *several places*, *one above the other*, and the *Filling* of the *Holes* with *Dung mingled with the Medicine*. And the *Watring* of those *Lumps* of *Dung*, with *Squirts* of an *Infusion* of the *Medicine* in *dunged Water*, once in three or four days. 500.

NATURAL

NATURAL HISTORY:

Century VI.

OUr *Experiments* we take care to be (as we have often said) either *Experimenta Fructifera*, or *Lucifera*; either of *Use*, or of *Discovery*: For we hate *Impostures*; and despise *Curiosities*. Yet because we must apply our selves somewhat to others, we will set down some *Curiosities* touching *Plants*. *Experiments in Consort, touching Curiosities about Fruits and Plants.*

501. It is a *Curiosity* to have *several Fruits* upon *one Tree*; and the more, when some of them come *early*, and some come *late*: So that you may have, upon the same *Tree*, ripe *Fruits* all Summer. This is easily done by grafting of several *Cions* upon several Boughs of a Stock, in a good ground plentifully fed. So you may have all kinds of *Cherries*, and all kinds of *Plumbs*, and *Peaches*, and *Apricots*, upon one *Tree*: But, I conceive the *Diversity of Fruits* must be such, as will graft upon the same Stock, And therefore, I doubt, whether you can have *Apples*, or *Pears*, or *Orenges*, upon the same Stock, upon which you graft *Plumbs*.

502. It is a *Curiosity* to have *Fruits of divers Shapes* and *Figures*. This is easily performed by Moulding them, when the *Fruit* is young, with Moulds of Earth or Wood. So you may have *Cucumbers*, &c. as long as a Cane, or as round as a Sphere, or formed like a Cross. You may have also *Apples* in the form of *Pears* or *Lemmons*. You may have also *Fruit* in more accurate Figures; as we said of *Men*, *Beasts*, or *Birds*, according as you make the Moulds, wherein you must understand, that you make the Mould big enough to contain the whole *Fruit*, when it is grown to the greatest; for else you will choak the spreading of the *Fruit*, which otherwise would spread it self, and fill the Concave, and so be turned into the *shape* desired: as it is in Mould-works of Liquid things. Some doubt may be conceived,

ceived, that the keeping of the Sun from the *Fruit*, may hurt it: But there is ordinary experience of *Fruit* that groweth covered. *Quere* also, whether some small holes may not be made in the Wood to let in the Sun. And note, that it were best to make the Moulds partible, glued, or cemented together, that you may open them when you take out the Fruit.

503. It is a *curiosity* to have *Inscriptions* or *Engravings*, in *Fruit* or *Trees*. This is easily performed, by *writing* with a *Needle*, or *Bodkin*, or *Knife*, or the like, when the *Fruit* or *Trees* are young; for as they grow, so the Letters will grow more large, and graphical.

——Teneriſque meos incidere Amores
Arboribus, creſcent illæ, creſcetis Amores.

504. You may have *Trees apparelled* with *Flowers* or *Herbs* by *boring holes* in the *Bodies* of them, and putting into them *Earth holpen* with *Muck*, and *ſetting Seeds* or *Slips*, *of Violets*, *Strawberries*, *Wilde Time*, *Camomil*, and such like in the *Earth*, wherein they do but grow in the *Tree*, as they do in *Pots* though (perhaps) with some feeding from the *Trees*. As it would be tryed also with *ſhoots of Vines*, and *Roots of Red Roſes*; for it may be they being of a more Ligneous Nature, will incorporate with the *Tree* it ſelf.

505. It is an ordinary *curioſity* to *form Trees* and *Shrubs* (as *Roſemary*, *Juniper*, and the like) into *ſundry ſhapes*; which is done by moulding them within, and cutting them without, but they are but lame things, being too ſmall to keep Figure; great *Caſtles* made of *Trees* upon Frames of Timber, with Turrets and Arches, were anciently matters of magnificence.

506. Amongſt *curioſities*, I ſhall place *Colouration*, though it be somewhat better; for *Beauty in Flowers* is their pre-eminence. It is obſerved by some that *Gilly-flowers*, *Sweet-Williams*, *Violets*, that are *coloured*, if they be neglected, and neither Watred, nor new Moulded, nor Tranſplanted, will turn *White*. And it is probable, that the *white*, with much culture, may turn *coloured*; for this is certain, That the *white colour* cometh of ſcarcity of Nouriſhment; except in Flowers that are onely *white*, and admit no other *colours*.

507. It is good therefore to ſee what *Natures* do accompany what *colours*; for by that you ſhall have light, how to induce colours; by producing thoſe *Natures*. *Whites* are more inoderate (for the moſt part) than *Flowers* of the ſame kind *coloured*; as is found in *ſingle White Violets*, *White Roſes*, *White Gilly-Flowers*, *White Stock Gilly-Flowers*, &c. We find alſo, that *Bloſſoms of Trees*, that are *White*, are commonly inoderate; as *Cherries*, *Pears*, *Plumbs*, whereas thoſe of *Apples*, *Crabs*, *Almonds*, and *Peaches*, are bluſhy, and ſmell ſweet. The *cauſe* is, for that the ſubſtance that maketh the *Flower*, is of the thinneſt and fineſt of the *Plant*, which alſo maketh *Flowers* to be of ſo dainty *Colours*. And if it be too ſparing and thin, it attaineth no ſtrength of odor, except it be in ſuch *Plants* as are very ſucculent; whereby they need rather to be ſcanted in their nouriſhment, than repleniſhed, to have them ſweet. As we ſee in *White Satyrion*, which is of a dainty ſmell; and in *Bean-Flowers*, &c. And again, if the *Plant* be of Nature to put forth *White-Flowers* onely, and thoſe not thin or dry, they are commonly of rank and fulſome ſmell; as *May-Flowers* and *White-Lillies*.

508. Contrariwiſe, in *Berries*, the *White* is commonly more delicate and ſweet in taſte, than the *Coulored*; as we ſee in *VVhite Grapes*, in *VVhite Raſpes*, in white *Strawberies*, in *VVhite Currans*, &c. The *cauſe* is for that the

the *coloured* are more juyced, and courser juyced; and therefore not so well and equally concocted, but the *white* are better proportioned to the disgestion of the *Plant*.

But in *Fruits*, the *white* commonly is meaner, as in *Pear-plumbs*, *Damosins*, &c. and the choicest *Plumbs* are black; the *Mulberry*, (which though they call it a *Berry*, is a *Fruit*) is better the *Black*, than the *White*. The *Harvest White-Plumb*, is a base *Plumb*, and the *Verdoccio* and *White Date-Plumb*, are no very good *Plumbs*. The *cause* is, for that they are all over-watry: Whereas an higher Concoction is required for sweetness, or pleasure of taste; and therefore all your dainty *Plumbs*, are a little dry, and come from the Stone; as the *Musk-Plumb*, the *Damosin-Plumb*, the *Peach*, the *Apricot*, &c. Yet some *Fruits* which grow not to be *Black*, are of the Nature of *Berries*, sweetest such as are paler, as the *Cœur Cherry*, which inclineth more to *White*, is sweeter than the *Red*; but the *Egriot* is more sowre. 509.

Take *Gilliflowers Seed*, of one kind of *Gilliflowers* (as of the *Clove-Gilliflower* which is the most common) and sow it, and there will come up *Gilliflowers*, some of one *colour*, and some of another, casually, as the *Seed* meeteth with nourishment in the Earth: So that the *Gardiners* find, that they may have two or three *Roots* amongst an hundred that are rare, and of great price, as *Purple Carnation* of several *stripes*. The *cause* is (no doubt) that in *Earth*, though it be contiguous, and in one Bed, there are very several *Juyces*; and as the *Seed* doth casually meet with them, so it cometh forth. And it is noted especially, that those which do come up *Purple*, do always come up single; the *Juyce*, as it seemeth, not being able to suffice a *succulent colour*, and a *double Leaf*. This *Experiment* of several *colours*, coming up from one *Seed*, would be tryed also in *Larks-foot*, *Monk-hood*, *Poppy*, and *Hollyoak*. 510.

Few *Fruits* are coloured *Red* within; the *Queen-Apple* is, and another *Apple*, called the *Rose-Apple*; *Mulberries* likewise, and *Grapes*, though most toward the skin. There is a *Peach* also, that hath a circle of *Red* towards the stone; and the *Egriot-Cherry* is somewhat *Red* within: But no *Pear*, nor *Warden*, nor *Plumb*, nor *Apricot*, although they have (many times) *Red* sides, are coloured *Red* within. The cause may be enquired. 511.

The general *colour* of *Plants* is *Green*, which is a *colour* that no *Flower* is of. There is a *greenish Prime-Rose*, but it is *pale*, and scarce a *green*; the *Leaves* of some *Trees* turn a little *Murrey* or *Reddish*, and they be commonly young *Leaves* that do so; as it is in *Oaks* and *Vines*. And *Hasle-Leaves* rot into a *Yellow*; and some *Hollies* have part of their *Leaves Yellow*, that are (to all seeming) as fresh and shining as the *Green*. I suppose also, that *Yellow* is a less succulent *colour* than *Green*, and a degree nearer *White*. For it hath been noted, that those *Yellow Leaves* of *Holly*, stand ever toward the *North* or *North-East*. Some *Roots* are *Yellow*, as *Carrets*; and some *Plants*, *Blood-red*, Stalk and Leaf and all; as *Amaranthus*. Some *Herbs* incline to *Purple* and *Red*; as a kind of *Sage* doth; and a kind of *Mint*, and *Rosa Solis*, &c. And some have *White Leaves*, as another kind of *Sage*, and another kind of *Mint*: But *Azure* and a *fair Purple* are never found in *Leaves*. This shews that *Flowers* are made of a refined Juyce of the Earth, and so are *Fruits*; but *Leaves* of a more course and common. 512.

It is a *curiosity* also to make *Flowers double*, which effected by *often removing* them into *new Earth*; as on the contrary part, *double Flowers*, 513.

by neglecting, and not removing, prove *single*. And the way to do it speedily, is to sow or set *Seeds*, or *Slips* of *Flowers*; and as soon as they come up, to remove them into new ground that is good: Enquire also, whether *inoculating* of *Flowers*, (as *Stock-Gilliflowers*, *Roses*, *Musk Roses*, &c.) doth not make them *double*. There is a *Cherry-Tree* that hath *double Blossoms*, but that *Tree* beareth no *Fruit*; and, it may be, that the same means, which applied to the *Tree*, doth extreamly accelerate the Sap to rise and break forth, would make the *Tree* spend it self in *Flowers*, and those to become *double*, which were a great pleasure to see, especially in *Apple trees*, *Peach-trees*, and *Almond-Trees*, that have *Blossoms Blush coloured*.

514. The *making* of *Fruits* without *Core* or *Stone*, is likewise a *curiosity*, and somewhat better; because whatsoever maketh them so, is like to make them more tender and delicate. If a *Cions* or *Shoot* fit to be set in the Ground, have the *Pith* finely taken forth (and not altogether, but some of it left, the better to save the life) it will bear a *Fruit* with little or no *Core* or *Stone*. And the like is said to be of dividing a *quick Tree* down to the Ground, and taking out the *Pith*, and then binding it up again.

515. It is reported also, that a *Citron* grafted upon a *Quince* will have small or no *Seeds*; and it is very probable, that any *sowre Fruit* grafted upon a *Stock* that beareth a *sweeter Fruit*, may both make the *Fruit* sweeter, and more void of the harsh matter of *Kernels* or *Seeds*.

516. It is reported, that not only the *taking out* of the *Pith*, but the *stopping* of the *Juyce* of the *Pith* from rising in the midst, and *turning* it to rise on the outside, will make the *Fruit* without *Core* or *Stone*; as if you should bore a *Tree* clean thorow, and put a wedge in. It is true, there is some affinity between the *Pith* and the *Kernel*, because they are both of a harsh substance, and both placed in the midst.

517. It is reported, that *Trees watered* perpetually with *warm Water*, will make a *Fruit* with little or no *Core* or *Stone*. And the rule is general, That whatsoever will make a *wild Tree*, a *Garden Tree*, will make a *Garden Tree* to have less *Core* or *Stone*.

518. Experiments in Consort, touching the *Degenerating* of *Plants*, and of the *Transmutation* of *them*, *one into another*.

THe Rule is certain, That *Plants* for want of Culture, *degenerate* to be baser in the same kind; and sometimes so far, as to change into another kind. 1. The *standing long*, and not being *removed*, maketh them *degenerate*. 2. *Drought*, unless the *Earth* of it self be moist, doth the like. 3. So doth *removing into worse Earth*, or *forbearing to compost the Earth*; as we see, that *Water Mint* turneth into *Field Mint*, and the *Colewort* into *Rape* by neglect, *&c.*

519. Whatsoever *Fruit* useth to be set upon a *Root*, or a *Slip*, if it be *sown*, will *degenerate*; *Grapes* sown, *Figs*, *Almonds*, *Pomegranate Kernels* sown, make the *Fruits degenerate*, and become wild. And again, most of those *Fruits* that use to be *grafted*, if they be set of *Kernels*, or *Stones*, *degenerate*. It is true, that *Peaches* (as hath been touched before) do better upon *Stones set*, than upon *grafting*: And the rule of Exception should seem to be this; That whatsoever *Plant* requireth much moisture, prospereth better upon the *Stone* or *Kernel*, than upon the *Graft*. For the *Stock*, though it giveth a finer nourishment, yet it giveth a scanter, than the Earth at large.

520. *Seeds*, if they be very *old*, and yet have strength enough to bring forth a *Plant*, make the *Plant degenerate*. And therefore skilful Gardners make tryal of the *Seeds*, before they buy them, whether they be good or no, by putting them

them into Water gently boiled: and if they be good, they will ſprout within half an hour.

521. It is ſtrange, which is reported, That *Baſil* too much expoſed to the *Sun*, doth turn into *Wild Time*: Although thoſe two *Herbs* ſeem to have ſmall Affinity; but *Baſil* is almoſt the onely hot *Herb* that hath fat and ſucculent *Leaves*, which Oylineſs, if it be drawn forth by the Sun, it is like it will make a very great change.

522. There is an old Tradition, that *Boughs of Oak* put into the Earth, will put forth *Wilde Vines*; which if it be true, (no doubt) it is not the *Oak* that turneth in a *Vine*, but the *Oak*-*Bough* putrifying, qualifieth the Earth to put forth a *Vine* of it ſelf.

523. It is not impoſſible, and I have heard it verified, that upon *cutting down* of an old *Timber-Tree*, the *Stub* hath put forth ſometimes a *Tree* of another kind; as that *Beech* hath put forth *Birch*: which if it be true, the *cauſe* may be, for that the old Stub is too ſcant of Juice to put forth the former *Tree*, and therefore putteth forth a *Tree* of a ſmaller kind, that needeth leſs Nouriſhment.

524. There is an opinion in the Countrey, That if the ſame *Ground be oft ſown* with the *Grain* that *grew upon it*, it will, in the end, grow to be of a baſer kind.

525. It is certain, that in very *Sterile Years*, *Corn ſown* will grow to an *other kind*.

Grandia ſæpè quibus mandavimus Hordea Sulcis,
Infœlix Lolium, & ſteriles dominatur Avenæ.

And generally it is a Rule, that *Plants* that are brought forth by *Culture*, as Corn, will ſooner change into other Species, than thoſe that come of themſelves: For that *Culture* giveth but an Adventitious Nature, which is more eaſily put off.

This work of the *Tranſmutation of Plants*, one into another, is *inter Magnalia Naturæ*: For the *Tranſmutation of Species* is, in the vulgar Philoſophy pronounced impoſſible: And certainly, it is a thing of difficulty, and requireth deep ſearch in Nature: But ſeeing there appear ſome manifeſt *inſtances* of it, the opinion of Impoſſibility is to be rejected, and the means thereof to be found out. We ſee that in *Living Creatures*, that come of *Putrefaction*, there is much *Tranſmutation* of one into another. As *Caterpillars* turn into *Flies*, &c. And it ſhould ſeem probable, that whatſoever *Creature* having life, is generated without *Seed*, that *Creature* will change out of one *ſpecies* into another; for it is the *Seed*, and the Nature of it, which locketh and boundeth in the *Creature*, that it doth not expatiate. So as we may well conclude, that ſeeing the Earth of it ſelf, doth put forth *Plants* without Seed, therefore *Plants* may well have a *Tranſmigration* of *Species*. Wherefore wanting *Inſtances*, which do occur, we ſhall give Directions of the moſt likely tryals: And generally, we would not have thoſe that read this our work of *Sylva Sylvarum*, account it ſtrange, or think that it is an overhaſte, that we have ſet down particulars untried: For contrariwiſe, in our own eſtimation, we account ſuch particulars more worthy than thoſe that are already tryed and known. For theſe latter muſt be taken as you find them, but the other do level point blank at the inventing of *cauſes*, and *Axioms*.

526. First, therefore you must make an account, that if you will have one *Plant* change into another, you must have the *Nourishment* over-rule the *Seed*. And therefore you are to practice it by *Nourishments*, as contrary as may be, to the *Nature* of the *Herb*; so nevertheless as the *Herb* may grow; and likewise with *Seeds* that are of the weakest sort, and have least vigor. You shall do well therefore to take *Marsh-Herbs*, and plant them upon tops of Hills and Champaigns; and such Plants as require much moisture, upon Sandy and very dry grounds. As for example, *Marsh-Mallows*, and *Sedge* upon Hills; *Cucumber* and *Lettuce-Seed*, and *Coleworts* upon a *Sandy Plat*; so contrariwise plant *Bushes*, *Heath*, *Ling*, and *Brakes* upon a *Wet* or *Marsh Ground*. This I conceive also, that all *Esculent* and *Garden-Herbs*, set upon the tops of Hills, will prove more *Medicinal*, though less *Esculent*, than they were before. And it may be likewise, some *Wilde-Herbs* you may make *Salet-Herbs*. This is the first Rule for *Transmutation* of *Plants*.

527. The second Rule shall be to bury some few *Seeds* of the *Herb* you would change amongst other *Seeds*; and then you shall see whether the Juyce of those other *Seeds* do not so qualifie the Earth, as it will alter the *Seed* whereupon you work. As for example, put *Parsly-seed* amongst *Onion-seed*, or *Lettuce-seed* amongst *Parsly-seed*, or *Basil-seed* amongst *Thyme seed*, and see the change of taste or otherwise. But you shall do well to put the *Seed* you would change into a little Linnen Cloth, that it mingle not with the Forreign *Seed*.

528. The third Rule shall be the *making* of some *meddly*, or *mixture* of *Earth*, with some other *Plants bruised*, or *shaven*, either in *Leaf* or *Root*: As for example, make *Earth*, with a mixture of *Colewort-Leaves* stamped, and set in it *Artichoaks*, or *Parsnips*: So take *Earth* made with *Majoram*, or *Origannum*, or *Wilde-Time*, bruised or stamped, and set in it *Fennel-seed*, &c. In which operation, the Process of Nature still will be, (as I conceive,) not that the *Herb* you work upon, should draw the Juyce of the Forreign *Herb*, (for that opinion we have formerly rejected) but that there will be a new confection of mould, which perhaps will alter the *Seed*, and yet not to the kind of the former *Herb*.

529. The fourth Rule shall be to mark what *Herbs some Earths do put forth of themselves*, and to take that *Earth*, and to *Pot* it, or to *Vessel* it; and in to that, set the Seed you would change: As for Example, take from under Walls, or the like; where *Nettles* put forth in abundance, the Earth which you shall there find, without any *String* or *Root* of the *Nettles*; and pot that *Earth*, and set in it *Stock-Gilly-Flowers*, or *Wall-flowers*, &c. Or sow in the *Seeds* of them, and see what the event will be; or take *Earth*, that you have prepared to put forth *Mushromes* of it self, (whereof you shall find some *instances* following,) and sow it in *Purslane-seed*, or *Lettuce-seed*; for in these *Experiments*, it is likely enough, that the *Earth*, being accustomed to send forth one kind of Nourishment, will alter the new Seed.

530. The fifth Rule shall be, to make the *Herb grow contrary to his nature*, as to make *Ground Herbs* rise in *height*: As for example, carry *Camomile*, or *Wilde Thyme*, or the *Green Strawberry*, upon sticks, as you do *Hops* upon Poles, and see what the event will be.

531. The sixth Rule shall be to make *Plants grow out of the Sun, or open Air*; for that is a great mutation in Nature, and may induce a change in the *Seed*: As barrel up *Earth*, and sow some *Seed* in it, and put it in the bottome of a Pond, or put it in some great hollow *Tree*; try also the sowing of

of *Seeds* in the bottomes of Caves; and Pots with *Seeds* ſown, hanged up in Wells, ſome diſtance from the Water, and ſee what the event will be.

532. Experiments in conſort, touching the *Procerity*, and *Lowneſs*, and *Artificial Dwarfing* of *Trees*.

IT is certain, that *Timber-Trees* in *Coppice Woods*, grow more upright, and more free from under Boughs, than thoſe that ſtand in the *Fields*. The *Cauſe* whereof is, for that *Plants* have a natural motion to get to the Sun; and beſides, they are not glutted with too much nouriſhment; for that the *Coppice* ſhareth with them, and Repletion ever hindreth ſtature. Laſtly, they are kept warm, and that ever in *Plants* helpeth mounting.

533.

Trees that are of themſelves full of *Heat*, (which *Heat* appeareth by their *Inflamable Gums*) as *Firrs*, and *Pines*, mount of themſelves in height without Side-boughs, till they come towards the top. The *Cauſe* is partly heat, and partly tenuity of Juyce; both which ſend the Sap upwards. As for *Juniper*, it is but a *Shrub*, and groweth not big enough in Body to maintain a tall *Tree*.

534.

It is reported, that a good ſtrong *Canvas*, ſpread over a *Tree* grafted low, ſoon after it putteth forth, will *Dwarf* it, and make it ſpread. The *Cauſe* is plain; for that all things that grow, will grow as they find room.

535.

Trees are generally ſet of *Roots* or *Kernels*; but if you ſet them of *Slips*, (as of ſome *Trees* you may, by name the *Mulberry*) ſome of the *Slips* will take; and thoſe that take (as is reported) will be *Dwarf-trees*. The *Cauſe* is, for that a *Slip* draweth nouriſhment more weakly, than either a *Root* or *Kernel*.

536.

All *Plants* that put forth their *Sap* haſtily, have their Bodies not proportionable to their length, and therefore they are *Winders* and *Creepers*; as *Ivy*, *Briony*, *Hops*, *Woodbine*; whereas *Dwarfing* requireth a ſlow putting forth, and leſs vigor of mounting.

Experiments in Conſort, touching the *Rudiments* of *Plants*, and of the *Excreſcences* of *Plants*, or *Super-Plants*.

THe *Scripture* ſaith, That *Solomon* wrote a *Natural Hiſtory*, from the *Cedar* of *Libanus*, to the *Moſs growing upon the Wall*; for ſo the beſt *Tranſlations* have it. And it is true, that *Moſs* is but the *Rudiment* of a *Plant*, and as it were the *Mould* of *Earth* or *Bark*.

537.

Moſs groweth chiefly upon *Ridges* of *Houſes*, tiled or thatched, and upon the *Creſts* of *Walls*, and that *Moſs* is of a lightſome and pleaſant Green. The growing upon *Slopes* is cauſed, for that *Moſs*, as on the one ſide it cometh of Moiſture and *Water*, ſo on the other ſide the Water muſt but ſlide, and not ſtand or pool. And the *Growing* upon *Tiles*, or *Walls*, &c. is cauſed, for that thoſe dried Earths, having not moiſture ſufficient to put forth a *Plant*, do practice *Germination* by putting forth *Moſs*; though when by age, or otherwiſe, they grow to relent and reſolve, they ſometimes put forth *Plants*, as *Wall-flowers*. And almoſt all *Moſs* hath here and there little Stalks; beſides the low Thrum.

538.

Moſs groweth upon *Alleys*, eſpecially ſuch as lye cold, and upon the North; as in divers Tarraſes. And again, if they be much troden; or if they were at the firſt gravelled; For whereſoever *Plants* are kept down, the Earth putteth forth *Moſs*.

539. *Old Ground*, that hath been long unbroken up, gathereth *Moss*; and therefore Husbandmen use to cure their *Pasture-Grounds*, when they grow to *Moss*, by Tilling them for a year, or two: Which also depend*eth* upon the same *cause*; for that the more sparing and starving Juyce the Earth, insufficient for *Plants*, doth breed *Moss*.

540. *Old Trees* are more *Mossy*, (far) than *Young*; for that the Sap is not so frank as to rise all to the Boughs, but tireth by the way, and putteth out *Moss*.

541. *Fountains* have *Moss* growing upon the *Ground* about them;

Muscosi Fontes ———

The *cause* is, for that the *Fountains* drain the *Water* from the *Ground adjacent*, and leave but sufficient moisture to breed *Moss*; and besides, the *coldness* of the *Water* conduceth to the same.

542. The *Moss* of *Trees* is a kind of *Hair*; for it is the Juyce of the *Tree* that is excerned, and doth not assimilate, and upon great *Trees* the *Moss* gather*eth* a figure, like a *Leaf*.

543. The *moister sort* of *Trees* yield little *Moss*, as we see in *Asps*, *Poplars*, *Willows*, *Beeches*, &c. Which is partly caused for the reason that hath been given of the frank putting up of the *Sap* into the *Boughs*; and partly for that the *Barks* of those *Trees* are more close and smooth, than those of *Oakes*, and *Ashes*, whereby the *Moss* can the hardlier issue out.

544. In *Clay Grounds*, all *Fruit-trees* grow full of *Moss*, both upon *Body* and *Boughs*; which is caused, partly by the *coldness* of the *Ground*, whereby the *Plants* nourish less; and partly by the *toughness* of the *Earth*, whereby the *Sap* is shut in, and cannot get up, to spread so frankly as it should do.

545. We have said heretofore, that if *Trees* be *hide-bound*, they wax less fruitful and gather *Moss*; and that they are holpen by *hacking* &c. And therefore by the reason of contraries, if *Trees* be bound in with *Cords* or some outward *Bands* they will put forth more *Moss*: Which (I think) happeneth to *Trees* that stand bleak, and upon the cold Wind. It would also be tryed, whether, if you cover a *Tree* somewhat thick upon the top, after his powling, it will not gather more *Moss*. I think also, the *Watring* of *Trees* with *cold Fountain Water* will make them grow full of *Moss*.

546. There is a *Moss* the *Perfumers* have, which cometh out of *Apple-trees*, that hath an excellent sent. *Quere*, particularly for the *manner* of the *growth*, and the *nature* of it. And for this *Experiments* sake, being a thing of price, I have set down the last *Experiments*, how to multiply and call on *Mosses*.

Next unto *Moss* I will speak of *Mushromes*, which are likewise an *unperfect Plant*. These *Mushromes* have two strange *properties*; the one, that they yield so *delicious* a Meat; the other, that they *come up* so hastily as in a *night*, and yet they are *unsown*. And therefore such as are Upstarts in State, they call in reproach, *Mushromes*. It must needs be therefore, that they be made of much *moisture*; and that *moisture* fat, gross, and yet somewhat concocted. And (indeed) we find, that *Mushromes* cause the *accident*, which we call *Incubus*, or the *Mare* in the *Stomack*. And therefore the *Surfeit* of them may suffocate and empoysom. And this sheweth, that they are windy; and that windiness is gross, and swelling; not sharp or griping. And upon the same reason *Mushromes* are a venere ous Meat.

It

547. It is reported, that the *Bark* of *White* or *Red Poplar*, (which are of the moisteſt of *Trees*) cut ſmall, and caſt into *Furrows* well dunged, will cauſe the ground to put forth *Muſhromes*, at all *Seaſons* of the *year* fit to be eaten, ſome add to the mixture *Leaven of Bread* reſolved in *Water*.

548. It is reported, that if a *Hilly-field*, where the *ſtubble* is ſtanding, be ſet on *fire*, in a *ſhowry ſeaſon*, it will put forth great ſtore of *Muſhromes*.

549. It is reported, that *Harts-Horn ſhaken*, or in *ſmall pieces*, mixed with *Dung* and *watred*, puttethup *Muſhromes*. And we know that *Harts-Horn* is of a fat and clammy ſubſtance: And it may be *Ox-Horn* would do the like.

550. It hath been reported, though it be ſcarce credible, that *Ivy* hath grown out of a *Stags-Horn*; which they ſuppoſe did rather come from a *confrication* of the *Horn* upon the *Ivy*, than from the *Horn* it ſelf. There is not known any ſubſtance, but *Earth*, and the *Precedures* of *Earth*, (as *Tile-ſtone*, &c.) that yieldeth any *Moſs*, or *Herby Subſtance*. There may be tryal made of ſome *Seeds*, as that of *Fennel-Seed*, *Muſtard-Seed*, and *Rape-Seed*, put into ſome little *holes* made in the *Horns* of *Stags*, or *Oxen*, to ſee if they will grow.

551. There is alſo another *unperfect Plant*, that (in ſhew) is like a great *Muſhrome*? And it is ſometimes as broad as ones Hat; which they call a *Toads-ſtool*; but it is not Eſculent, and it groweth (commonly) by a dead Stub of a *Tree*, and likewiſe about the *Roots* of *rotten Trees*; and therefore ſeemeth to take his Juyce from *Wood putrified*. Which ſheweth by the way, *Wood putrified yieldeth* a frank *moiſture*.

552. There is a *Cake* that groweth upon the ſide of a *dead tree*, that hath gotten no name, but it is large and of a Cheſnut colour, and hard and pithy; whereby it ſhould ſeem, that even *dead trees* forget not their putting forth no more than the *Carcaſſes* of *Men Bodies*, that put forth *Hair* and *Nails* for a time.

553. There is a *Cod* or *Bag* that groweth commonly in the *Fields*; that at firſt is hard like a *Tennis-Ball*, and white; and after groweth of a *Muſhrome colour*, and full of light *duſt* upon the breaking; and is though to be dangerous for the *eyes*, if the *Powder* get into them, and to be good for *Kibes*: Belike it hath a *Corroſive*, and *fretting Nature*.

554. There is an *Herb* called *Jewes-Ear*, that groweth upon the *Roots*, and *lower parts* of the *Bodies* of *Trees*, eſpecially of *Elders*, and ſometimes *Aſhes*. It hath a ſtrange property; for in *warm Water*, it ſwelleth, and openeth extreamly. It is not green, but of a duſky brown colour. And it is uſed for *ſquinancies* and *inflamations* in the *Throat*, whereby it ſeemeth to have a mollifying, and lenifying vertue.

555. There is a kind of *Spongy Excreſcence*, which groweth chiefly upon the *Roots* of the *Laſer-Tree*, and ſometimes upon *Cedar*, and other *Trees*. It is very white, and light, and fryable; which we call *Agarick*, It is famous in *Phyſick* for the *purging* of *tough Flegm*. And it is alſo an excellent *opener* for the *Liver*, but *offenſive* to the *Stomach*; and in taſte it is, at the firſt *ſweet* and after *bitter*.

556. We find no *Super-Plant*, that is a formed Plant, but *Miſſelto*. They have an idle Tradition, that there is a *Bird* called a *Miſſel-Bird*, that feedeth upon a *Seed*, which many times ſhe cannot diſgeſt, and ſo expelleth it whole with her excrement; which falling upon a *Bough* of a *Tree*, that hath ſome riſt, putteth forth *Miſſelto*. But this is a Fable; for it is not probable, that *Birds* ſhould feed upon that they cannot diſgeſt. But allow that,

that, yet it cannot be for other Reasons: For first, it is found but upon certain *Trees*; and those *Trees* bear no such *Fruit*, as may allure that *Bird* to sit and feed upon them. It may be, that *Bird* feedeth upon the *Misseltoe*-*Berries*, and so is often found there; which may have given occasion to the tale. But that which maketh an end of the question is, that *Misseltoe* hath been found to put forth under the *Boughs*, and not (only) above the *Boughs*; so it cannot be any thing that falleth upon the *Bough*. *Misseltoe* groweth chiefly upon *Crab-trees*, *Apples-trees* sometimes upon *Hasles*, and rarely upon *Oaks*; the *Misseltoe* whereof is counted very *Medicinal*. It is ever green, Winter and Summer, and beareth a *white glistring Berry*; and it is a *Plant*, utterly differing from the *Plant*, upon which it groweth. Two things therefore may be certainly set down: First, that *Superfœtation* must be by *abundance* of *Sap*, in the *Bough* that putteth it forth. Secondly that that *Sap* must be such as the *Tree* doth excern, and cannot assimilate, for else it would go into a *Bough*; and besides, it seemeth to be more fat and unctuous than the ordinary *Sap of* the *Tree*; both by the *Berry* which is clammy, and by that it continueth green Winter and Summer, which the *Tree* doth not.

557. This *Experiment of Misseltoe* may give light to other practices; therefore tryal would be made, by ripping off the *Bough* of a *Crab-tree* in the *Bark*, and *Watring* of the wound every day, with *warm water dunged*, to see if it would bring forth *Misseltoe*, or any such like thing. But it were yet more likely, to try it with some other *Watring* or *anointing*, that were not so natural to the *Tree* as *Water* is; as *Oyl*, or *Barm* of *Drink*, &c. So they be such things as kill not the *Bough*.

558. It were good to try, what *Plants* would put forth, if they be forbidden to put forth their *Natural Boughs*: Powl therefore a *Tree*, and cover it some thickness with *Clay* on the top, and see what it will put forth. I suppose it will put forth *Roots*; for so will a *Cions*, being turned down into *Clay*. Therefore in this *Experiment* also the tree would be closed with somewhat that is not so natural to the *Plant*, as *Clay* is; try it with *Leather*, or *Cloath*, or *Painting*, so it be not hurtful to the *Tree*. And it is certain, that a *Brake* hath been known to grow out of a *Pollard*.

559. A Man may count the *Prickles* of *Trees* to be a kind of *Excrescence*, for they will never be *Boughs*, nor bear *Leaves*. The *Plants* that have *Prickles*, are *Thorns*, Black and White; *Bryer*, *Rose*, *Lemmon-trees*, *Crab-trees*, *Goosberry*, *Berbery*; these have it in the *Bough*. The *Plants* that have *Prickles* in the *Leaf* are *Holly*, *Juniper*, *Whin-bush*, *Thistle*; *Nettles* also have a small venemous *Prickle*; so hath *Borrage*, but harmless. The *cause* must be, *Hasty putting forth*, *want* of *moisture*, and the *Closeness* of the *Bark*. For the *Hast* of the *Spirit to put forth*, and the *want* of *Nourishment* to put forth a *Bough*, and the *closeness* of the *Bark*, cause *Prickles* in *Boughs*; and therefore they are ever like a *Pyramis*, for that the *Moisture* spendeth after a little putting forth. And for *Prickles* in *Leaves*, they come also in *putting forth more Juyce* into the *Leaf*, than can spread in the *Leaf* smooth; therefore the *Leaves* otherwise are *Rough*, as *Burrage* and *Nettles* are. As for the *Leaves* of *Holly*, they are *Smooth*, but never *Plain*, but as it were with *Folds* for the same cause.

560. There be also *Plants*, that though they have no *Prickles*, yet they have a kind of *Downey* or *Velvet Rine* upon their *Leaves*; as *Rose-Campion*, *Stock-Gilliflowers*, *Colts-foot*; which *Down* or *Nap* cometh of a *subtile Spirit*, in a *soft* or *Fat substance*. For it is certain that both *Stock-Gillyflowers*, and *Rose-Campions*

Campions, ſtamped, have been applied (with ſucceſs) to the *Wreſts* o thoſe that have had *Tertian* or *Quartan Agues*; and the *Vapor* of *Colts-foot* hath a ſanative vertue towards the *Lungs*, and the *Leaf* alſo is *healing* in *Surgery*.

Another kind of *Excreſcence* is an *Exudation* of *Plants*, joyned with *Putrefaction*, as we ſee in *Oak-Apples*, which are found chiefly upon the *Leaves* of *Oaks*, and the like upon *Willows*: And Country people have a kind of *Prediction*, that if the *Oak-Apple*, broken, be full of *Worms* it is a ſign of a *peſtilent year*; which is a likely thing, becauſe they grow of corruption. 561.

There is alſo upon *Sweet*, or other *Bryer*, a fine *Tuft*, or *Bruſh* of *Moſs* of divers colours; which if you cut, you ſhall ever find full of little white *Worms*. 562.

IT it certain, that *Earth* taken out of the *Foundations* of *Vaults*, and *Houſes*, and *bottoms* of *Wells*, and then put into *Pots*, will put forth ſundry kind of *Herbs*: But ſome *time* is required for the *Germination*; for if it be taken but from a *Fathom* deep, it will put forth the *firſt-year*, if much deeper, not till after a *year* or *two*. 563.

Experiments in conſort, touching the *Producing of perfect Plants without Seeds*.

The *nature* of the *Plants* growing out of *Earth* ſo taken up, doth follow the *nature* of the *Mould* it ſelf, as if the *Mould* be *ſoft* and fine, it putteth forth ſoft *Herbs*; as *Graſs*, *Plantine*, and the like: If the *Earth* be harder and courſer, it putteth forth *Herbs* more rough, as *Thiſtles*, *Firs*, &c. 564.

It is common *Experience*, that where *Alleys* are cloſe *gravelled*, the *Earth* putteth forth the firſt year *Knot Graſs*, and after *Spire Graſs*. The *cauſe* is for that the hard *Gravel* or *Pebble*, at the firſt laying, will not ſuffer the *Graſs* to come forth upright, but turneth it to find his way where it can; but after that the *Earth* is ſomewhat looſened at the top, the ordinary *Graſs* cometh up. 565.

It is reported, that Earth being taken out of *ſhady* and *watry Woods*, ſome depth, and potted, will put forth *Herbs* of a fat and juicy ſubſtance; as *Penny-wort*, *Purſlane*, *Houſeek*, *Penny-Royal*, &c. 566.

The *Water* alſo doth ſend forth *Plants* that have no *Roots* fixed in the bottom: but they are leſs *perfect Plants*, being almoſt but *Leaves*, and thoſe ſmall ones: Such is that we call *Duck-weed*, which hath a *Leaf* no bigger then a *Thyme Leaf*, but of a freſher Green, and putteth forth a little *ſtring* into the *Water*, far from the *bottom*. As for the *Water-Lilly*, it hath a *Root* in the *Ground*; and ſo have a number of other *Herbs* that grow in *Ponds*. 567.

It is reported by ſome of the *Ancients*, and ſome *Modern Teſtimony* likewiſe, that there be ſome *Plants*, that grow upon the top of the *Sea*; being ſuppoſed to grow of ſome *concretion* of *Slime* from *Water*, where the *Sun* heateth hot, and where the *Sea* ſtirreth little. As for the *Alga Marina*, (*Sea-weed*) and *Eringium* (*Sea Thiſtle*) both have *Roots*; but the *Sea-weed* under the *Water*, the *Sea-Thiſtle* but upon the *Shore*. 568.

The Ancients have noted, that there are ſome *Herbs* that grow out of *Snow*, laid up cloſe together and *putriſied*; and that they are all *bitter*, and they name one eſpecially, *Flomus*, which we call *Moth-Mullein*. It is certain that *Worms* are found in *Snow* commonly, like *Earth-Worms*; and therefore it is not unlike, that it may likewiſe put forth *Plants*. 569.

The

570. The *Ancients* have affirmed, that there are some *Herbs* that grow out of *Stone*; which may be, for that it is certain, that *Toads* have been found in the middle of a Freestone. We see also, that *Flints*, lying above *ground*, gather *Moss*; and *Wall-flowers*, and some other *Flowers* grow upon *Walls*. But whether upon the main *Brick* or *Stone*, or whether out of the *Lime*, or *Chinks*, is not well observed. For *Elders* and *Ashes* have been seen to grow out of *Steeples*; but they manifestly grow out of *Clefts*, insomuch as, when they grow big, they will disjoyn the *Stone*. And besides, it is doubtful, whether the *Mortar* it self putteth it forth, or whether some *Seeds* be not let fall by *Birds*. There be likewise *Rock-Herbs*, but, I suppose, those are, where there is some *Mould* or *Earth*. It hath likewise been found, that great *Trees*, growing upon *Quarries*, have put down their *Root* into the *Stone*.

571. In some *Mines* in *Germany*, as is reported, there grow in the bottom *Vegetables*; and the *Workfolks* use to say, They have *Magical vertue*, and will not suffer men together them.

572. The *Sea-sands* seldom bear *Plants*. Whereof the *cause* is yielded by some of the *Ancients*, for that the *Sun* exhaleth the *Moisture*, before it can incorporate with the *Earth*, and yield a Nourishment for the *Plant*. And it is affirmed also, that Sand hath (always) his *Root* in *Clay*; and that there be no Veins of *Sand*, any great depth within the *Earth*.

573. It is certain, that some *Plants* put forth for a time of their own *Store*, without any *Nourishment* from *Earth*, *Water*, *Stone*, &c. Of which, *vide the Experiment* 29.

574. Experiments in consort, touching the Forreign Plants. IT is reported, That *Earth*, that was brought out of the *Indies*, and other *remote Countries* for *Ballast* for *Ships*, cast upon some *Grounds* in *Italy*, did put forth *Forreign Herbs*, to us in *Europe* not known; and, that which is more, that of their *Roots*, *Barks*, and *Seeds*, confused together, and mingled with other *Earth*, and well watered with *warm Water*, there came forth *Herbs* much like the other.

575. *Plants*, brought out of *hot Countries*, will endeavor to put forth at the same *time*, that they do usually do in their own *climate*; and therefore to preserve them, there is no more required than to keep them from the injury of putting back by *Cold*. It is reported also, that *Grain* out of the *hotter Countreys* translated into the *Colder*, will be more forward than the ordinary *Grain* of the *cold Country*. It is likely, that this will prove better in *Grains*, than in *Trees*; for that *Grains* are but *Annual*, and so the *vertue* of the *Seed* is not worn out; whereas in a *Tree*, it is embased by the *Ground*, to which it is removed.

576. Many *Plants*, which grow in the *hotter Countreys*, being set in the *colder*, will nevertheless, even in those *cold Countreys*, being sown of *Seeds* late in the *Spring*, come up and abide most part of the Summer; as we find it in *Orenge*, and *Lemmon-Seeds*, &c. The *Seeds* whereof, sown in the end of *April*, will bring forth excellent *Sallets*, mingled with other *Herbs*. And I doubt not, but the *Seeds* of *Cloves-Trees*, and *Pepper-Seeds*, &c. If they could come hither *Green* enough to be sown, would do the like.

There

577. Experiments in Consort, touching the Seasons in which Plants come forth.

THere be some *Flowers*, *Blossoms*, *Grains*, and *Fruits*, which come more *early*, and others which come more *late* in the year. The *Flowers* that come early with us, are, *Prime-Roses*, *Violets*, *Anemonies*, *Water-Daffadillies*, *Crocus Vernus*, and some early *Tulippa's*, and they are all *Cold Plants*. which therefore (as it should seem) have a quicker *Perception* of the *Heat* of the *Sun* increasing, than the *Hot Herbs* have, as a *Cold hand* will sooner find a little *warmth*, than a hot. And those that come next after are *Wall-Flowers*, *Cowslips*, *Hyacinths*, *Rosemary-flowers*, &c. And after them *Pinks*, *Roses*, *Flower-deluces*, &c. And the latest are, *Gilly-flowers*, *Holly-Oaks*, *Larks-Foot*, &c. The earliest *Blossoms* are, the *Blossoms* of *Peaches*, *Almonds*, *Cornelians*, *Mezerions*, &c. And they are of such *Trees*, as have much *moisture*, either *Watry*, or *Oyly*. And therefore *Crocus Vernus* also, being an *Herb* that hath an *Oyly Juyce*, putteth forth early. For those also find the *Sun* sooner than the *dryer Trees*. The *Grains* are, first, *Rye* and *Wheat*, then *Oats* and *Barley*, then *Pease* and *Beans*; for though Green *Pease* and *Beans* be eaten sooner, yet the dry ones, that are used for *Horse-meat*, are *ripe* last; and it seemeth, that the *fatter Grains* cometh first. The earliest *Fruits* are, *Strawberries*, *Cherries*, *Gooseberries*, *Corrans*; and after them *early Apples*, *early Pears*, *Apricots*, *Rasps*; and after them, *Damosins*, and most kind of *Plumbs*, *Peaches*, &c. And the latest are, *Apples*, *Wardens*, *Grapes*, *Nuts*, *Quinces*, *Almonds*, *Sloes*, *Brier-berries*, *Helps*, *Medlars*, *Services*, *Cornelians*, &c.

578. It is to be noted, That (commonly) *Trees* that *ripen latest*, *blossom soonest*; As *Peaches*, *Cornelians Sloes*, *Almonds*, &c. And it seemeth to be a work of providence that they blossom so soon, for otherwise they could not have the *Sun* long enough to ripen.

579. There be Fruits (but rarely) that come *twice* a *year*; as some *Pears*, *Strawberries*, &c. And it seemeth, they are such as abound with nourishment, whereby after one period, before the *Sun* waxeth too weak, they can endure another. The *Violet* also, amongst *Flowers*, cometh twice a year, especially the *double white*; and that also is a *Plant* full of moisture. *Roses* come twice, but it is not without *cutting*, as hath been formerly said.

580. In *Muscovia*, though the *Corn* come not up till late *Spring*, yet their *Harvest* is as early as ours. The *cause* is, for that the *strength* of the *Ground* is kept in with the *Snow*; and we see with us, that if it be a long *Winter* it is commonly a more *plentiful year*. And after those kind of *Winters* likewise, the *Flowers* and *Corn* which are earlier and later, do come commonly at once, and at the same time; which troubleth the *Husbandman* many times; For you shall have *Red-Roses* and *Damask-Roses* come together, and likewise the *Harvest* of *Wheat* and *Barley*. But this hapneth ever, for that the earlier stayeth for the later, and not that the later cometh sooner.

581. There be divers *Fruit-trees*, in the *Hot countries*, which have *Blossoms*, and *Young fruit*, and *Ripe fruit*, almost all the year, succeeding one another. And it is said, the *Orenge* hath the like with us, for a great part of Summer, and so also hath the *Fig*. And no doubt, the *Natural Motion* of *Plants* is to have so: But that either they want *Juyce* to spend, or they meet with the *cold* of the Winter. And therefore this *Circle* of *ripening* cannot be, but in *succulent Plants*, and *hot countries*.

Some

582. Some *Herbs* are but *Annual*, and die, *Root* and all, once a year; as *Borrage*, *Lettuce*, *Cucumbers*, *Musk-melons*, *Basil*, *Tobacco*, *Mustard seed*, and all kinds of *Corn*; some continue many years, as *Hyssope*, *Germander*, *Lavender*, *Fennel*, &c. The *cause* of the *Dying* is double; the first is, the *tenderness* and *Weakness* of the *Seed*, which maketh the period in a small time; as it is in *Borrage*, *Lettuce*, *Cucumbers*, *Corn*, &c. And therefore none of these are hot. The other *cause* is, for that some *Herbs* can worse endure *cold*, as *Basil*, *Tobacco*, *Mustard-seed*; and these have (all) much *heat*.

583. Experiments in Consort, touching the *Lasting of Herbs and Trees.* The *lasting* of *Plants*, is most in those that are *largest* of *Body*, as *Oaks*, *Elms*, *Chesnut*, the *Loat-tree*, &c. And this holdeth in *Trees*, but in *Herbs* it is often contrary, for *Borrage*, *Coleworts*, *Pompions*, which are *Herbs* of the *largest size*, are of *small* durance; whereas *Hyssope*, *Winter-Savory*, *Germander*, *Time*, *Sage*, will last long. The *cause* is, for that *Trees* last according to the *strength*, and *quantity* of their *Sap* and *Juyce*, being well munited by their *Bark*, against the injuries of the *Air*: But *Herbs* draw a weak *Juyce*, and have a soft *Stalk*; and therefore those amongst them which last longest, are *Herbs* of *strong smell*, and with a *sticky stalk*.

584. *Trees* that bear *Mast* and *Nuts*, are commonly more lasting than those that bear *Fruits*, especially the *moister Fruits*; as *Oaks*, *Beeches*, *Chesnuts*, *Walnuts*, *Almonds*, *Pine-trees*, &c. last longer than *Apples*, *Pears*, *Plumbs*, &c. The *cause* is, the *fatness*, and *oylines* of the *Sap*; which ever wasteth less, than the more *Watry*.

585. *Trees* that bring forth their *Leaves* late in the *year*, and cast them likewise late, are more *lasting* than those that sprout their *Leaves* early, or shed them be times. The *cause* is, for that the late *coming forth*, sheweth a *moisture* more fixed; and the other more loose, and more easily resolved. And the same *cause* is, that *Wild-trees* last longer than *Garden-trees*; and in the same kind, those whose *Fruit* is acide, more than those whose *Fruit* is sweet.

586. Nothing procureth the *lasting* of *Trees*, *Bushes*, and *Herbs*, so much as often *cutting*; for every cutting causeth a renovation of the *Juyce* of the *Plant*: that it neither goeth so far, nor riseth so faintly, as when the *Plant* is not *cut*: Insomuch, as *Annual Plants*, if you cut them seasonably, and will spare the use of them, and suffer them to come up still young, will last more years than one, as hath been partly touched; such as is *Lettuce*, *Purslane*, *Cucumber*, and the like. And for *great Trees*, we see almost all *overgrown Trees* in Church-yards, or near ancient Building, and the like, are *Pollards* or *Dottards*, and not *Trees* at their full height.

587. Some *Experiment* would be made, how by *Art* to make *Plants* more *lasting* than their ordinary period; as to make a *Stalk* of *Wheat*, &c. last a whole year. You must ever presuppose, that you handle it so, as the *Winter* killeth it not; for we speak only of *prolonging* the *Natural Period*. I conceive, that the *Rule* will hold, That whatsoever maketh the *Herb* come later than at his time, will make it last longer time: It were good to try it in a *Stalk* of *Wheat*, &c. set in the shade, and encompassed with a case of *Wood*, not touching the *Straw*, to keep out open *Air*.

As for the Preservation *of* Fruits, *and* Plants, *as well upon the* Tree *or* Stalk, *as gathered, we shall handle it under the* Title *of* Conservation *of* Bodies.

The

588. Experiments in Consort touching the several Figures of Plants.

THe *Particular Figures* of *Plants* we leave to their *descriptions*, but some few things in general, we will observe. *Trees* and *Herbs*, in the growing forth of their *Boughs* and *Branches* are not *figured*, and keep no order. The *cause* is, for that the *Sap*, being restrained in the *Rinde* and *Bark*, breaketh not forth at all, (as in the Bodies of *Trees* and *Stalks* of *Herbs*) till they begin to branch, and then, when they make an eruption, they break forth casually, where they find best way in the *Bark* or *Rind*. It is true, that some *Trees* are more scattered in their *Boughes*; as *Sallow-trees*, *Warden-trees*, *Quince-tree*, *Medlar-trees*, *Lemmon-trees*, &c. Some are more in the form of a *Pyramis*, and come almost to rod; as the *Pear-trees* (which the *Criticks* will have to borrow his name of πῦρ, Fire) *Orenge-trees*, *Firr-trees*, *Service-Trees*, *Lime-trees*, &c. And some are more spread and broad, as *Beeches*, *Hornbeam*, &c. The rest are more indifferent. The *cause* of scattering the *Boughs* is, the hasty breaking forth of the *Sap*; and therefore those *Trees* rise not in a *Body* of any height, but Branch near the *Ground*. The *cause* of the *Pyramis* is, the keeping in of the *Sap*, long before it branch, and the spending of it, when it beginneth to branch, by equal degrees: The *spreading* is caused, by the *carrying* up of the *Sap* plentifully, without expence, and then putting it forth speedily, and at once.

589. There be divers *Herbs*, but no *Trees*, that may be said to have some kind of order, in the putting forth of their *Leaves*: For they have *Joynts*, or *Knuckles*, as it were stops in their *Germination*; as have *Gilli-flowers*, *Pincks*, *Fennel Corn*, *Reeds*, and *Canes*. The *cause* whereof is, for that the *Sap* ascendeth unequally, and doth (as it were) tire and stop by the way. And it seemeth, they have some *closeness* and *hardness* in their *Stalk*, which hindreth the *Sap* from going up, until it hath gathered into a knot, and so is more urged to put forth. And therefore, they are most of them hollow, when the Stalk is dry; as *Fennel-Stalks*, *Stubble*, and *Canes*.

590. *Flowers* have (all) exquisite *Figures*, and the *Flower numbers* are (chiefly) *five* and *four*; as in *Prime-Roses*, *Brier-Roses*, *single Musk-Roses*, *single Pinks*, and *Gilli-flowers*, &c. which have five Leaves: *Lillies*, *Flower-de luces* Borage, Bugloss, &c. which have four *Leaves*. But some put forth *Leaves* not numbred, but they are ever small ones, as *Marigolds*, *Trifoile*, &c. We see also, that the *Sockets*, and *Supporters* of *Flowers*, are *Figured*; as in the five Brethren of the *Rose*, *Sockets* of *Gilli-flowers*, &c. *Leaves* also are all *Figured*, some round, some long, none square, and many jagged on the sides; which *Leaves* of *Flowers* seldom are. For, I account, the *jagging* of *Pinks*, and *Gilli-flowers*, to be like the inequality of *Oak-leaves*, of *Vine-leaves*, or the like; but they seldom or never have any small *Purls*.

591. Experiments in Consort touching Some principal differences in Plants.

OF *Plants* some few put forth their *Blossoms* before their *Leaves*; as *Almonds*, *Peaches*, *Cornelians*, *Black-Thorn*, &c. But most put forth some *Leaves* before their *Blossoms*; as *Apples*, *Pears*, *Plumbs*, *Cherries*, *White-Thorn*, &c. The *cause* is, for that those that put forth their *Blossoms* first, have either an acute and *sharp spirit*; (and therefore commonly they all put forth early in the Spring, and ripen very late, as most of the particulars before mentioned) or else an *Oyly Juyce*, which is apter to put out *Flowers* than *Leaves*.

592. Of *Plants* some are *Green* all *Winter*, others cast their *Leaves*. There are *Green* all *Winter*, *Holly*, *Ivy*, *Box*, *Firr*, *Eugh*, *Cypress*, *Juniper*, *Bays*, *Rosemary*, &c. The *cause* of the holding *Green*, is the close and compact *sub-*

ſtance of their *Leaves* and the *Pedicles* of them. And the *cauſe* of that again, is, either the *tough* and *viſcous Juyce* of the *Plant*, or the *ſtrength* and *Heat* thereof. Of the firſt ſort is, *Holly*: which is of ſo *viſcuous* a *Juyce*, as they make *Bird-lime* of the *Bark* of it. The *Stalk* of *Ivy* is tough, and not fragile, as we ſee it in other ſmall Twigs dry. *Firr* yieldeth *Pitch*. *Box* is a faſt and heavy *Wood*, as we ſee it in *Bowls*. *Eugh* is a ſtrong and tough *Wood*, as we ſee it in *Bows*. Of the ſecond ſort, is *Juniper*, which is a *Wood* odorate, and maketh a hot Fire. *Bays* is likewiſe a hot and aromatical *Wood*, and ſo is *Roſemary* for a *Shrub*. As for the *Leaves*, their denſity appeareth in that, either they are ſmooth and ſhining, as in *Bays*, *Holly*, *Ivy*, *Box*, &c. or in that, they are hard and ſpiry, as in the reſt. And tryal would be made of *Grafting* of *Roſemary* for *Bays*, and *Box*, upon a *Holly Stock*, becauſe they are *Plants* that come all *Winter*. It were good to try it alſo with *Grafts* of other *Trees*, either *Fruit-trees*, or *Wild trees*, to ſee whether they will not yield their *Fruit*, or bear their *Leavs* later, and longer in the *Winter*; becauſe the *Sap* of the *Holly* putteth forth moſt in the *Winter*. It may be alſo a *Mezerion-tree*, grafted upon a *Holly*, will prove both an earlier, and a greater *Tree*.

593. There be ſome *Plants* that bear no *Flower*, and yet bear *Fruit*; there be ſome that bear *Flowers*, and no *Fruit*; there be ſome that bear neither *Flowers* nor *Fruit*. Moſt of the great *Timber-trees*, (as *Oaks*, *Beeches*, &c.) bear no apparent *Flowers*; ſome few (likewiſe) of the *Fruit-trees*, as *Mulberry*, *Walnuts*, &c. And ſome *Shrubs*, (as *Juniper*, *Holly*, &c.) bear no *Flowers*. Divers *Herbs* alſo bear *Seeds*, (which is as the *Fruit*,) and yet bear no *flowers*, as *Purſlane*, &c. Thoſe that bear *Flowers* and no *Fruit*, are few, as the double *Cherry*, the *Sallow*, &c. But for the *Cherry*, it is doubtful, whether it be not by Art or Culture; for if it be by Art, then tryal would be made, whether *Apples* and other *Fruits* *Bloſſoms* may not be doubled. There are ſome few, that bear neither *Fruit*, nor *Flowers*; as the *Elm*, the *Poplars*, *Box*, *Barks*, &c.

594. There be ſome *Plants* that ſhoot ſtill upwards, and can *ſupport* themſelvs; as the greateſt part of *Trees* and *Plants*: There be ſome other, that *creep* along the *Ground*, or *Wind* about other *Trees*, or *Props*, and cannot *ſupport* themſelves; as *Vines*, *Ivy*, *Bryar*, *Bryony*, *Woodbines*, *Hops*, *Climatis*, *Camomile*, &c. The *cauſe* is, (as hath been partly touched) for that all *Plants*, (naturally) move upwards; but if the *Sap* put up too faſt, it maketh a ſlender *Stalk*, which will not ſupport the weight; and therefore theſe latter ſort are all ſwift and haſty comers.

595. Experiments in Coniort touching *all Manner of Compoſts and Help of Ground*.

THe firſt and moſt ordinary *help* is *Stercoration*. The *Sheeps-dung* is one of the beſt; and next, the *Dung* of *Kine*; and thirdly, that of *Horſes*; which is held to be ſomewhat too hot, unleſs it be mingled; that of *Pigeons* for a Garden, or a ſmall quantity of Ground, excelleth. The *ordering* of *Dung* is, if the *Ground* be *Arable*, to ſpread it immediately before the *Plowing* and and *Sowing*, and ſo to *Plough* it in: For if you ſpread it long before, the *Sun* will draw out much of the *fatneſs* of the *Dung*: If the *Ground* be *Grazing Ground*, to ſpread it ſomewhat late towards *Winter*, that the *Sun* may have the leſs power to dry it up. As for ſpecial *Compoſts* for *Gardens* (as a *Hot Bed* &c.) we have handled them before.

596. The ſecond *kind* of *Compoſt* is the *ſpreading* of divers *kinds* of *Earth* as *Marl*, *Chalk*, *Seaſand*, *Earth* upon *Earth*, *Pond-Earth*, and the *mixtures* of them. *Marl* is thought to be the beſt, as having moſt fatneſs. And not heating

heating the *Ground* too much. The next is *Sea-ſand*, which (no doubt) obtained a ſpecial vertue by the *Salt*; for *Salt* is the firſt rudiment of life. *Chalk* over-heateth the *Ground* a little; and therefore is beſt upon *cold Clay-Grounds*, or *Moiſt-Grounds*: But I heard a great *Husband* ſay, that it was a common error to think that *Chalk* helpeth *Arable Grounds*, but helpeth not *Grazing Grounds*, whereas (indeed) it helpeth *Graſs* as well as *Corn*. But that which breedeth the error is, becauſe after the *chalking* of the *Ground*, they wear it out with many *Crops* without reſt; and then (indeed) afterwards it will bear little *Graſs*; becauſe the *Ground* is tired out. It were good to try the laying of *Chalk* upon *Arable Grounds*, a little while before *Ploughing*, and to *Plough* it in, as they do the *Dung*; but then it muſt be Friable firſt, by Rain or Lying: As for *Earth* it *Compaſſeth* it ſelf; for I knew a *great Garden*, that had a *Field* (in a manner) poured upon it, and it did bear *Fruit* excellently the firſt year of the Planting; for the *Surface* of the *Earth* is ever then fruitfulleſt: And *Earth* ſo prepared hath a double *Surface*. But it is true, as I conceive, that ſuch *Earth* as hath *Salt-Peter* bred in it, if you can procure it without too much charge, doth excel. The way to haſten the *breeding* of *Salt-Peter*, is to forbid the Sun, and the growth of *Vegetables*. And therefore, if you make a large Hovel, thatched over ſome quantity of Ground; nay, if you do but plank the Ground over, it will breed *Salt-Peter*. As for *Pond-Earth* or *River-Earth*, it is a very good *compoſt*, eſpecially, if the *Pond* have been long uncleanſed, and ſo the *Water* be not too hungry; and I judge it will be yet better, if there be ſome *mixture* of *Chalk*

The third *help* of *Ground* is, by ſome other *Subſtances* that have a vertue to make *Ground* Fertile, though they be not meerly *Earth*, wherein *Aſhes* excel; inſomuch as the countries about *Etna* and *Veſuvius* have a kind of amends made them, for the miſchief the eruptions (many times) do, by the exceeding *fruitfulneſs* of the *ſoyl*, cauſed by the *Aſhes* ſcattered about. *Soot* alſo, though thin, ſpred in a *Field* or *Garden*, is tryed to be a very good *compoſt*. For *Salt* it is too coſtly; but it is tried, that mingled with *Seed-corn*, and ſown together, it doth good: And I am of opinion, that *Chalk* in *Powder*, mingled with *Seed corn*, would do good: perhaps as much as *Chalking* the *Ground* all over. As for the *ſteeping* of the *Seeds* in ſeveral *mixtures* with *Water*, to give them vigor, or *watring Grounds* with *Compoſt-water*, we have ſpoken of them before. 597.

The fourth *help* of *Ground* is, the *ſuffering* of *Vegetables to die into the Ground*, and ſo to fatten it; as the *Stubble* of *Corn*, eſpecially *Peaſe*. *Brakes* caſt upon the *Ground* in the beginning of *Winter*, will make it very fruitful. It were good (alſo) to try whether *Leaves* of *Trees* ſwept together with ſome *Chalk* and *Dung* mixed, to give them more heart, would not make a good *Compoſt*: For there is nothing loſt, ſo much as *Leaves* of *Trees*, and as they lie ſcattered, and without mixture, they rather make the *Ground* ſowre, than otherwiſe. 598.

The fifth *help* of *Ground* is, *Heat* and *Warmth*. It hath been anciently practiſed to burn *Heath*, and *Ling*, and Sedge, with the vantage of the *Wind*, upon the *Ground*. We ſee, that *Warmth* of *Walls* and *Incloſures*, mendeth *Ground*: we ſee alſo, that *lying open* to the South, mendeth *Ground*; we ſee again that the *Foldings* of Sheep help *Ground* as well by their *warmth* as by their *compoſt*: And it may be doubted, whether the *covering* of the *Ground* with *Brakes*, in the beginning of the *Winter* (whereof we ſpake in the laſt *Experiment*) helpeth it not, by reaſon of the *Warmth*. Nay, ſome very good 599.

Husbands do ſuſpect, that the *gathering* up of *Flints* in *Flinty Ground*, and laying them on (*Heaps* which is much uſed) is no good *Husbandry* for that they would keep the *Ground* warm.

600. The ſixth *help* of *Ground* is, by *Watring* and *Irrigation*; which is in two manners; The one by *Letting* in, and *Shutting* out *Waters*, at ſeaſonable times; for *Water*, at ſome ſeaſons, and with reaſonable ſtay, doth good; but at ſome other ſeaſons, and with too long ſtay, doth hurt. And this ſerveth onely for *Meadows*, which are along ſome *River*. The other way is to bring *Water* from ſome *hanging Grounds*, where there are *Springs*, into the *lower Ground*, carrying it in ſome long *Furrows*; and from thoſe *Furrows*, drawing it traverſe to ſpread the *Water*: And this maketh an excellent improvement, both for *Corn* and *Graſs*. It is the richer, if thoſe *hanging Grounds*, be fruitful, becauſe it waſheth off ſome of the fatneſs of the *Earth*; but howſoever it profiteth much. Generally where there are great overflows in *Fens*, or the like, the drowning of them in the *Winter*, maketh the *Summer* following more fruitful: The *cauſe* may be, for that it keepeth the *Ground* warm, and nouriſheth it. But the *Fen-men* hold, that the *Sewers* muſt be kept ſo, as the *Water* may not ſtay too long in the *Spring* till the *Weeds* and *Sedge* be grown up; for then the *Ground* will be like a Wood which keepeth out the Sun, and ſo continueth the wet; whereby it will never graze (to purpoſe) that year. Thus much for *Irrigation*; but for *Avoidances*, and *Drainings* of Water, where there is too much, and the *helps* of *Ground* in that kind, we ſhall ſpeak of them in another place.

NATURAL

NATURAL HISTORY:

Century VII.

601. Experiments in consort, touching the *Affinities and Differences between Plants and Inanimate Bodies.*

THe differences between *Animate* and *Inanimate Bodies*, we shall handle fully under the *Title* of *Life*, and *Living Spirits*, and *Powers*. We shall therefore make but a brief mention of them in this place. The main *differences* are two. All *Bodies* have *Spirits*, and *Pneumatical parts* within them; but the main *differences* between *Animate* and *Inanimate* are two. The first is, that the *Spirit* of *things animate*, are all *continued* with themselves, and are *branched* in *Veins* and secret *Canales*, as *Blood* is: And in *Living Creatures*, the *Spirits* have not onely *Branches*, but certain *Sells* or *Seats*, where the *principal Spirits* do reside, and whereunto the rest do resort: But the *Sprits* in *things Inanimate* are shut in, and cut off by the *Tangible parts*; and are pervious one to another, as *Air* is in *Snow*. The second main *difference* is, that the *Spirits* of *Animate Bodies* are all in some degree (more or less) kindled and inflamed, and have a fine *commixture* of *Flame*, and an *Aërial substance*: But *Inanimate Bodies* have their *Spirits* no whit *inflamed* or *kindled*. And this *difference* consisteth not in the *Heat* or *Coolness* of *Spirits*; for *Cloves* and other *Spices*, *Naptha* and *Petroleum*, have exceeding *Hot Spirits* (hotter a great deal than *Oyl*, *Wax*, or *Tallow*, &c. but not *inflamed*. And when any of those weak, and temperate *Bodies* come to be inflamed than they gather a much greater *heat*, than others have *uninflamed*, besides their *light* and *motion*, &c.

602. The *differences* which are *secondary*, and proceed from these two *radical differences* are, first, *Plants* are all *figurate* and *determinate*, which *inanimate Bodies* are not, for look how far the *Spirit* is able to spread and continue it self, so far goeth the *shape* or *figure*; and then is *determined*. Secondly, *Plants* do nourish, *inanimate Bodies* do not; they have an *Accretion*, but no *Alimentation*. Thirdly, *Plants* have a period of life, which *inanimate Bodies* have not. Fourthly, they have a *succession* and *propagation* of their *kind*, which is not in *Bodies inanimate*.

603. The *differences* between *Plants*, and *Metals* or *Fossiles*, besides those four before mentioned, (for *Metals* I hold inanimate) are these: First, *Metals* are more *durable* than *Plants*: Secondly, they are more *solid* and *hard*: Thirdly, they are wholly *subterrany*; whereas *Plants* are part above *Earth* and part under *Earth*.

604. There be very few *Creatures* that participate of the *Nature* of *Plants*, and *Metals* both; *Coral* is one of the neareſt of both *kinds*; another is *Vitriol*, for that is apteſt to ſprout with *moiſture*.

605. Another ſpecial *Affinity* is between *Plants* and *Mould* or *Putrefaction*: For all *Putrefaction*, (if it diſſolve not in *Arefaction*) will in the end iſſue into *Plants* or *Living Creatures* bred of *Putrefaction*. I account *Moſs*, and *Muſhromes*, and *Agarick*, and other of thoſe kinds, to be but *Moulds* of the *Ground*, *Walls*, and *Trees*, and the like. As for *Fleſh*, and *Fiſh*, and *Plants* themſelves, and a number other things, after a *Mouldineſs*, or *Rottenneſs*, or *Corrupting*, they will fall to breed *Worms*. Theſe *Putrefactions*, which have *Affinity* with *Plants*, have this *difference* from them; that they have no *ſucceſſion* or *propagation*, though they *nouriſh*, and have a *period* of *Life*, and have likewiſe ſome *Figure*.

606. I left once, by chance, a *Citron* cut in a cloſe room, for three Summer-months, that I was abſent; and at my return, there were grown forth out of the Pith cut, *Tufts* of *Hairs*, an inch long, with little black Heads, as if they would have been ſome *Herb*.

607. Experiments in Conſort, touching the *Affinities and differences of Plants and Living Creatures: And the Confines and Participles of them*

THe *Affinities* and *differences* between *Plants* and *Living Creatures* are theſe that follow. They have both of them *Spirits continued* and *branched*, and alſo *inflamed*. But firſt in *Living Creatures* the *Spirits* have a *Cell* or *Seat*, which *Plants* have not, as was alſo formerly ſaid. And ſecondly, the *Spirits* of *Living Creatures* hold more of *Flame*, than the *Spirits* of *Plants* do; and theſe two are the *Radical differences*. For the Secondary differences, they are as follow. Firſt, *Plants* are all *fixed* to the *Earth*; whereas all *Living Creatures* are ſevered, and of themſelves. Secondly, *Living Creatures* have *Local Motion*, *Plants* have not. Thirdly, *Living Creatures* nouriſh from their *upper parts* by the *Mouth* chiefly; *Plants* nouriſh from below, namely from the *Roots*. Fourthly, *Plants* have their *Seed* and *Seminal parts* uppermoſt, *Living Creatures* have them lowermoſt; and therefore it was ſaid, not Elegantly alone, but Philoſophically: *Homo eſt Planta inverſa. Man is like a Plant turned upwards*; For the *Root* in *Plants*, is as the *Head* in *Living Creatures*. Fifthly, *Living Creatures* have a more exact *Figure* than *Plants*. Sixthly, *Living Creatures* have more *diverſity* of *Organs* within their *Bodies*, and (as it were) *inward Figures*, than *Plants* have. Seventhly, *Living Creatures* have *Senſe*, which *Plants* have not. Eightly, *Living Creatures* have *voluntary Motion*, which *Plants* have not.

608. For the *difference* of *Sexes* in *Plants*, they are oftentimes by name diſtinguiſhed; as *Male-Piony*, *Female-Piony*; *Male-Roſemary*, *Female-Roſemary*; *He-Holly*, *She-Holly*, &c. But *Generation* by *Copulation* (certainly) extendeth not to *Plants*. The neareſt approach of it, is between the *He-Palm*, and the *She-Palm*, which (as they report) if they grow near, incline the one to the other; inſomuch as, (that which is more ſtrange) they doubt not to report, that to keep the *Trees* upright from bending, they tye *Ropes* or *Lines* from the one to the other, that the *contact* might be enjoyed by the *contact* of a *middle Body*. But this may be feigned, or at leaſt amplified. Nevertheleſs, I

am

am apt enough to think, that this ſame *Binarium* of a ſtronger and a weaker, like unto *Maſculine* and *Feminine*, doth hold in all *Living Bodies*. It is confounded ſometimes, as in ſome *Creatures* of *Putrefaction*, wherein no *marks* of *diſtinction* appear; and it is doubled ſometimes, as in *Hermaphrodites*: but generally there is a degree of ſtrength in moſt *Species*.

609. The *Participles* or *Confiners* between *Plants* and *Living Creatures*, are ſuch chiefly as are *fixed*, and have no *Local Motion* of *remove*; though they have a *Motion* in their *parts*, ſuch as are *Oyſters*, *Cockles*, and ſuch like. There is a fabulous Narration, That in the *Northern Countreys* there ſhould be an *Herb* that groweth in the likeneſs of a *Lamb*, and feedeth upon the *Graſs*, in ſuch ſort, as it will bare the *Graſs* round about. But I ſuppoſe, that the *Figure* maketh the *Fable*; for ſo we ſee there be *Bee-flowers*, &c. And as for the *Graſs*, it ſeemeth the *Plant*, having a great *ſtalk* and *top*, doth prey upon the *Graſs* a good way about, by drawing the *Juyce* of the *Earth* from it.

610. Experiments promiſcuous touching *Plants*.

THe *Indian Fig* boweth his *Roots* down ſo low in one year, as of it ſelf it taketh *Root* again; and ſo multiplieth from *Root* to *Root*, making of one *Tree* a kind of *Wood*. The *cauſe* is, the *plenty* of the *Sap*, and the *ſoftneſs* of the *ſtalk*, which maketh the *Bough*, being over-loaden, and not ſtiffly upheld, weigh down. It hath *Leaves* as broad as a little *Target*, but the *Fruit* no bigger than *Beans*. The *cauſe* is, for that the continual ſhade increaſeth the *Leaves*, and abateth the *Fruit*; which nevertheleſs is of a pleaſant taſte. And that (no doubt) is cauſed, by the *ſuppleneſs* and *gentleneſs* of the Juyce of that *Plant*, being that which maketh the *Boughs* alſo ſo flexible.

611. It is reported by one of the *Ancients*, that there is a certain *Indian Tree*, having few, but very great *Leaves*, three cubits long, and two broad; and that the *Fruit* being of good taſte, groweth out of the *Bark*. It may be there be *Plants* that pour out the *Sap* ſo faſt, as they have no leaſure, either to divide into many *Leaves*, or to put forth *Stalks* to the *Fruit*. With us *Trees* generally have ſmall *Leaves* in compariſon. The *Fig* hath the greateſt, and next it the *Vine*, *Mulberry*, and *Sycamore*, and the leaſt are thoſe of the *Willow*, *Birch*, and *Thorn*. But there be found *Herbs* with far greater *Leaves* than any *Tree*; as the *Bur*, *Gourd*, *Cucumber*, and *Colewort*. The cauſe is, (like to that of the *Indian Fig*) the haſty and plentiful putting forth of the *Sap*.

612. There be three *things* in uſe for *ſweetneſs*, *Sugar*, *Honey*, *Manna*. For *Sugar*, to the *Ancients* it was ſcarce known, and little uſed. It is found in *Canes*; *Quære*, whether to the firſt *Knuckle*, or further up? and whether the very *Bark* of the *Cane* it ſelf do yield *Sugar*, or no? For *Honey*, the Bee maketh it, or gathereth it; but I have heard from one, that was induſtrious in Huſbandry, that the labour of the Bee is about the *Wax*, and that he hath known in the beginning of *May*, *Honey-Combs* empty of *Honey*, and within a fortnight, when the ſweet *Dewes* fall, filled like a *Cellar*. It is reported by ſome of the *Ancients*, that there is a Tree called *Occhus*, in the Valleys of *Hyrcania*, that diſtilleth *Honey* in the *Mornings*. It is not unlike, that the *Sap* and *Tears* of ſome *Trees* may be ſweet. It may be alſo, that ſome ſweet Juyces, fit for many uſes, may be concocted out of *Fruits*, to the thickneſs of *Honey*, or perhaps of *Sugar*; the likelieſt are *Raſins* of the Sun, *Figs* and *Corrans*: The Means may be enquired.

613. The *Ancients* report of a *Tree*, by the *Perſian Sea*, upon the *Shore-ſands*, which

which is nouriſhed with the *Salt-water*; and when the *Tide* ebbeth, you ſhall ſee the *Roots*, as it were, bare without *Bark* (being, as it ſeemeth, corroded by the *Salt*) and graſping the *Sands* like a *Crab*, which nevertheleſs beareth a *Fruit*. It were good to try ſome *hard-Trees*, as a *Service-Tree* or *Fir-tree*, by ſetting them within the *Sands*.

614. There be of *Plants* which they uſe for *Garments*, theſe that follow, *Hemp*, *Flax*, *Cotton*, *Nettles*, (whereof they make *Nettle Cloth*) *Sericum*, which is a *growing Silk*; they make alſo *Cables* of the *Bark* of *Lime-trees*. It is the *Stalk* that maketh the *Filaceous* matter commonly, and ſometimes the *Down* that groweth above.

615. They have in ſome *Countries*, a *Plant* of a *Roſie-colour*, which ſhutteth in the *Night*, openeth in the *Morning*, and openeth wide at *Noon*; which the *Inhabitants* of thoſe *Countreys* ſay, is a *Plant* that *ſleepeth*. There be *Sleepers* enough then; for almoſt all *Flowers* do the like.

616. Some *Plants* there are, but rare, that have a *Moſſie* or *Downy Root*, and likewiſe that have a number of *Threds* like *Beards*, as *Mandrakes*; whereof *Witches* and *Impoſtors* make an ugly *Image*, giving it the form of a *face* at the *top* of the *Root*, and leave thoſe *ſtrings* to make a broad *beard* down to the foot. Alſo there is a kind of *Nard* in *Creet* (being a kind of *Phu*) that hath a *Root* hairy, like a *Rough-footed Doves foot*. So as you may ſee, there are of *Roots*, *Bulbous Roots*, *Fibrous Roots*, and *Hurſute Roots*. And I take it, in the *Bulbous*, the *Sap* haſteneth moſt to the Air and Sun: in the *Fibrous*, the Sap delighteth more in the Earth, and therefore putteth downward: and the *Hurſute* is a middle between both, that beſides the putting forth upwards and downwards, putteth forth in round.

617. There are ſome *Tears* of *Trees*, which are kembed from the *Beards* of *Goats*; for when the *Goats* bite and crop them, eſpecially in the Mournings, the Dew being on, the *Tear* cometh forth, and hangeth upon their *Beards*: Of this ſort is ſome kind of *Ladanum*.

618. The *irrigation* of the *Plane-tree* by *Wine*, is reported by the *Ancients*, to make it fruitful. It would be tryed likewiſe with *Roots*; for upon *Seeds* it worketh no great effect.

619. The way to carry *Forreign Roots*, a long way, is to veſſel them cloſe in *Earthen Veſſels*; but if the *Veſſels* be not very great, you muſt make ſome holes in the bottom, to give ſome refreſhments to the *Roots*; which otherwiſe (as it ſeemeth) will decay, and ſuffocate.

620. The ancient *Cinnamon*, was, of all other *Plants* while they grew, the dryeſt, and thoſe things which are known to comfort other *Plants*, did make that more ſterile; for in *ſhowers* it proſpered worſt: It grew alſo amongſt *Buſhes* of other kinds, where commonly *Plants* do not thrive, neither did it love the Sun. There might be one *cauſe* of all thoſe effects, namely, the ſparing nouriſhment, which that *Plant* required. *Quære*, how far *Caſſia*, which is now the ſubſtitute of *Cinnamon*, doth participate of theſe things.

621. It is reported by one of the *Ancients*, that *Caſſia*, when it is gathered, is put into the *Skins* of *Beaſts* newly fleyed; and that the *Skins* corrupting, and breeding *Worms*, the *Worms* do devour the *Pith* and *Marrow* of it, and ſo make it hollow, but meddle not with the *Bark*, becauſe to them it is bitter.

622. There were in ancient time, *Vines* of far greater *Bodies* than we know any; for there have been *Cups* made of them, and an *Image* of *Jupiter*. But it is like they were *wild Vines*; for the *Vines* that they uſe for *Wine*, are ſo often

often cut; and so much digged and dressed, that their *Sap* spendeth into the *Grapes*, and so the *Stalk* cannot increase much in *bulk*. The *Wood* of *Vines* is very durable, without *rotting*. And that which is strange, though no *Tree*, hath the *Twigs*, while they are green, so brittle, yet the Wood dried is extream tough, and was used by the *Captains* of *Armies* amongst the *Romans* for their *Cudgels*.

It is reported, That in some places, *Vines* are suffered to grow like *Herbs* spreading upon the *Ground*, and that the *Grapes* of those *Vines* are very great. It were good to make tryal, whether *Plants* that use to be born up by props, will not put forth greater *Leaves*, and greater *Fruits*, if they be laid along the *Ground*; as *Hops*, *Ivy*, *Woodbine*, &c. 623.

Quinces or *Apples*, &c. if you will keep them long, drown them in *Hony*; but because *Honey* (perhaps) will give them a taste over-lushious, it were good to make tryal in *Powder* of *Sugar*, or in *Syrrup* of *Wine* onely boiled to height. Both these would likewise be tried in *Orenges*, *Lemmons*, and *Pomegranates*; for the *Powder* of *Sugar*, and *Syrrup* of *Wine*, will serve for more times than once. 624.

The *Conservation of Fruit* would be also tried in *Vessels*, filled with *fine Sand*, or with *Powder* of *Chalk*, or in *Meal* and *Flower*, or in *Dust* of *Oak-wood*, or in *Mill*. 625.

Such *Fruits* as you appoint for *long keeping*, you must gather before they be full *ripe*, and in a *fair* and *dry day*, towards *Noon*; and when the *Wind* bloweth not *South*, and when the *Moon* is under the *Earth*, and in *decrease*. 626.

Take *Grapes*, and hang them in an *empty Vessel*, well stopped; and set the *Vessel* not in a *Cellar*, but in some dry *place*, and it is said, they will last long. But it is reported by some, they will keep better in a Vessel half full of *Wines*, so that the *Grapes* touch not the *Wine*. 627.

It is reported, that the *preserving* of the *Stalk*, helpeth to preserve the *Grap*; especially, if the *Stalk* be put into the *Pith* of *Elder*, the *Elder* not touching the *Fruit*. 628.

It is reported by some of the *Ancients*, that *Fruit* put in *Bottles*, and the *Bottles* let down into *Wells* under *Water*, will keep long. 629.

Of *Herbs* and *Plants*, some are good to eat *Raw*; as *Lettuce*, *Endive*, *Purslane*, *Tarragon*, *Cresses*, *Cucumbers*, *Musk-Melons*, *Raddish*, &c. Others onely after they are *boiled*, or have *passed the Fire*; as *Parsley*, *Clary*, *Sage*, *Parsnips*, *Turnips*, *Asparagus*, *Artichoaks*, (though they also being young are eaten *raw*.) But a number of *Herbs* are not *esculent* at all; as *Wormwood*, *Grass*, *Green-Corn*, *Centory*, *Hyssope*, *Lavender*, *Balm*, &c. The *causes* are, for that the *Herbs* that are not *Esculent*, do want the two *tastes*, in which *nourishment* resteth; which are *fat* and *sweet*, and have (contrariwise) *bitter* and *over strong tastes*, or a *Juyce* so crude, as cannot be ripened to the degree of *Nourishment*. *Herbs*, and *Plants*, that are *Esculent raw*, have *fatness*, or *sweetness* (as all Esculent *Fruits*) such are *Onions*, *Lettuce*, &c. But then it must be such a *fatness* (for as for *sweet things*, they are in effect alway *Esculent*) as is not over-gross, and loading of the *Stomack*; for *Parsnips* and *Leeks* have *fatness*; but it is too gross and heavy without *boiling*. It must be also in a substance somewhat tender; for we see *Wheat*, *Barley*, *Artichoaks*, are no good *Nourishment*, till they have passed the *Fire*; but the *Fire* doth ripen, and maketh them soft and tender, and so they become *Esculent*. As for *Raddish*, and *Tarragon*, and the like, they are for *Condiments*, and not for *Nourishment*; and even some of those *Herbs*, which are not 630.

not *Esculent*, are notwithstanding *poculent*; as *Hops*, *Brooms*, &c. *Quære*, what *Herbs* are good for *Drink*, besides the two aforenamed; for that it may (perhaps) ease the *charge* of *Brewing*; if they make *Beer* to require less Malt, or make it last longer.

631. Parts fit for the *nourishment* of *Man* in *Plants*, are *Seeds*, *Roots*, and *Fruits*; but chiefly *Seeds* and *Roots*. For *Leaves*, they give no *nourishment* at all, or very little; no more do *Flowers*, or *Blossoms*, or *Stalks*. The reason is, for that *Roots*, and *Seeds*, and *Fruits*, (in as much as all *Plants* consist of an *Oyly* and *Watry substance* commixed) have more of the *Oyly substance*; and *Leaves*, *Flowers*, &c. of the *Watry*. And secondly, they are more *concocted*, for the *Root*, which continueth ever in the *Earth*, is still concocted by the *Earth*; and *Fruits*, and *Grains* (we see) are half a year, or more in *concocting*; whereas *Leaves* are out, and perfect in a Month.

632. *Plants* (for the most part) are more strong, both in *taste* and *smell*, in the *Seed*, than in the *Leaf* and *Root*. The *cause* is, for that in *Plants* that are not of a fierce and eager *spirit*, the vertue is increased by *Concoction* and *Maturation*, which is ever most in the *Seed*; but in *Plants* that are of a fierce and eager spirit, they are stronger whilest the *spirit* is inclosed in the *Root*; and the *spirits* do but weaken and dissipate, when they come to the *Air* and *Sun*; as we see it in *Onions*, *Garlick*, *Dragon*, &c. Nay, there be *Plants* that have their *Roots* very *hot* and *Aromatical*, and their *Seeds* rather *insipide* as *Ginger*. The *cause* is (as was touched before) for that the *heat* of those *Plants* is very dissipable; which under the *Earth* is contained and held in, but when it cometh to the *Air*, it exhaleth.

633. The *Juyces* of *Fruits*, are either *Watry* or *Oyly*. I reckon amongst the *Watry*, all the *Fruits*, out of which, *Drink* is expressed; as the *Grape*, the *Apple*, the *Pear*, the *Cherry*, the *Pomgranate*, &c. And there are some others, which though they be not in use for *Drink*, yet they appear to be of the same nature; as *Plumbs*, *Services*, *Mulberries*, *Rasps*, *Orenges*, *Lemmons*, &c. And for their *Juyces* that are so fleshy, as they cannot make *Drink* by expression, yet (perhaps) they may make *Drink* by mixture of *Water*.

Poculaque admistis imitantur vitea Sorbis.

And it may be *Heps* and *Brier-Berries* would do the like. Those that have *Oyly Juyce*, are *Olives*, *Almonds*, *Nuts* of all sorts *Pine-Apples*, &c. and their *Juyces* are all *inflamable*. And you must observe also, that some of the *Watry Juyces*, after they have gathered *spirit*, will burn and enflame, as *Wine*. There is a third kind of *Fruit* that is sweet, without either *sharpness* or *oyliness*, such as is the *Fig* and the *Date*.

634. It hath been noted, that most *Trees*, and especially those that bear *Mast*, are fruitful but once in two years. The *cause* (no doubt,) is the expence of *Sap*; for many *Orchard-Trees* well cultured, will bear divers years together.

635. There is no *Tree*, which besides the *Natural Fruit*, doth bear so many *Bastard Fruits* as the *Oak* doth; for besides the *Acorn*, it beareth *Galls*, *Oak Apples*, and certain *Oak-Nuts*, which are inflamable; and certain *Oak Berries* sticking close to the *Body* of the *Tree* without *Stalk*. It beareth also *Mistelto*, though rarely. The *cause* of all these may be, the *Closeness* and *solidness* of the *Wood*, and *Pith* of the *Oak*; which maketh several Juyces find several *Eruptions*. And therefore, if you will devise to make any *Super-Plants*, you must ever give the *Sap* plentiful rising, and hard issue.

There

636. There are two *Excreſcences*, which grow upon *Trees*, both of them in the nature of *Muſhromes*; the one the *Romans* called *Boletus*, which groweth upon the *Roots* of *Oaks*, and was one of the *dainties* of their *Table*: The other is *Medicinal*, that is called *Agarick* (whereof we have ſpoken before) which groweth upon the tops of *Oaks*; though it be affirmed by ſome, that it groweth alſo at the *Roots*. I do conceive, that many *Excreſences* of *Trees* grow chiefly, where the *Tree* is dead or faded; for that the *Natural Sap* of the *Tree*, corrupteth into ſome *Prenatural ſubſtance*.

637. The greater part of *Trees* bear *moſt*, and *beſt* on the *lower Boughs*; as *Oaks*, *Figs*, *Walnuts*, *Pears*, &c. but ſome bear *beſt* on the *top Boughs*, as *Crabs*, &c. Thoſe that bear beſt below, are ſuch, as ſhade do more good to than hurt: For generally all *Fruits* bear beſt loweſt, becauſe the *Sap* tireth, not having but a ſhort way. And therefore in *Fruits* ſpread upon *Walls*, the loweſt are the greateſt, as was formerly ſaid: So it is, the *ſhade*, that hindreth the *lower Boughs*, except it be in ſuch *Trees* as delight in *ſhade*, or at leaſt bear it well. And therefore there are either ſtrong *Trees*, as the *Oak*, or elſe they have large *Leaves* as the *Walnut* and *Fig*, or elſe they grow in *Pyramis* as the *Pear*. But if they require very much *Sun*, they bear beſt on the *top*; as it is in *Crabs*, *Apples*, *Plumbs*, &c.

638. There be *Trees* that bear beſt when they begin to be *old*; as *Almonds*, *Pears*, *Vines*, and all *Trees* that give *Maſt*. The *cauſe* is, for that all *Trees* that bear *Maſt* have an *oyly Fruit*; and *young Trees* have a more *watry Juyce*, and leſs concocted; and of the ſame kind alſo is the *Almond*. The *Pear* likewiſe though it be not *oyly*, yet it requireth much *Sap*, and well concocted; for we ſee it is a heavy *Fruit* and ſolid, much more than *Apples*, *Plumbs*, &c. As for the *Vine*, it is noted that it beareth more *Grapes* when it is *Young*; but *Grapes* that make better *Wine* when it is *Old*, for that the *Juyce* is better concocted: And we ſee, that *Wine* is inflamable, ſo as it hath a kind of *oylineſs*. But the moſt part of *Trees*, amongſt which are *Apples*, *Plumbs*, &c. bear beſt when they are *Young*.

639. There be *Plants* that have a *Milk* in them when they are cut; as *Figs*, *Old Lettuce*, *Sow-thiſtles*, *Spurge*, &c. The *cauſe* may be an *Inception* of *Putrefaction*: For thoſe *Milks* have all an *Acrimony*, though one would think they ſhould be *Lenitive*. For if you write upon Paper with the *Milk* of the *Fig*, the Letters will not be ſeen, until you hold the Paper before the fire, and then they wax brown; which ſheweth, that it is a ſharp or fretting *Juice*. *Lettuce* is thought poyſonous, when it is ſo *old* as to have *Milk*, *Spurge* a kind of poyſon in it ſelf; and as for *Sow-Thiſtles*, though Coneys eat them, yet Sheep and Cattle will not touch them; and beſides, the *Milk* of them, rubbed upon Warts, in ſhort time weareth them away: Which ſheweth the *Milk* of them to be *Corroſive*. We ſee alſo, that *Wheat* and other *Corn ſown*, if you take them forth of the *Ground*, before they ſprout, are full of *Milk*; and the beginning of *Germination* is ever a kind of *Putrefaction* of the *Seed*. *Euphobium* alſo hath a *Milk*, though not very white, which is of a great *Acrimony*. And *Saladine* hath a yellow *Milk*, which hath likewiſe much *Acrimony*, for it cleanſeth the *Eyes*, it is good alſo for *Cataracts*.

640. *Muſhromes* are reported to grow, as well upon the *Bodies* of *Trees*, as upon their *Roots*, or upon the *Earth*, and eſpecially upon the *Oak*. The *cauſe* is, for that ſtrong *Trees* are towards ſuch *Excreſcences* in the nature of *Earth*, and therefore put forth *Moſs*, *Muſhromes*, and the like.

There

641. There is hardly found a *Plant* that yieldeth a *red Juice* in the *Blade* or *Ear*, except it be the *Tree* that beareth *Sanguis Draconis*; which groweth chiefly in the *Island Soquotra*: The *Herb Amaranthus* (indeed) is *red* all over; and *Basil* is *red* in the *Wood*; and so is *Red-Sanders*. The *Tree* of *Sanguis Draconis* groweth in the form of a *Sugar-Loaf*; it is like, that the *Sap* of that *Plant*, concocteth in the *Body* of the *Tree*. For we see, that *Grapes* and *Pomegranates* are *red* in the *Juice*, but are *Green* in the *Tear*. And this maketh the *Tree* of *Sanguis Draconis* lesser towards the *top*, because the *Juice* hasteneth not up; and besides, it is very *Astringent*, and therefore of slow motion.

642. It is reported, that *sweet Moss*, besides that upon the *Apple-trees*, groweth likewise (sometimes) upon *Poplars*, and yet (generally) the *Poplar* is a smooth *Tree* of *Bark*, and hath little *Moss*. The *Moss* of the *Larix-tree* burneth also sweet, and sparkleth in the burning. *Quære*, of the *Mosses* of *Odorate Trees*; as *Cedar*, *Cipress*, *Lignum Aloes*, &c.

643. The *death*, that is most without pain, hath been noted to be upon the *Taking* of the *Potion* of *Hemlock*; which in Humanity was the form of *Execution* of *Capital Offenders* in *Athens*. The *Poyson* of the *Asp*, that *Cleopatra* used, hath some affinity with it. The *cause* is, for that the *Torments* of *Death* are chiefly raised by the strife of the *Spirits*; and these *Vapours* quench the *Spirits* by *degrees*; like to the *Death* of an extream Old Man. I conceive it is less painful than *Opium*, because *Opium* hath parts of *Heat*, mixed.

644. There be *Fruits*, that are *Sweet* before they be *Ripe*; As *Mirabolanes*; so *Fennel Seeds* are Sweet before they ripen, and after grow Spicy. And some never *ripen* to be *sweet*; as *Tamarinds*, *Barberries*, *Crabs*, *Sloes*, &c. The *cause* is, for that the former kind have much and subtile *Heat*, which causeth early sweetness; the later have a *cold* and *accide Juice*, which no *Heat* of the *Sun* can sweeten. But as for the *Mirabolane*, it hath parts of contrary *natures* for it is sweet and yet *astringent*.

645. There be few *Herbs* that have a *Salt taste*; and contrariwise, all *Blood* of *Living Creatures* hath a *saltness*; the *cause* may be, for that *Salt*, though it be the *Rudiment* of *Life*, yet in *Plants* the original *taste* remaineth not; for you shall have them *bitter*, *sowre*, *sweet*, *biting*, but seldom *salt*: But in *Living Creatures*, all those high *tastes*, may happen to be (sometimes) in the *Humors*, but are seldome in the *flesh*, or *substance*; because it is of a more *oyly nature*, which is not very susceptable of those *tastes*; and the *saltness* it self of *Blood*, is but a light and secret *saltness*. And even among *Plants*, some do participate of *saltness*, as *Alga Marina*, *Samphire*, *Scurvey Grass*, &c. And they report there is in some of the *Indian Seas*, a *Swimming Plant*, which they call *Salgazus*, spreading over the *Sea*, in such sort, as one would think it were a *Meadow*. It is certain, that out of the *Ashes* of all *Plants*, they extract a *Salt*, which they use in *Medicines*.

646. It is reported by one of the *Ancients*, that there is an *Herb* growing in the *Water* called *Lincostis*, which is full of *Prickles*: This *Herb* putteth forth another small *Herb* out of the *Leaf*, which is imputed to some *moisture*, that is gathered between the *Prickles*, which putrified by the *Sun*, germinateth. But I remember also, I have seen, for a great rarity, one *Rose* grow out of another, like *Honey Suckles*, that they call *Top* and *Top-gallants*.

647. *Barley* (as appeareth in the *Malting*) being steeped in *Water* three days, and afterwards the *Water* drained from it, and the *Barley* turned upon a dry Floor, will sprout half an Inch long, at least: And if it be let alone, and

not

not turned, much more, until the heart be out. *Wheat* will do the same; try it also with *Peaſe* and *Beans*. This *Experiment* is not like that of the *Orpin* and *Semper vive*; for there it is of the old ſtore, for no *Water* is added, but here it is nouriſhed from the *Water*. The *Experiment* would be further driven; for it appeareth already, by that which hath been ſaid, that *Earth* is not neceſſary to the firſt ſprouting of *Plants*, and we ſee, that *Roſe-Buds* ſet in *Water*, will blow: Therefore try whether the *Sprouts* of ſuch *Grains* may not be raiſed to a further degree, as to an *Herb* or *Flower*, with *Water* only, or ſome ſmall commixture of *Earth*: For if they will, it ſhould ſeem by the *Experiments* before, both of the *Malt*, and of the *Roſes*, that they will come far faſter on in *Water* than in *Earth*; for the nouriſhment is eaſilier drawn out of *Water* than out of *Earth*. It may give ſome light alſo, that *Drink* infuſed with *Fleſh*, as that with the *Capon*, &c. will nouriſh faſter and eaſilier, than *Meat* and *Drink* together. Try the ſame *Experiment* with *Roots*, as well as with *Grains*. As for example, take a *Turnip*, and ſteep it a while, and then dry it, and ſee whether it will ſprout.

Malt in the *Drenching* will ſwell, and that in ſuch a manner, as after the putting forth in ſprouts, and the drying upon the Kiln, there will be gained, at leaſt, a Buſhel in eight, and yet the ſprouts are rubbed off, and there will be a Buſhel of *Duſt* beſides the *Malt*: which I ſuppoſe to be, not only by the looſe and open laying of the *Parts*, but by ſome addition of *ſubſtance* drawn from the *Water*, in which it was ſteeped. 648.

Malt gathereth a *ſweetneſs* to the *taſte*, which appeareth yet more in the *Wort*. The *Dulcoration* of *things* is worthy to be tryed to the full; for that *Dulcoration* importeth a degree to *nouriſhment*. And the making of *things inalimental* to become *alimental*, may be an *Experiment* of great profit for making new *victual*. 649.

Moſt *Seeds* in the growing, leave their *Huſk* or *Rind* about the *Root*; but the *Onion* will carry it up, that it will be like a cap upon the top of the *young Onion*. The cauſe may be, for that the *Skin* or *Huſk* is not eaſie to break; as we ſee by the pilling of *Onions*, what a holding *ſubſtance* the *Skin* is. 650.

Plants that have *curled Leaves*, do all abound with *moiſture*, which cometh ſo faſt on, as they cannot ſpread themſelves plain, but muſt needs gather together. The weakeſt kind of *curling* is *roughneſs*, as in *Clary* and *Bur*. The ſecond is, *curling* on the ſides; as in *Lettuce* and *young Cabbage*. And the third is, *folding* into an *Head*, as in *Cabbage* full grown, and *Cabbage Lettuce*. 651.

It is reported that *Firr* and *Pine*, eſpecially if they be old and putrefied, though they ſhine not as ſome *rotten Woods* do, yet in the ſudden *breaking* they will ſparkle like hard *Sugar*. 652.

The *Roots* of *Trees* do (ſome of them) put downwards deep into the *Ground*; as the *Oak*, *Pine*, *Firr*, &c. Some ſpread more towards the *Surface* of the *Earth*; as the *Aſh*, *Cypreſs-tree*, *Olive*, &c. The *cauſe* of this latter may be, for that ſuch *Trees* as love the *Sun*, do not willingly deſcend far into the *Earth*; and therefore they are (commonly) *Trees* that ſhoot up much; for in their *Body* their deſire of approach to the *Sun* maketh them ſpread the leſs. And the ſame reaſon, under *Ground*, to avoid receſs from the *Sun*, maketh them ſpread the more. And we ſee it cometh to paſs in ſome *Trees*, which have been planted too deep in the Ground, that for love of approach to the *Sun*, they forſake their firſt *Root*, and put out another more towards the *top* of the *Earth*. And we ſee alſo, that 653.

the *Olive* is full of *Oily Juyce*, and *Aſh* maketh the beſt Fire, and *Cypreſs* is an *hot Tree*. As for the *Oak*, which is of the former ſort, it loveth the *Earth*, and therefore groweth ſlowly. And for the *Pine*, and *Firr* likewiſe, they have ſo much heat in themſelves, as they need leſs the *heat* of the *Sun*. There be *Herbs* alſo, that have the ſame difference; as the *Herb* they call *Morſus Diaboli*, which putteth the *Root* down ſo low, as you cannot pull it up without *breaking*; which gave occaſion to the *name* and *fable*, for that it was ſaid it was ſo wholſome a *Root*, *That the* Devil *when it was gathered, bit it for* envy. And ſome of the *Ancients* do report, that there was a goodly *Firr* (which they deſired to remove whole) that had a *Root* under *ground* eight cubits deep, and ſo the *Root* came up broken.

654. It hath been obſerved, that a *Branch* of a *Tree* being *unbarked* ſome ſpace at the bottom, and ſo ſet into the *Ground*, hath grown even of ſuch *Trees*, as if the *Branch* were ſet with the *Bark* on, they would not grow; yet contrariwiſe we ſee, that a *Tree* pared round in the *Body* above *Ground* will die. The *cauſe* may be, for that the *unbarkt part* draweth the nouriſhment beſt, but the *Bark* continueth it only.

655. *Grapes* will continue *freſh* and *moiſt* all Winter long, if you hang them *cluſter* by *cluſter* in the *Roof* of a *warm Room*, eſpecially, if, when you gather the *cluſter*, you take off with the *cluſter* ſome of the *ſtock*.

656. The *Reed* or *Cane* is a *watry Plant*, and groweth not but in the *Water*. It hath theſe properties, That it is *hollow*, that it is *knuckled*, both *Stalk* and *Root*, that being *dry* it is more *hard* and *fragile* than other *Wood*; that it putteth forth no *Boughs*, though many *Stalks* come out of one *Root*. It differeth much in greatneſs, the ſmalleſt being fit for thatching of Houſes, and ſtopping the chinks of Ships better than Glew or Pitch. The ſecond bigneſs is uſed for Angle-rods and Staves, and in *China* for beating of offenders upon the Thighs. The differing kinds of them are, the *common Reed*, the *Caſſia Fiſtula*, and the *Sugar-Reed*. Of all *Plants* it boweth the eaſieſt, and riſeth again. It ſeemeth, that amongſt *Plants* which are nouriſhed with *mixture* of *Earth* and *Water*, it draweth moſt nouriſhment from *Water*; which maketh it the *ſmootheſt* of all others in *Bark*, and the *holloweſt* in *Body*.

657. The *Sap* of *Trees*, when they are let *Blood*, is of differing *Natures*. Some more *watry* and *clear*, as that of *Vines*, of *Beeches*, of *Pears*; ſome *thick*, as *Apples*; ſome *Gummy*, as *Cherries*; ſome *frothy*, as *Elms*; ſome *milky*, as *Figs*. In *Mulberries*, the *Sap* ſeemeth to be (almoſt) towards the *Bark* only; for if you cut the *Tree* a little into the *Bark* with a *Stone*, it will come forth, if you pierce it deeper with a *tool*, it will be *dry*. The *Trees* which have the *moiſteſt Juyces* in their *Fruit*, have commonly the *moiſteſt Sap* in their *Body*, for the *Vines* and *Pears* are very *moiſt*, *Apples* ſomewhat more *ſpongy*: the *Milk* of the *Fig* hath the quality of the *Rennet*, to gather *Cheeſe*, and ſo have certain *ſowre Herbs* wherewith they make *Cheeſe* in *Lent*.

658. The *Timber* and *Wood* are in ſome *Trees* more *clean*, in ſome more *knotty*; and it is a good tryal, to try it by ſpeaking at one end, and laying the Ear at the other: For if it be *knotty*, the voice will not paſs well. Some have the *Veins* more varied and Chamloted; as *Oak*, whereof *Wainſcot* is made; *Maple*, whereof *Trenchers* are made: Some more ſmooth, as *Firr* and *Walnut*; ſome do more eaſily breed *Worms* and *Spiders*; ſome more hardly, as it is ſaid of *Iriſh Trees*. Beſides, there be a number of differences

differences that concern their use: As *Oak*, *Cedar*, and *Chessnut*, are the best builders. Some are best for *Plough-timber*, as *Ash*; some for *Peers*, that are sometimes wet and sometimes dry, as *Elm*; some for *Planchers*, as *Deal*; some for *Tables*, *Cupboards* and *Desks*, as *Walnuts*; some for *Ship-timber*, as *Oaks* that grow in *moist Grounds*, for that maketh the *Timber* tough, and not apt to rift with *Ordnance*; wherein *English* and *Irish Timber* are thought to excel: some for *Masts* of *Ships*, as *Firr* and *Pine*, because of their length, straightness, and lightness; some for *Pale*, as *Oak*; some for *Fuel*, as *Ash*: And so of the rest.

659. The *coming* of *Trees* and *Plants* in certain *Regions*, and not in others, is sometimes *casual*; for many have been translated, and have prospered well; as *Damask Roses*, that have not been known in *England* above an hundred years, and now are so common. But the liking of *Plants* in certain *Soyls* more than in others, is meerly *Natural*; as the *Firr* and *Pine* love the *Mountains*; the *Poplar*, *Willow*, *Sallow*, and *Alder*, love *Rivers* and *moist places*: the *Ash* loveth *Coppices*, but is best in *Standards* alone; *Juniper* loveth *Chalk*, and so do most *Fruit-trees*; *Sampire* groweth but upon *Rocks*; *Reeds* and *Osiers* grow where they are washed with *Water*; the *Vine* loveth sides of *Hills* turning upon the *South-East Sun*, &c.

660. The *putting forth* of certain *Herbs*, discovereth of what nature the *Ground* where they put forth is; as *wild Thyme* sheweth good *Feeding Ground* for *Cattel*; *Bettony* and *Strawberries* shew *Grounds* fit for *Wood*; *Camomile* sheweth mellow *Grounds* fit for *Wheat*; *Mustard-seed* growing after the *Plough*, sheweth a good *strong Ground* also for *Wheat*; *Burnet* sheweth good *Meadow*, and the like.

661. There are found in divers *Countreys*, some other *Plants* that grow out of *Trees* and *Plants*, besides *Misseltoe*: As in *Syria* there is an *Herb* called *Cassytas*, that groweth out of tall *Trees*, and windeth it self about the same *Tree* where it groweth, and sometimes about *Thorns*. There is a kind of *Polypode* that groweth out of *Trees*, though it windeth not. So likewise an *Herb* called *Faunos* upon the *Wild Olive*; and an *Herb* called *Hippophæston* upon the *Fullers Thorn*, which, they say, is good for the *Falling-sickness*.

662. It hath been observed by some of the *Ancients*, that howsoever *cold* and *Easterly winds* are thought to be great enemies to *Fruit*, yet nevertheless *South-winds* are also found to do hurt, especially in the *Blossoming* time, and the more, if *showers* follow. It seemeth they call forth the *moisture* too fast. The *West winds* are the best. It hath been observed also, that *green* and *open Winters* do hurt *Trees*, insomuch, as if two or three such *Winters* come together. *Almond-Trees*, and some other *Trees* will die. The *cause* is the same with the former, because the *Lust* of the *Earth* overspendeth it self; howsoever some other of the *Ancients* have commended *warm Winters*.

663. *Snows* lying long cause a *fruitful year*. For first, they keep in the *strength* of the *Earth*: Secondly, they *water* the *Earth* better than *Rain*; for in *Snow* the *Earth* doth (as it were) suck the *Water* as out of the *Teat*: Thirdly, the *moisture* of *Snow* is the finest *moisture*, for it is the *Froth* of the *Cloudy Waters*.

664. *Showers*, if they come a little before the *ripening* of *Fruits*, do good to all *succulent* and *moist Fruits*, as *Vines*, *Olives*, *Pomegranates*; yet it is rather for plenty than for goodness, for the best *Wines* are in the dryest *Vintages*.

Small showers are likewise good for *Corn*, so as *parching heats* come not upon them. Generally, *Night-showers* are better than *Day showers*; for that the *Sun* followeth not so fast upon them: And we see, even in *watering* by the *Hand*, it is best in *Summer-time* to water in the *Evening*.

665. The *differences* of *Earths*, and the *tryal* of them, are worthy to be diligently enquired. The *Earth* that with *showers* doth easily *soften*, is commended: and yet some *Earth* of that kind will be very dry and hard before the *showers*. The *Earth* that casteth up from the *Plough* a great *clod*, is not so good as that which casteth up a smaller *clod*. The *Earth* that putteth forth *Moss* easily, and may be called *Mouldy*, is not good. The *Earth* that smelleth well upon the Digging, or Ploughing, is commended; as containing the *Juyce* of *Vegetables* almost already prepared. It is thought by some, that the *ends* of low *Rain-bows* fall more upon one kind of *Earth* than upon another: As it may well be, for that that *Earth* is most roscide: and therefore it is commended for a sign of a good *Earth*. The *poorness* of the *Herbs* (it is plain) shew the *poorness* of the *Earth*, and especially, if they be in *colour* more dark: But if the *Herbs* shew *withered* or *blasted* at the top, it sheweth the *Earth* to be very *cold*; and so doth the *Mossiness* of *Trees*. The *Earth* whereof the *Grass* is soon *parched* with the *Sun* and *tosted*, is commonly *forced Earth*, and barren in his own nature. The *tender*, *chessom*, and *mellow Earth* is the best; being meer *Mould*, between the two extreams of *Clay* and *Sand*, especially, if it be not *Loamy* and *Binding*. The *Earth* that after *Rain* will scarce be *Ploughed*, is commonly *fruitful*; for it is *cleaving*, and full of *Juyce*.

666. It is strange, which is observed by some of the *Ancients*, that *Dust* helpeth the *fruitfulness* of *Trees*, and of *Vines* by name; insomuch, as they cast Dust upon them of purpose. It should seem that that powdring, when a shower cometh, maketh a kind of soyling to the *Tree*, being *Earth* and *Water* finely laid on. And they note, that Countreys where the *Fields* and *Ways* are *dusty*, bear the best *Vines*.

667. It is commended by the *Ancients* for an excellent *help* to *Trees*, to lay the *Stalks* and *Leaves* of *Lupines* about the *Roots*, or to Plough them into the *Ground*, where you will sow *Corn*. The *burning* also of the *cuttings* of *Vines*, and *casting* them upon *Land*, doth much good. And it was generally received of old, that the *dunging* of *Grounds* when the *West wind* bloweth, and in the *decrease* of the *Moon*, doth greatly help the *Earth* (as it seemeth) being then more thirsty, and open to receive the *Dung*.

668. The *Grafting* of *Vines* upon *Vines* (as I take it) is not now in use. The *Ancients* had it, and that three ways; the first was *Insition*, which is the ordinary manner of *Grafting*: The second was *Terebration*, through the *middle* of the *Stock*, and putting in the *Cions* there: And the third was Paring of two *Vines* that grow together to the *Marrow*, and binding them close.

669. The *Diseases* and ill *Accidents* of *Corn*, are worthy to be enquired, and would be more worthy to be enquired, if it were in Mens power to help them; whereas many of them are not to be remedied. The *Mildew* is one of the greatest, which (out of question) cometh by *closeness* of *Air*; and therefore in *Hills*, or large *Champain-Grounds*, it seldom cometh, such as is with us *York's Woald*. This cannot be remedied, otherwise than that in *Countreys* of small enclosure the *Grounds* be turned into larger *Fields*: Which I have known to do good in some Farms.

Another

Another *Diſeaſe* is the *putting forth* of *Wild Oats*, whereinto *Corn* ottentimes (eſpecially *Barley*) doth degenerate. It hapneth chiefly from the *weakneſs* of the *Grain* that is ſown; for if it be either too old or mouldy, it will bring forth *wild Oats*. Another *diſeaſe* is the *ſatiety* of the *Ground*; for if you ſow one *Ground* ſtill with the ſame *Corn* (I mean not the ſame *Corn* that grew upon the ſame *Ground*, but the ſame *kind* of *Grain*, as *Wheat*, *Barley*, &c.) it will proſper but poorly; therefore beſides the *reſting* of the *Ground*, you muſt vary the *Seed*. Another ill *Accident* is from the *Winds*, which hurt at two times; at the *flowring* by *ſhaking* off the *Flowers*, and at the full *ripening* by *ſhaking* out the *Corn*. Another ill *Accident* is *Drought* at the *ſpindling* of the *Corn*, which with us is rare, but in hotter *Countreys* common, inſomuch as the word *Calamitas* was firſt derived from *Calamus*, when the *Corn* could not get out of the *ſtalk*. Another ill *Accident* is *Over-wet* at *ſowing time*, which with us breedeth much *Dearth*, inſomuch as the *Corn* never cometh up; and (many times) they are forced to re-ſow *Summer-Corn*, where they ſowed *Winter-Corn*. Another ill *Accident* is *bitter Froſts*, continued without *Snow*, eſpecially in the beginning of the *Winter*, after the *Seed* is new ſown. Another *Diſeaſe* is *Worms*, which ſometimes breed in the *Root*, and happen upon hot *Suns* and *ſhowers* immediately after the *ſowing*; and another *Worm* breedeth in the *Ear* it ſelf, eſpecially when *hot Suns* break often out of *Clouds*. Another *Diſeaſe* is *Weeds*; and they are ſuch, as either choak and over-ſhadow the *Corn*, and bear it down, or ſtarve the *Corn*, and deceive it of nouriſhment. Another *Diſeaſe* is, *over-rankneſs* of the *Corn*, which they uſe to remedy by *Mowing* it after it is come up, or putting *Sheep* into it. Another ill *Accident* is, laying of *Corn* with great *Rains* near or in *Harveſt*. Another ill *Accident* is, if the *Seed* happen to have touched *Oyl*, or any *thing* that is *fat*; for thoſe *ſubſtances* have an *antipathy* with *nouriſhment* of *Water*.

The *remedies* of the *Diſeaſes* of *Corn* have been obſerved as followeth. 670.
The *Steeping* of the *Grain* before *Sowing*, a little time in *Wine*, is thought a *preſervative*; the *Mingling* of *Seed-Corn* with *Aſhes*, is thought to be good; the *Sowing* at the *wane* of the *Moon*, is thought to make the *Corn* ſound. It hath not been practiſed, but it is thought to be of uſe to make ſome *Miſſelane* in *Corn*; as if you ſow a few *Beans* with *Wheat*, your *Wheat* will be the better. It hath been obſerved, that the ſowing of *Corn* with *Houſleek* doth good. Though *Grain* that toucheth *Oyl* or *Fat* receiveth hurt, yet the *ſteeping* of it in the *Dregs* of *Oyl*, when it beginneth to putrifie, (which they call *Amurca*) is thought to aſſure it againſt *Worms*. Is is reported alſo, that if *Corn* be *mowed*, it will make the *Grain* longer, but emptier, and having more of the *Huſk*.

It hath been noted, that *Seed* of a year old is the beſt, and of two or 671.
three years is worſe; and that which is more old is quite barren, though (no doubt) ſome *Seeds* and *Grains* laſt better than others. The *Corn* which in the *Vanning* lieth loweſt is the beſt; and the *Corn* which broken or bitten, retaineth a little *yellowneſs*, is better than that which is very *white*.

It hath been obſerved, that of all *Roots* of *Herbs*, the *Root* of *Sorrel* 672.
goeth the fartheſt into the *Earth*, inſomuch as it hath been known to go three cubits deep; and that it is the *Root* that continueth fit (longeſt) to be ſet again, of any *Root* that groweth. It is a *cold* and *acide Herb*, that (as it ſeemeth) loveth the *Earth*, and is not much drawn by the *Sun*.

673. It hath been observed, that some *Herbs* like best, being watered with *Salt-water*; as *Radish*, *Beet*, *Rue*, *Penny-royal*. This tryal would be extended to some other *Herbs*; especially such as are strong, as *Tarragon*, *Mustard-seed*, *Rocket*, and the like.

674. It is strange, that is generally received, how some *poysonous Beasts* affect *odorate* and *wholsome Herbs*; as, that the *Snake* loveth *Fennel*, that the *Toad* will be much under *Sage*, that *Frogs* will be in *Cinquefoil*. It may be it is rather the *Shade*, or other Coverture, that they take liking in, than the virtue of the *Herb*.

675. It were a matter of great profit, (save that I doubt it is too conjectural to venture upon) if one could discern what *Corn*, *Herbs*, or *Fruits*, are like to be in *Plenty* or *Scarcity*, by some *Signs* and *Prognosticks* in the beginning of the year: For as for those that are like to be in *Plenty*, they may be bargained for upon the *Ground*; as the old relation was of *Thales*, who to shew how easie it was for a *Philosopher* to be rich, when he foresaw a great *plenty* of *Olives*, made a *Monopoly* of them. And for *Scarcity*, Men may make profit in keeping better the old store. Long *continuance* of *Snow* is believed to make a *fruitful year* of *Corn*; an *early Winter*, or a very *late Winter*, a *barren year* of *Corn*; an open and *serene Winter*, an ill year of *Fruit*. These we have partly touched before, but other *Prognosticks* of like nature are diligently to be enquired.

676. There seem to be in some *Plants singularities*, wherein they differ from all other. The *Olive* hath the *oyly part* only on the *outside*, whereas all other *Fruits* have it in the *Nut* or *Kernel*. The *Firr* hath (in effect) no *Stone*, *Nut*, nor *Kernel*; except you will count the little *Grains*, *Kernels*. The *Pomegranate* and *Pine-Apple* have only, amongst *Fruits*, *Grains*, distinct in several *Cells*. No Herbs have *curled Leaves*, but *Cabbage* and *Cabbage-Lettuce*. None have double *Leaves*, one belonging to the *Stalk*, another to the *Fruit* or *Seed*, but the *Artichoak*. No *Flower* hath that kind of spred that the *Woodbine* hath. This may be a large Field of Contemplation; for it sheweth that in the Frame of *Nature* there is, in the producing of some *Species*, a composition of Matter, which hapneth oft, and may be much diversified; in others, such as hapneth rarely, and admitteth little variety. For so it is likewise in *Beasts*; *Dogs* have a resemblance with *Wolves*, and *Foxes*, *Horses* with *Asses*, *Kine* with *Buffles*, *Hares* with *Coneys*, &c. And so in *Birds*; *Kites* and *Kestrels* have a resemblance with *Hawks*; *Common Doves* with *Ring Doves* and *Turtles*; *Black-Birds* with *Thrushes* and *Mavisses*; *Crows* with *Ravens*, *Daws*, and *Choughs*, &c. But *Elephants* and *Swine* amongst *Beasts*, and the *Bird* of *Paradise*, and the *Peacock* amongst *Birds*, and some few others, have scarce any other *Species* that have affinity with them.

We leave the *Description* of *Plants* and their *Virtues* to *Herbals*, and other like *Books* of *Natural History*, wherein *Mens diligence* hath been great, even to *Curiosity*. For our *Experiments* are only such, as do ever ascend a degree to the *deriving* of *Causes*, and *extracting* of *Axioms*, which we are not ignorant, but that some, both of the *Ancient* and *Modern Writers* have also laboured; but their *Causes* and *Axioms* are so full of Imagination, and so infected with the old received *Theories*, as they are meer *Inquinations* of *Experience*, and concoct it not.

677. Experiment Solitary, touching *Healing of Wounds.*

IT hath been observed by some of the *Ancients*, that *Skins*, (especially of *Rams*) newly pulled off, and applied to the *Wounds* of *Stripes*, do keep them from swelling and exulcerating, and likewise heal them, and close them up: and that the *Whites* of *Eggs* do the same. The *cause* is, a *temperate Conglutination*, for both *Bodies* are clammy and viscous, and do bridle the *Defluxe* of *Humors* to the hurts, without penning them in too much.

678. Experiment Solitary, touching *Fat diffused in Flesh.*

YOu may turn (almost) all *Flesh* into a *fatty substance*, if you take *Flesh* and cut it into pieces, and put the pieces into a *Glass* covered with Parchment, and so let the *Glass* stand six or seven hours in *boyling Water*. It may be an *experiment* of profit, for making of *Fat* or *Grease* for many uses: But then it must be of such *Flesh* as is not edible; as *Horses*, *Dogs*, *Bears*, *Foxes*, *Badgers*, &c.

679. Experiment Solitary, touching *Ripening of Drink before the time.*

IT is reported by one of the *Ancients*, that *new Wine* put into *Vessels*, well stopped, and the *Vessels* let down into the *Sea*, will accelerate very much the making of them ripe and potable; the same would be tryed in *Wort*.

680. Experiment Solitary, touching *Filosity and Plumage.*

Beasts are more *Hairy* than *Men*; and *Savage Men* more than *Civil*; and the *Plumage* of *Birds* exceedeth the *Filosity* of *Beasts*. The *cause* of the smoothness in *Men*, is not any abundance of *Heat* and *Moisture*, though that indeed causeth *Filosity*; but there is requisite to *Filosity*, not so much *Heat* and *Moisture*, as *Excrementitious Heat* and *Moisture*; (for whatsoever assimilateth goeth not into the *Hair*) and *Excrementitious Moisture* aboundeth most in Beasts, and *Men* that are more *savage*. Much the same reason is there of the *Plumage* of *Birds*; for *Birds* assimilate less, and excern more than *Beasts*, for their *Excrements* are ever liquid, and their *Flesh* (generally) more dry; beside, they have not *Instruments* for *Urine*, and so all the *Excrementitious Moisture* goeth into the *Feathers*: And therefore it is no marvel though *Birds* be commonly better Meat than *Beasts*, because their *flesh* doth assimilate more finely, and secerneth more subtilly. Again, the *Head* of *Man* hath *Hair* upon the *first Birth*, which no other *part* of the *Body* hath. The *cause* may be want of *Perspiration*; for much of the matter of *Hair* in the other *parts* of the *Body* goeth forth by insensible *Perspiration*. And besides, the *Skull*, being of a more solid substance, nourisheth and assimilateth less, and excerneth more; and so likewise doth the *Chin*. We see also that *Hair* cometh not upon the *Palms* of the *Hands*, nor *Soals* of the *Feet*, which are *parts* more *perspirable*. And *Children* likewise are not *Hairy*, for that their *Skins* are more *perspirable*.

681. Experiment Solitary, touching the *Quickness of Motion in Birds.*

Birds are of *swifter motion* than *Beasts*; for the *flight* of many *Birds* is *swifter* than the race of any *Beasts*. The *cause* is, for that the *Spirits* in *Birds* are in greater proportion, in comparison of the bulk of their Body, than in *Beasts*. For as for the reason that some give, that they are partly carried, whereas *Beasts* go, that is nothing; for by that reason, swimming should be swifter than running: And that kind of *carriage* also, is not without labour of the *Wing*.

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682. Experiment Solitary, touching the *Different clearness of the Sea*

The *Sea* is *clearer* when the *North-wind* bloweth, than when the *South-wind*. The *cause is*, for that *Salt-water* hath a little *Oylineſs* in the *Surface* thereof, as appeareth in very hot days: And again, for that the *Southern-wind* relaxeth the *VVater* ſomewhat; as no *VVater boyling*, is ſo clear as *cold VVater*.

683. Experiment Solitary, touching the *Different Heats of Fire and boiling Water.*

Fire burneth *Wood*, making it firſt *Luminous*, then *black* and *brittle*, and laſtly, *broken* and *incinerate*; *ſcalding Water* doth none of theſe. The *cauſe* is, for that by *Fire* the *Spirit* of the *Body* is firſt *refined*, and then *emitted*; whereof the *refining* or attenuation cauſeth the *light*, and the *emiſſion*, firſt the *fragility*, and after the *diſſolution* into *Aſhes*, neither doth any other *Body* enter. But in *Water*, the *Spirit* of the *Body* is not *refined* ſo much; and beſides, part of the *Water* entreth, which doth increaſe the *Spirit*, and in a degree extinguiſh it; therefore we ſee that *hot Water* will quench *Fire*. And again, we ſee that in *Bodies* wherein the *Water* doth not much enter, but only the *heat* paſſeth, *hot Water* worketh the effects of *Fire*: As in *Eggs boiled* and *roaſted*, (into which the *Water* entreth not at all) there is ſcarce difference to be diſcerned; but in *Fruit* and *Fleſh*, whereinto the *Water* entreth in ſome part, there is much more difference.

684. Experiment Solitary, touching the *Qualification of Heat by Moiſture.*

The *bottom* of a *Veſſel* of *boyling Water* (as hath been obſerved) is not very much *heated*, ſo as men may put their *hand* under the *Veſſel*, and remove it. The *cauſe* is, for that the *moiſture* of *Water*, as it quencheth Coals where it entreth, ſo it doth allay heat where it toucheth. And therefore note well, that *moiſture*, although it doth not paſs through Bodies without Communication of ſome ſubſtance (as heat and cold do) yet it worketh manifeſt effects; not by entrance of the *Body*, but by qualifying of the heat and cold, as we ſee in this *inſtance*. And we ſee likewiſe, that the *water* of *things diſtilled* in *water*, (which they call the *Bath*) differeth not much from the *water* of *things diſtilled* by *Fire*. We ſee alſo, that *Pewter-diſhes* with *VVater* in them will not melt eaſily, but without it they will. Nay, we ſee more, that *Butter* or *Oyl*, which in themſelves are inflamable, yet by virtue of their *moiſture*, will do the like.

685 Experiment Solitary, touching *Yawning.*

It hath been noted by the *Ancients*, that it is dangerous to pick ones *Ear* whileſt he *Yawneth*. The *cauſe* is, for that in *Yawning*, the inner *Parchment* of the *Ear* is extended by the *drawing* in of the *Spirit* and *Breath*; for in *Yawning* and *Sighing* both, the *Spirit* is firſt ſtrongly drawn in, and then ſtrongly expelled.

686. Experiment Solitary, touching the *Hiccough.*

It hath been obſerved by the *Ancients*, that *Sneezing* doth ceaſe the *Hiccough*. The *cauſe* is, for that the *Motion* of the *Hiccough* is, a *lifting* up of the *Stomach*; which *Sneezing* doth ſomewhat depreſs, and divert the *motion* another way. For firſt, we ſee that the *Hiccough* cometh of *fulneſs* of *Meat*, (eſpecially in *Children*) which cauſeth an extenſion of the *Stomach*: We ſee alſo, it is cauſed by *acide Meats* or *Drinks*, which is by the *pricking* of the *Stomach*. And this *motion* is ceaſed, either by *Diverſion*, or by *Detention* of the *Spirits*: *Diverſion*, as in *Sneezing*; *Detention*, as we ſee *holding* of the *Breath* doth help ſomewhat to ceaſe the *Hiccough*, and putting a Man into an earneſt ſtudy doth the like, as is commonly uſed: And *Vinegar* put to the *Noſtrils* or *Gargarized* doth it alſo; for that it is *Aſtringent*, and inhibiteth the *motion* of the *Spirit*.

Looking

687. Experiment Solitary, touching Sneezing.

Looking against the *Sun* doth induce *Sneezing*. The *cause* is, not the *heating* of the *Nostrils*; for then the *holding* up of the *Nostrils* against the *Sun*, though one wink, would do it, but the *drawing* down of the *moisture* of the *Brain*: For it will make the *Eyes* run with *water*, and the *drawing* of *moisture* to the *Eyes*, doth draw it to the *Nostrils* by *Motion* of *Consent*, and so followeth *Sneezing*. As contrarywise, the *Tickling* of the *Nostrils* within doth draw the *moisture* to the *Nostrils*, and to the *Eyes* by *consent*, for they also will *water*. But yet it hath been observed, that if one be about to *sneeze*, the rubbing of the *Eyes* till they run with water, will prevent it. Whereof the *cause* is, for that the *humor*, which was descending to the *Nostrils*, is diverted to the *Eyes*.

688. Experiment Solitary, touching the *Tenderness of the Teeth*.

The *Teeth* are more by *cold drink*, or the like, affected, than the other *parts*. The *cause* is double; the one, for that the *resistance* of *Bone* to *cold*, is greater than of *Flesh*; for that the *Flesh* shrinketh, but the *Bone* resisteth, whereby the *Cold* becometh more eager. The other is, for that the *Teeth* are *parts* without *Blood*, whereas *Blood* helpeth to qualifie the *cold*. And therefore we see, that the *Sinews* are much affected with *Cold*, for that they are *parts* without *Blood*. So the *Bones* in sharp *Colds* wax *brittle*; and therefore it hath been seen, that all *contusions* of *Bones* in *hard weather*, are more difficult to cure.

689. Experiment Solitary, touching the *Tongue*.

It hath been noted, that the *Tongue* receiveth more easily *tokens* of *Diseases* than the other *parts*; as of *heats* within, which appear most in the *blackness* of the *Tongue*. Again, *Pied Cattel* are spotted in their *Tongues*, &c. The *cause* is (no doubt) the *tenderness* of the *part*, which thereby receiveth more easily all *alterations* than any other *parts* of the *Flesh*.

690. Experiment Solitary, touching the *Taste*.

When the *Mouth* is out of *taste*, it maketh things taste sometimes *salt*, chiefly *bitter*, and sometimes *loathsome*, but never *sweet*. The *cause* is, the *corrupting* of the *moisture* about the *Tongue*, which many times turneth *bitter*, and *salt*, and *loathsome*, but *sweet* never; for the rest are *degrees* of *corruption*.

691. Experiment Solitary, touching *Some Prognosticks of Pestilential Seasons*.

It was observed in the *Great Plague* of the last year, that there were seen in divers *Ditches*, and low *Grounds* about *London*, many *Toads* that had *Tails* two or three inches long at the least, whereas *Toads* (usually) have no *Tails* at all; which argueth a great disposition to *putrefaction* in the *Soil* and *Air*. It is reported likewise, that *Roots* (such as *Carrots* and *Parsnips*) are more *sweet* and *luscious* in infectious years than in other years.

692. Experiment Solitary, touching *Special Simples for Medicines*.

Wise *Physicians* should with all diligence inquire what *Simples* Nature yieldeth, that have extream *subtile parts* without any *Mordication* or *Acrimony*; for they undermine that which is *hard*, they open that which is *stopped* and *shut* and they expel that which is *offensive* gently, without too much *perturbation*. Of this kind are *Elder-flowers*, which therefore are proper for the *Stone*; of this kind is the *Dwarf-pine*, which is proper for the *Jaundice*; of this kind is *Harts-horn*, which is proper for *Agues* and *Infections*; of this kind is *Piony*, which is proper for *Stoppings* in the *Head*; of this kind is *Fumitory*, which is proper for the *Spleen*; and

and a number of others. Generally, divers *Creatures* bred of *Putrefaction*, though they be somewhat loathsome to take, are of this kind; as *Earth-worms*, *Timber-sows*, *Snails*, &c. And I conceive, that the *Trochiſes* of *Vipers*, (which are so much magnified) and the *flesh* of *Snakes* some ways condited and corrected (which of late are grown into some credit) are of the same nature. So the *parts* of *Beasts putrefied* (as *Castoreum* and *Musk*, which have extream *subtil parts*) are to be placed amongst them. We see also, that *putrefactions* of *Plants* (as *Agarick* and *Jews-Ear*) are of greatest vertue. The *cause* is, for that *putrefaction* is the subtilest of all *motions* in the *parts* of *Bodies*. And since we cannot take down the *lives* of *Living Creatures* (which some of the *Paracelsians* say, (if they could be taken down) would make us *Immortal*,) the next is, for *subtilty* of *operation* to take *Bodies putrefied*, such as may be safely taken.

693. Experiments in Consort, touching *Venus*.

IT hath been observed by the *Ancients*, that *much use* of *Venus* doth *dim* the *sight*, and yet *Eunuchs*, which are unable to generate, are (nevertheless) also *dim-sighted*. The *cause* of *dimness* of *sight* in the former, is the *expence* of *Spirits*; in the latter, the *over-moisture* of the *Brain*; for the *over moisture* of the *Brain* doth thicken the *Spirits visual*, and obstructeth their passages, as we see by the decay in the *sight* in *Age*, where also the *diminution* of the *Spirits* concurreth as another *cause*. We see also, that *blindness* cometh by *Rheums* and *Cataracts*. Now in *Eunuchs* there are all the notes of *moisture*; as the swelling of their Thighs, the looseness of their Belly, the smoothness of their skin, *&c.*

694. The *pleasure* in the *Act* of *Venus*, is the greatest of the *pleasures* of the *Senses*; the matching of it with *Itch* is improper, though that also be pleasing to the touch, but the *causes* are profound. First, all the *Organs* of the *Senses* qualifie the *motions* of the *Spirits*, and make so many several *species* of *motions*, and *pleasures* or *displeasures* thereupon, as there be *diversities* of *Organs*. The Instruments of *Sight*, *Hearing*, *Taste*, and *Smell*, are of several frame, and so are the parts for Generation; therefore *Scaliger* doth well to make the *pleasure* of *Generation* a *sixth Sense*. And if there were any other differing *Organs*, and qualified *Perforations* for the *Spirits* to pass, there would be more than the *Five Senses*: Neither do we well know, whether some *Beasts* and *Birds* have not *Senses* that we know not, and the very *Sent* of *Dogs* is almost a *sense* by it self. Secondly, the *Pleasures* of the *Touch* are greater and deeper than those of the other *Senses*, as we see in *Warming* upon *Cold*, or *Refrigeration* upon *Heat*: For as the *Pains* of the *Touch* are greater than the *offences* of other *Senses*, so likewise are the *Pleasures*. It is true, that the *affecting* of the *Spirits immediately*, and (as it were) without an *Organ*, is of the greatest *pleasure*, which is but in two things, *sweet smells* and *Wine*, and the like *Sweet vapors*. For *Smells*, we see their great and sudden effect in fetching *Men* again when they swoun for *Drink*, it is certain, that the *pleasure* of *Drunkenness* is next the *pleasure* of *Venus*; and *great Joyes* (likewise) make the *Spirits* move and touch themselves; and the *pleasure* of *Venus* is somewhat of the same kind.

695. It hath been always observed, that *Men* are more inclined to *Venus* in the *Winter*, and *Women* in the *Summer*. The *cause* is, for that the *Spirits* in a Body more hot and dry, (as the *Spirits* of *Men* are) by the *Summer* are more exhaled and dissipated, and in the *Winter* more condensed and kept entire; but in *Bodies* that are cold and moist, (as *Womens* are) the *Summer* doth

doth cherish the *Spirits*, and calleth them forth, the *Winter* doth dull them. Furthermore, the *Abstinence* or *Intermission* of the *use* of *Venus*, in *moist* and *well habituate* Bodies, breedeth a *number* of *Diseases*; and especially dangerous *impostumations*. The reason is evident, for that it is a principal *evacuation*, especially of the *Spirits*; for of the *Spirits*, there is scarce any *evacuation*, but in *Venus* and *exercise*. And therefore the *emission* of either of them breedeth all *diseases* of *Repletion*.

Experiments in Consort, touching the *Insecta*.

THe *nature* of *Vivification* is very worthy the enquiry; and as the *Nature* of *things* is commonly better perceived in small than in great, and in unperfect than in perfect, and in parts than in whole; so the *Nature* of *Vivification* is best enquired in *Creatures* bred of *Putrefaction*. The *contemplation* whereof hath many *excellent Fruits*. First, in *disclosing* the *original* of *Vivification*. Secondly, in *disclosing* the *original* of *Figuration*. Thirdly, in *disclosing* many *things* in the *nature* of *perfect Creatures*, which in them lie more hidden. And fourthly, in *traducing*, by way of *operation*, some *observations* in the *Insecta*, to work *effects* upon *perfect Creatures*. Note, that the word *Insecta* agreeth not with the matter, but we ever use it for brevities sake, intending by it *Creatures bred* of *Putrefaction*.

696.

The *Insecta* are found to breed out of several *matters*: Some breed of *Mud* or *Dung*; as the *Earth worms*, *Eels*, *Snakes*, &c. For they are both *Putrefactions*: For *Water* in *Mud* do putrefie, as not able to preserve it self; and for *Dung*, all *Excrements* are the *refuse* and *putrefactions* of *nourishment*. Some breed in *Wood*, both growing, and cut down. *Quære*, in what *Woods* most, and at what seasons? We see that the *Worms* with many feet, which round themselves into Balls, are bred chiefly under *Logs* of *Timber*, but not in the *Timber*, and they are said to be found also (many times) in *Gardens* where no *Logs* are. But it seemeth their *Generation* requireth a coverture both from *Sun*, and *Rain* or *Dew*, as the *Timber* is; and therefore they are not *venemous*, but (contrariwise) are held by the *Physitians* to clarifie the *Blood*. It is observed also, that *Cimices* are found in the *holes* of *Bedsides*. Some breed in the *Hair* of *Living Creatures*; as *Lice* and *Tikes*, which are bred by the *sweat* close kept, and somewhat airified by the *Hair*. The *Excrements* of *Living Creatures* do not only breed *Insecta* when they are excerned, but also while they are in the *Body*; as in *Worms*, whereto Children are most subject, and are chiefly in the Guts. And it hath been lately observed by *Physitians*, that in many *Pestilent Diseases* there are *Worms* found in the upper parts of the Body, where *Excrements* are not, but only *humors putrefied*. *Fleas* breed principally of *Straw* or *Mats*, where there hath been a little *moisture*, or the *Chamber* and *Bed straw* kept close, and not aired. It is received, that they are killed by strewing *Wormwood* in the *Rooms*. And it is truly observed, that *bitter things* are apt rather to kill than engender *Putrefaction*, and they be *things* that are *fat* or *sweet* that are aptest to *putrefie*. There is a *Worm* that breedeth in *Meal* of the shape of a large white *Maggot*, which is given as a great dainty to *Nightingales*. The *Moth* breedeth upon *Cloth*, and other *Lanifices*, especially if they be laid up dankish and wet. It delighteth to be about the *flame* of a *Candle*. There is a *Worm* called *Wevil*, bread under *Ground*, and that feedeth upon *Roots*, as *Parsnips*, *Carrots*, &c. Some breed in *Waters*, especially shaded, but they must be *standing Waters*; as the *Water-Spider* that hath six Legs. The *Fly* called the *Gad-fly* breedeth of somewhat that swimeth upon the top of the *Water*, and

is

is most about *Ponds*. There is a *Worm* that breedeth of the *Dregs* of *Wine decayed*, which afterwards (as is observed by some of the *Ancients*) turneth into a *Gnat*. It hath been observed by the *Ancients*, that there is a *Worm* that breedeth in old *Snow*, and is of colour reddish, and dull of motion, and dieth soon after it cometh out of *Snow*; which should shew that *Snow* hath in it a secret *warmth*, for else it could hardly vivifie. And the reason of the dying of the *Worm* may be the sudden exhaling of that little *Spirit*, as soon as it cometh out of the *cold*, which had shut it in. For as *Putterflies* quicken with *heat*, which were benummed with *cold*; so *Spirits* may exhale with *heat*, which were preserved in *cold*. It is affirmed, both by *Ancient* and *Modern observation*, that in *Furnaces* of *Copper* and *Brass*, where *Chalcites* (which is *Vitriol*) is often cast in to mend the working, there riseth suddenly a *Fly* which sometimes moveth, as if it took hold on the Walls of the *Furnace*; sometimes is seen moving in the *fire* below, and dieth presently as soon as it is out of the *Furnace*. Which is a noble *instance*, and worthy to be weighed, for it sheweth that as well *violent heat* of *fire*, as the *gentle heat* of *Living Creatures* will vivifie, if it have matter proportionable. Now the great *axiom* of *Vivification* is, that there must be *heat* to dilate the *Spirit* of the *Body*, an *Active Spirit* to be dilated, *matter viscous* or *tenacious* to hold in the *Spirit*, and that *matter* to be *put forth* and *figured*. Now a *Spirit* dilated by so ardent a *fire* as that of the *Furnace*, as soon as ever it cooleth never so little, congealeth presently. And (no doubt) this *action* is furthered by the *Chalcites*, which hath a *Spirit* that will put forth and germinate, as we see in *Chimical* Tryals. Briefly, most *things putrefied* bring forth *Insecta* of several names, but we will not take upon us now to enumerate them all.

697. The *Insecta* have been noted by the *Ancients* to feed little: But this hath not been diligently observed; for *Grashoppers* eat up the *Green* of whole *Countreys*, and *Silk-worms* devour *Leaves* swiftly, and *Ants* make great provision. It is true, that *Creatures* that sleep and rest much, eat little, as *Dormice* and *Bats*, &c. they are all without *Blood*; which may be, for that the *Juyce* of their *Bodies* is almost all one; not *Blood*, and *Flesh*, and *Skin*, and *Bone*, as in *perfect Creatures*: The *integral parts* have extream variety, but the *similar parts* little. It is true, that they have (some of them) *Diaphragms*, and an *Intestine*; and they have all *Skins*, which in most of the *Insecta*, are cast often. They are not (generally) of *long life*; yet *Bees* have been known to live seven years; and *Snakes* are thought, the rather for the *casting* of their *spoil*, to live till they be old; and *Eels*, which many times breed of *putrefaction*, will live and grow very long; and those that enterchange from *Worms* to *Flies* in the *Summer*, and from *Flies* to *Worms* in the *Winter*, have been kept in Boxes four years at the least; yet there are certain *Flies* that are called *Ephemera* that live but a day. The *cause* is, the exility of the *Spirit*, or perhaps the absence of the *Sun*; for that if they were brought in, or kept close, they might live longer. Many of the *Insecta* (as *Butter-flies* and other *Flies*) revive easily, when they seem dead, being brought to the *Sun* or *Fire*. The *cause* whereof is, the *diffusion* of the *Vital Spirit*, and the *easie dilating* of it by a little *heat*. They stir a good while after their *heads* are off, or that they be cut in pieces; which is caused also, for that their *Vital Spirits* are more diffused throughout all their *parts*, and less confined to *Organs* than in *perfect Creatures*.

698. The *Insecta* have *voluntary Motion*, and therefore *imagination*. And whereas some of the *Ancients* have said, that their *Motion* is indeterminate, and their *imagination* indefinite, it is negligently observed; for *Ants* go right forwards

forwards to their Hills: and *Bees* do (admirably) know the way from a Flowry Heath, two or three miles off to their Hives. It may be *Gnats* and *Flies* have their *Imagination* more mutable and giddy, as *small Birds* likewise have. It is said by some of the *Ancients*, that they have only the *Sense* of *Feeling*, which is manifestly untrue; for if they go forth right to a place, they must needs have *Sight*: Besides, they delight more in one *Flower* or *Herb*, than in another, and therefore have *taste*. And *Bees* are called with *sound* upon *Brass*, and therefore they have *hearing*. Which sheweth likewise, that though their *Spirits* be diffused, yet there is a *Seat* of their *Senses* in their Head.

Other Observations *concerning the* Insecta, *together with the* Enumeration *of them, we refer to that place where we mean to handle the Title of* Animals *in general.*

699. Experiment Solitary, touching *Leaping.*

A *Man leapeth* better with *weights* in his *hands*, than without. The *cause* is, for that the *weight* (if it be proportionable) strengthneth the *Sinews*, by *contracting* them; for otherwise, where no *contraction* is needful, *weight* hindreth. As we see in *Horse Races*. Men are curious to foresee that there be not the least weight upon the one *Horse* more than upon the other. In *Leaping* with *Weights*, the Arms are first cast backwards, and then forwards, with so much the greater force; for the *hands* go backward before they take their raise. *Quære*, if the contrary *motion* of the *Spirits*, immediately before the *Motion* we intend, doth not cause the *Spirits* as it were to break forth with more force; as *Breath* also drawn, and kept in, cometh forth more forcibly: And in *casting* of any *thing*, the *Arms*, to make a greater swing, are first cast backward.

700. Experiment Solitary, touching the *Pleasures and Displeasures of the Senses, especially of Hearing.*

OF *Musical Tones* and *unequal Sounds*, we have spoken before, but touching the *pleasure* and *displeasure* of the *Senses* not so fully. *Harsh Sounds*, as of a *Saw* when it is sharpned, *Grinding* of one *Stone* against another, *squeaking* or *scrietching noises*, make a *shivering* or *horror* in the *Body*, and set the *Teeth* on edge. The *cause* is, for that the *objects* of the *Ear* do affect the *Spirits* (immediately) most with *pleasure* and offence. We see there is no *colour* that affecteth the *Eye* much with *displeasure*. There be *sights* that are *horrible*, because they excite the *memory* of *things* that are *odious* or *fearful*; but the same *things painted*, do little affect. As for *Smells*, *Tastes*, and *Touches*, they be *things* that do affect by a *Participation* or *Impulsion* of the *body* of the *Object*. So it is *Sound* alone that doth immediately and incorporeally affect most. This is most manifest in *Musick*, and *Concords*, and *Discords* in *Musick*: For all *Sounds*, whether they be sharp or flat, if they be sweet, have a roundness and *equality*; and if they be harsh, are *unequal*: For a *Discord* it self, is but a *harshness* of *divers sounds meeting*. It is true, that *inequality*, not staid upon, but passing, is rather an increase of *sweetness*; as in the *Purling* of a *Wreathed String*, and in the *raucity* of a *Trumpet*, and in the *Nightingale Pipe* of a *Regal*, and in a *Discord* straight falling upon a *Concord*: But if you stay upon it, it is *offensive*. And therefore there be these three *degrees* of *pleasing* and *displeasing* in *Sounds*, *Sweet sounds*, *Discords*, and *Harsh sounds*, which we call by divers names, as *Scrietching*, or *Grating*, such as we now speak of. As for the *setting* of the *Teeth* on *edge*, we plainly see what an intercourse there is between the *Teeth*, and the *Organ* of the *Hearing*, by the taking of the end of a Bow between the *Teeth*, and *striking* upon the *String*.

NATURAL HISTORY;

Century VIII.

THere be *Minerals* and *Fossiles* in great variety, but of *Veins* of *Earth Medicinal* but few. The chief are, *Terra Lemnia*, *Terra Sigillata communis*, and *Bolus Arminus*; whereof *Terra Lemnia* is the chief. The *Vertues* of them are for *Curing* of *Wounds*, *Stanching* of *Blood*, *Stopping* of *Fluxes* and *Rheums*, and *Arresting* the *Spreading* of *Poyson*, *Infection*, and *Putrefaction*: And they have of all other *Simples* the perfectest and purest *quality* of *Drying* with little or no mixture of any other quality. Yet it is true, that the *Bole-Arminick* is the most *cold* of them, and that *Terra Lemnia* is the most *hot*; for which cause the *Island Lemnos* where it is digged, was in the old *Fabulous Ages* consecrated to *Vulcan*.

701. Experiment Solitary, touching *Veins of Medicinal Earth*.

ABout the *Bottom* of the *Straights* are gathered great quantities of *Sponges*, which are gathered from the sides of *Rocks*, being as it were a large, but tough *Moss*. It is the more to be noted, because that there be but few *Substances*, *Plant-like*, that grow deep within the *Sea*, for they are gathered sometime Fifteen fathom deep: And when they are laid on Shore, they seem to be of great Bulk; but crushed together, will be transported in a very small room.

702. Experiment Solitary, touching the *Growth of Sponges*.

IT seemeth that *Fish*, that are used to the *Salt-water*, do nevertheless delight more in *fresh*. We see that *Salmons* and *Smelts* love to get into *Rivers*, though it be against the *Stream*. At the *Haven* of *Constantinople* you shall have great *quantities* of *Fish* that come from the *Euxine Sea*, that when they come into the *Fresh-water*, do inebriate and turn up their *Bellies*, so as you may take them with your hand. I doubt there hath not been sufficient *Ex-*

703. Experiment Solitary, touching *Sea Fish put in Fresh water*.

periment made of putting *Sea-fish* into *Fresh-water*, *Ponds*, and *Pools*. It is a thing of great use and pleasure; for so you may have them new at some good distance from the *Sea*: And besides, it may be the *Fish* will eat the pleasanter, and may fall to breed. And it is said, that *Colchester Oysters*, which are put into Pits, where the *Sea* goeth and cometh, (but yet so that there is a *Fresh*-water coming also to them when the *Sea* voideth) become by that means fatter, and more grown.

704. Experiments Solitary, touching *Attraction by Similitude of Substance.*

THe *Turkish Bow* giveth a very forcible *Shoot*, insomuch as it hath been known, that the *Arrow* hath pierced a *Steel Target*, or a piece of *Brass* of two Inches thick: But that which is more strange, the *Arrow*, if it be headed with *Wood*, hath been known to pierce through a piece of *Wood* of eight Inches thick. And it is certain, that we had in use at one time, for *Sea-fight*, short *Arrows*, which they called *Sprights*, without any other Heads, save *Wood* sharpned; which were discharged out of *Muskets*, and would pierce through the sides of *Ships*, where a *Bullet* would not pierce. But this dependeth upon one of the greatest *Secrets* in all *Nature*; which is, that *Similitude* of *Substance* will cause *Attraction*, where the Body is wholly freed from the *Motion* of *Gravity*: For if that were taken away, *Lead* would draw *Lead*, and *Gold* would draw *Gold*, and *Iron* would draw *Iron* without the help of the *Load stone*. But this same *Motion* of *Weight* or *Gravity*, (which is a meer *Motion* of the *Matter*, and hath no affinity with the *Form* or *Kind*) doth kill the other *Motion*, except it self be killed by a violent *Motion*; as in these *instances* of *Arrows*, for then the *Motion* of *Attraction* by *Similitude* of *Substance* beginneth to shew it self. But we shall handle this point of *Nature* fully in due place.

705. Experiment Solitary, touching *Certain drinks in Turky.*

THey have in *Turky*, and the *East*, certain *Confections*, which they call *Servets*, which are like to *Candid Conserves*, and are made of *Sugar* and *Lemmons*, or *Sugar* and *Citrons*, or *Sugar* and *Violets*, and some other Flowers; and some mixture of *Amber* for the more delicate persons: And those they dissolve in *Water*, and thereof make their *Drink*, because they are forbidden *Wine* by their *Law*. But I do much marvel, that no *Englishman*, or *Dutchman*, or *German*, doth set up Brewing in *Constantinople*, considering they have such quantity of *Barley*. For as for the general sort of Men, frugality may be the *cause* of *Drinking Water*; for that it is no small saving to pay nothing for ones *drink*: But the better sort might well be at the cost. And yet I wonder the less at it, because I see *France*, *Italy*, or *Spain* have not taken into use *Beer* or *Ale*; which (perhaps) if they did, would better both their Healths and their Complexions. It is likely it would be matter of great gain to any that should begin it in *Turkey*.

706. Experiments in Consort, touching *Sweat.*

IN *Bathing* in *hot water*, *sweat* (nevertheless) cometh not in the *parts* under the *Water*. The *cause* is, first, for that *sweat* is a kind of *Colliquation*. And that kind of *Colliquation* is not made either by an *over-dry Heat*, or an *over-moist Heat*. For *over-moisture* doth somewhat extinguish the *Heat*; as we see, that even *hot water* quencheth *Fire*, and *over-dry Heat* shutteth the *Pores*. And therefore Men will sooner *sweat* covered before the *Sun* or *Fire*, than if they stood naked: And *Earthen Bottles* filled with *hot water*, do provoke in Bed a *Sweat* more daintily than *Brick bats hot*. Secondly, *Hot water* doth cause *Evaporation* from the *Skin*; so as it spendeth the matter in those parts under the *Water*, before it issueth in

Sweat.

Sweat. Again, *Sweat* cometh more plentifully, if the *Heat* be increased by *degrees*, than if it be greatest at first, or equal. The *cause* is, for that the *Pores* are better opened by a *gentle Heat*, than by a more *violent*; and by their opening the *Sweat* issueth more abundantly. And therefore *Physicians* may do well, when they provoke *Sweat* in Bed by *Bottles*, with a *Decoction* of *Sudorifick Herbs* in *Hot Water*, to make two *degrees* of *Heat* in the *Bottles*, and to lay in the Bed the *less heated* first, and after half an hour the *more heated*.

707. *Sweat* is *salt* in taste. The *cause* is, for that that part of the *Nourishment* which is *fresh* and *sweet*, turneth into *Blood* and *Flesh*; and the *Sweat* is only that *part* which is *separate* and *excerned*. *Blood* also raw, hath some *saltness* more than *Flesh*, because the *Assimilation* into *Flesh*, is not without a little and subtile *excretion* from the *Blood*.

708. *Sweat* cometh forth more out of the *upper parts* of the *Body* than the *lower*. The *reason* is, because those *parts* are more replenished with *Spirits*, and the *Spirits* are they that put forth *Sweat*; besides, they are less *fleshy*, and *Sweat* issueth (chiefly) out of the *parts* that are less *fleshy* and more *dry*, as the *Forehead* and *Breast*.

709. Men *sweat* more in *sleep* than *waking*, and yet *sleep* doth rather stay other *Fluxions*, than cause them; as *Rheums*, *Looseness* of the *Body*, &c. The *cause* is, for that in *Sleep* the *Heat* and *Spirits* do naturally move inwards, and there rest. But when they are collected once within, the *Heat* becometh more violent and irritate, and thereby expelleth *Sweat*.

710. *Cold Sweats* are (many times) *Mortal* and near *Death*, and always *ill* and *suspected*; as in great *Fears*, *Hypochondriacal Passions*, &c. The *cause* is, for that *Cold Sweats* come by a *relaxation* or *forsaking* of the *Spirits*, whereby the *Moisture* of the *Body*, which *Heat* did keep firm in the *parts*, severeth and issueth out.

711. In those *Diseases* which cannot be discharged by *Sweat*, *Sweat* is ill, and rather to be stayed; as in *Diseases* of the *Lungs*, and *Fluxes* of the *Belly*; but in those *Diseases* which are expelled by *Sweat*, it easeth and lightneth; as in *Agues*, *Pestilences*, &c. The *cause* is, for that *Sweat* in the latter sort is partly *Critical*, and sendeth forth the *Matter* that offendeth: But in the former, it either proceedeth from the *Labor* of the *Spirits*, which sheweth them oppressed; or from *Motion* of *Consent*, when *Nature* not able to expel the *Disease* where it is seated, moveth to an *Expulsion* indifferent over all the *Body*.

712. Experiment Solitary, touching the *Glo worm*.

THe *Nature* of the *Glo-worm* is hitherto not well observed. Thus much we see, that they breed chiefly in the *hottest Months* of *Summer*; and that they breed not in *Champaign*, but in *Bushes* and *Hedges*. Whereby it may be conceived, that the *Spirit* of them is very fine, and not to be refined but by *Summer heats*. And again, that by reason of the fineness, it doth easily exhale. In *Italy*, and the *Hotter Countreys*, there is a *Fly* they call *Lucciole*, that shineth as the *Glo-worm* doth, and it may be is the *Flying-Glo-worm*; but that *Fly* is chiefly upon *Fens* and *Marishes*. But yet the two former *observations* hold, for they are not seen but in the *heat* of *Summer*; and *Sedge*, or other *Green* of the *Fens* give as good shade as *Bushes*. It may be the *Glo-worms* of the *Cold Countreys* ripen not so far as to be *winged*.

713. Experiments in Consort, touching the *Impressions* which the *Passions* of the *Mind* make upon the *Body*.

THe *Passions* of the *Mind*, work upon the *Body* the *impressions* following. *Fear*, causeth *Paleness*, *Trembling*, the *Standing* of the *Hair* upright,

right Starting, and *Screeching*. The *Paleneſs* is cauſed, for that the *Blood* runneth inward to ſuccor the *Heart*. The *Trembling* is cauſed, for that through the *flight* of the *Spirits* inward, the *outward parts* are deſtituted, and not ſuſtained. *Standing upright* of the *Hair* is cauſed, for that by *ſhutting* of the *Pores* of the *Skin*, the *Hair* that lyeth aſloap muſt needs riſe. *Starting* is both an *apprehenſion* of the *thing feared*, (and in that kind it is a *motion* of *ſhrinking*,) and likewiſe an *Inquiſition* in the beginning what the matter ſhould be, (and in that kind it is a *motion* of *Erection*;) and therefore when a *Man* would liſten ſuddenly to any thing, he *ſtarteth*; for the *ſtarting* is an *Erection* of the *Spirits* to attend. *Screeching* is an *appetite* of *expelling* that which ſuddenly ſtriketh the *Spirits*. For it muſt be noted, that many *Motions*, though they be unprofitable to expel that which hurteth, yet they are *Offers* of *Nature*, and cauſe *Motions* by *Conſent*; as in *Groaning*, or *Crying* upon *Pain*.

714. *Grief* and *Pain*, cauſe *Sighing*, *Sobbing*, *Groaning*, *Screeming*, and *Roaring*, *Tears*, *Diſtorting* of the *Face*, *Grinding* of the *Teeth*, *Sweating*. *Sighing* is cauſed by the *drawing* in of a greater *quantity* of *Breath* to refreſh the *Heart* that laboureth; like a great *draught* when one is thirſty. *Sobbing* is the ſame thing ſtronger. *Groaning*, and *Screaming*, and *Roaring*, are cauſed by an *appetite* of *Expulſion*, as hath been ſaid; for when the *Spirits* cannot expel the thing that hurteth in their ſtrife to do it, by *Motion* of *Conſent* they expel the *Voice*. And this is when the *Spirits* yield, and give over to reſiſt; for if one do conſtantly reſiſt *Pain*, he will not groan. *Tears* are cauſed by a *Contraction* of the *Spirits* of the *Brain*; which *Contraction* by conſequence aſtringeth the *Moiſture* of the *Brain*, and thereby ſendeth *Tears* into the *Eyes*. And this *Contraction* or *Compreſſion* cauſeth alſo *Wringing* of the *Hands*; for *Wringing* is a *Geſture* of *Expreſſion* of *Moiſture*. The *Diſtorting* of the *Face* is cauſed by a *Contention*, firſt, to bear and reſiſt, and then to expel; which maketh the Parts knit firſt, and afterwards open. *Grinding* of the *Teeth* is cauſed (likewiſe) by a *Gathering* and *Serring* of the *Spirits* together to reſiſt; which maketh the *Teeth* alſo to ſet hard one againſt another. *Sweating* is alſo a *Compound Motion* by the *Labor* of the *Spirits*, firſt to reſiſt, and then to expel.

715. *Joy* cauſeth a *Chearfulneſs* and *Vigor* in the *Eyes*, *Singing*, *Leaping*, *Dancing*, and ſometimes *Tears*. All theſe are the *effects* of *Dilatation* and *coming* forth of the *Spirits* into the *outward parts*, which maketh them more *lively* and *ſtirring*. We know it hath been ſeen, that *Exceſſive ſudden Joy* hath cauſed preſent *Death*, while the *Spirits* did ſpread ſo much as they could not retire again. As for *Tears*, they are the effects of *Compreſſion* of the *Moiſture* of the *Brain*, upon *Dilatation* of the *Spirits*. For *Compreſſion* of the *Spirits* worketh an *Expreſſion* of the *Moiſture* of the *Brain* by *conſent*, as hath been ſaid in *Grief*: But then in *Joy* it worketh it diverſly, *viz.* By *Propulſion* of the *Moiſture*, when the *Spirits* dilate, and occupy more room.

716. *Anger* cauſeth *Paleneſs* in ſome, and the *going* and *coming of the colour* in others; alſo *Trembling* in ſome, *Swelling*, *Foaming* at the *Mouth*, *Stamping*, *Bending* of the *Fiſt*. *Paleneſs*, and *Going*, and *Coming* of the *Colour*, are cauſed by the *Burning* of the *Spirits* about the *Heart*; which to refreſh themſelves, call in more *Spirits* from the *outward parts*. And if the *Paleneſs* be alone, without *ſending forth* the *colour* again, it is commonly joyned with ſome *fear*: But in many there is no *Paleneſs* at all, but contrariwiſe *Redneſs* about the *Cheeks* and *Gills*, which is by the *ſending forth* of the

Spirits,

Spirits, in an *appetite* to *Revenge*. *Trembling* in *Anger* is likewise by a *calling* in of the *Spirits*, and is commonly when *Anger* is joyned with *Fear*. *Swelling* is caused both by a *Dilatation* of the *Spirits* by *over-heating*, and by a *Liquefaction* or *Boiling* of the *Humors* thereupon. *Foaming* at the *Mouth* is from the same *cause*, being an *Ebullition*. *Stamping* and *Bending* of the *Fist* are caused by an *Imagination* of the *Act* of *Revenge*.

717. *Light Displeasure* or *Dislike* causeth *shaking* of the *Head* *Frowning*, and *Knitting* of the *Brows*. These *effects* arise from the same *causes* that *Trembling* and *Horror* do; namely, from the *Retiring* of the *Spirits*, but in a less degree. For the *Shaking* of the *Head*, is but a slow and definite *Trembling*; and is a *Gesture* of *slight refusal*: And we see also, that a *dislike* causeth often that *Gesture* of the *Hand*, which we use when we refuse a thing, or warn it away. The *Frowning* and *Knitting* of the *Brows*, is a *Gathering* or *Serring* of the *Spirits*, to resist in some measure. And we see also, this *Knitting* of the *Brows* will follow upon earnest *Studying*, or *Cogitation* of any thing, though it be without *dislike*.

718. *Shame* causeth *Blushing*, and *casting down* of the *Eyes*. *Blushing* is the *Resort* of *Blood* to the *Face*, which in the *Passion* of *Shame*, is the *part* that laboreth most. And although the *Blushing* will be seen in the whole *Breast*, if it be naked, yet that is but in passage to the *Face*. As for the *casting down* of the *Eyes*, it proceedeth of the *Reverence* a Man beareth to other Men, whereby, when he is ashamed, he cannot endure to look firmly upon others: And we see, that *Blushing* and the *Casting down* of the *Eyes* both, are more when we come before many; *Ore Pompeii quid mollius? Nunquàm non coram pluribus erubuit*; and likewise, when we come before *Great* or *Reverend Persons*.

719. *Pity* causeth sometimes *Tears*, and a *Flexion* or *Cast* of the *Eye aside*. *Tears* come from the same *cause*, that they do in *Grief*: For *Pity* is but *Grief* in anothers behalf. The *Cast* of the *Eye*, is a *Gesture* of *Aversion* or *Loathness* to behold the *object* of *Pity*.

720. *Wonder* causeth *Astonishment*, or an *Immovable Posture* of the *Body*, *Casting* up of the *Eyes* to *Heaven*, and *Lifting* up of the *Hands*. For *Astonishment*, it is caused by the *Fixing* of the *Mind* upon one *object* of *Cogitation*, whereby it doth not spatiate and transcur as it useth: For in *Wonder* the *Spirits* fly not, as in *Fear*; but only settle, and are made less apt to move. As for the *Casting* up of the *Eyes*, and *Lifting* up of the *Hands*, it is a *kind* of *Appeal* to the *Deity*, which is the *Author*, by *Power* and *Providence* of *strange Wonders*.

721. *Laughing* causeth a *Dilatation* of the *Mouth* and *Lips*; a *continued Expulsion* of the *Breath*, with the loud *Noise*, which maketh the *Interjection* of *Laughing*; *Shaking* of the *Breast* and *Sides*; *Running* of the *Eyes* with *Water*, if it be violent and continued. Wherein first it is to be understood, that *Laughing* is scarce (properly) a *Passion*, but hath his *Source* from the *Intellect*; for in *Laughing*, there ever precedeth a *conceit* of somewhat *ridiculous*. And therefore it is proper to *Man*. Secondly, that the *cause* of *Laughing*, is but a *light touch* of the *Spirits*, and not so deep an *Impression* as in other *Passions*. And therefore (that which hath no *Affinity* with the *Passions* of the *Mind*) it is moved, and that in great vehemency, only by *Tickling* some *parts* of the *Body*. And we see, that *Men* even in a *grieved State* of *Mind*, yet cannot sometimes forbear *Laughing*. Thirdly, it is ever joyned with some *degree* of *Delight*: And therefore *Exhilaration* hath some *Affinity* with *Joy*, though it be a much *Lighter Motion*. *Res severa est verum Gaudium*.

Fourthly, That the *object* of it is *Deformity*, *Absurdity*, *Shrewd turns*, and the like. Now to speak of the *causes* of the *effects* before-mentioned, whereunto these *general Notes* give some *light*. For the *Dilatation* of the *Mouth* and *Lips*, *continued Expulsion* of the *Breath* and *Voice*, and *Shaking* of the *Breast*, and *Sides*, they proceed (all) from the *Dilatation* of the *Spirits*, especially being sudden. So likewise the *Running* of the *Eyes* with *Water*, (as hath been formerly touched, where we speak of the *Tears* of *Joy* and *Grief*) is an effect of *Dilatation* of the *Spirits*. And for *Suddenness*, it is a great *part* of the *Matter*: For we see that any *Shrewd turn* that lighteth upon another, or any *Deformity*, &c. moveth *Laughter* in the instant, which after a little time it doth not. So we cannot *Laugh* at any thing after it is *stale*, but whilest it is *new*. And even in *Tickling*, if you *tickle* the *sides*, and give warning, or give a *hard* or *continued touch*, it doth not move *Laughter* so much.

722. *Lust* causeth a *Flagrancy* in the *Eyes*, and *Priapism*. The *cause* of both these is, for that in *Lust* the *Sight* and the *Touch*, are the things desired; and therefore the *Spirits* resort to those parts which are most affected. And note well in general, (for that great use may be made of the *observation*) that (evermore) the *Spirits* in all *Passions* resort most to the *parts* that labour most, or are most affected. As in the last, which hath been mentioned, they resort to the *Eyes* and *Venereous parts*; in *Fear* and *Anger* to the *Heart*; in *Shame* to the *Face*; and in *Light dislikes* to the *Head*.

723. Experiments in Consort, touching Drunkenness.

IT hath been observed by the *Ancients*, and is yet believed, That the *Sperm* of *Drunken-men* is unfruitful. The *cause* is, for that it is *over-moistned*, and wanteth *Spissitude*. And we have a merry saying, *That they that go drunk to Bed, get Daughters.*

724. *Drunken-men* are taken with a plain *Defect* or *Destitution* in *Voluntary Motion*; they reel, they tremble, they cannot stand, nor speak strongly. The *cause* is, for that the *Spirits* of the *Wine* oppress the *Spirits Animal* and occupate part of the place where they are, and so make them weak to move; and therefore *Drunken-men* are apt to fall asleep. And *Opiates* and *Stupefactives* (as *Poppy*, *Henbane*, *Hemlock*, &c.) induce a kind of *Drunkenness* by the *grossness* of their *Vapor*, as *Wine* doth by the *quantity* of the *Vapor*. Besides, they rob the *Spirits Animal* of their *Matter* whereby they are nourished: for the *Spirits* of the *Wine*, prey upon it as well as they, and so they make the *Spirits* less supple and apt to move.

725. *Drunken-men* imagine every *thing turneth round*; they imagine also, that *things come upon them*; they *see* not well *things afar off*; those things that they *see near hand*, they *see out of their place*; and (sometimes) they *see things double*. The *cause* of the imagination that *things turn round*, is, for that the *Spirits* themselves turn, (being compressed by the *vapor* of the *Wine*: for any *Liquid Body* upon *Compression* turneth, as we see in *Water*:) And it is all one to the *sight*, whether the *Visual Spirits* move, or the *Object* moveth, or the *Medium* moveth; and we see, that long *turning round* breedeth the same imagination. The *cause* of the imagination that *things come upon them*, is, for that the *Spirits Visual* themselves draw back, which maketh the *Object* seem to come on; and besides, when they see things turn round and move, *Fear* maketh them think they come upon them. The *cause* that they cannot see *things afar off*, is the *weakness* of the *Spirits*: for in every *Megrim* or *Vertigo*, there is an *Obtenebration* joyned with a semblance of *Turning round*, which we see also in the lighter sort of *Swoonings*.

The

The *cause* of *seeing things out of their place*, is the *refraction* of the *Spirits visual*; for the *vapor* is an *unequal Medium*, and it is as the sight of things out of place in Water. The *cause* of *seeing things double*, is the *swift* and *unquiet motion* of the *Spirits* (being oppressed) to and fro; for (as was said before) the *motion* of the *Spirits visual*, and the *motion* of the *object*, make the same *appearances*; and for the *swift motion* of the *object*, we see that if you fillip a *Lute string*, it sheweth double or trebble.

726. *Men* are sooner *Drunk* with *small draughts* than with *great*. And again, *Wine sugred*, inebriateth less than *Wine pure*. The *cause* of the former is, for that the *Wine* descendeth not so fast to the *Bottom* of the *Stomack*, but maketh longer stay in the *upper part* of the *Stomack*, and sendeth *Vapors* faster to the *Head*, and therefore inebriateth sooner. And for the same reason, *Sops* in *Wine* (quantity for quantity) inebriate more than *Wine* of it self. The *cause* of the latter is, for that the *Sugar* doth inspissate the *Spirits* of the *Wine*, and maketh them not so easie to resolve into *Vapor*. Nay further, it is thought to be some remedy against *inebriating*, if *Wine sugred* be taken after *Wine pure*. And the same effect is wrought, either by *Oyl* or *Milk* taken upon much *Drinking*.

727. Experiment Solitary, touching the Help or hurt of Wine, though Moderately used.

THe *use* of *Wine* in *dry* and *consumed Bodies* is hurtful, in *moist* and *full Bodies* it is good. The *cause* is, for that the *Spirits* of the *Wine* do prey upon the *Dew* or *radical moisture* (as they term it) of the *Body*, and so deceive the *Animal Spirits*. But where there is *moisture* enough, or superfluous, there *Wine* helpeth to digest and desiccate the *moisture*.

728. Experiment Solitary, touching Catterpillers.

THe *Catterpiller* is one of the most general of *Worms*, and breedeth of *Dew* and *Leaves*; for we see infinite number of *Catterpillers* which breed upon *Trees* and *Hedges*, by which the *Leaves* of the *Trees* or *Hedges* are in great part consumed; as well by their breeding out of the *Leaf*, as by their feeding upon the *Leaf*. They breed in the *Spring* chiefly, because then there is both *Dew* and *Leaf*. And they breed commonly when the *East Winds* have much blown: The *cause* whereof is, the *dryness* of that *Wind*; for to all *Vivification* upon *Putrefaction*, it is requisite the *matter* be not too *moist*: And therefore we see they have *Cobwebs* about them, which is a sign of a *slimy dryness*; as we see upon the *Ground*, whereupon by *Dew* and *Sun Cobwebs* breed all over. We see also the *Green Catterpiller* breedeth in the *inward* parts of *Roses*, especially not blown where the *Dew* sticketh: But especially *Catterpillers*, both the greatest and the most breed upon *Cabbages*, which have a *fat Leaf*, and apt to *putrefie*. The *Catterpiller* toward the *end* of *Summer* waxeth *volatile*, and turneth to a *Butterflie*, or perhaps some other *Flie*. There is a *Catterpiller* that hath a *Fur* or *Down* upon him, and seemeth to have affinity with the *Silk-worm*.

729. Experiment Solitary, touching the Flies Cantharids.

THe *Flies Cantharides*, are bred of a *Worm* or *Catterpiller*, but peculiar to certain *Fruit trees*; as are the *Fig-tree*, the *Pine-tree*, and the *Wild Bryar*, all which bear *sweet Fruit*, and *Fruit* that hath a kind of secret *biting* or *sharpness*. For the *Fig* hath a *Milk* in it that is *sweet* and *corrosive*; the *Pine-Apple* hath a *Kernel* that is *strong* and *abstersive*; the *Fruit* of the *Bryar* is said to make *Children*, or those that eat them, *scabbed*. And therefore no marvel though *Cantharides* have such a *Corrosive* and *Cauterizing quality*; for there is not any other of the *Insecta*, but is bred of a *duller matter*. The *Body* of the *Cantharides* is bright coloured; and it may be,

be, that the delicate coloured *Dragon Flies* may have likewise some *Corrosive quality*.

730. Experiments in Consort, touching *Lassitude*.

Lassitude is remedied by *Bathing* or *Anointing* with *Oyl* and *warm Water*. The *cause* is, for that all *Lassitude* is a kind of *Contusion* and *Compression* of the *Parts*; and *Bathing* or *Anointing* give a *Relaxion* or *Emollition*: And the *mixture* of *Oyl* and *Water* is better than either of them alone, because *Water* entreth better into the *Pores*, and *Oyl* after entry softneth better. It is found also, that the *taking* of *Tobacco* doth help and discharge *Lassitude*. The *reason* whereof is partly, because by chearing or comforting of the *Spirits*, it openeth the *Parts compressed* or *contused*: And chiefly, because it refresheth the *Spirits* by the *Opiate Vertue* thereof, and so dischargeth *Wearinesse*, as *Sleep* likewise doth.

731. In *going* up a *Hill* the *Knees* will be most *weary*; In *going down a Hill*, the *Thighs*. The *cause* is, for that in the *Lift* of the *Feet*, when a man *goeth up the Hill*, the weight of the *Body* beareth most upon the *Knees*; and in *going down the Hill*, upon the *Thighs*.

732. Experiment Solitary, touching the *Casting of the Skin and Shell in some Creatures*.

The *casting* of the *Skin*, is by the *Ancients* compared to the *breaking* of the *Secundine* or *Call*, but not rightly; for that were to make every *casting* of the *Skin* a new *Birth*: And besides, the *Secundine* is but a general *Cover*, not shaped according to the *Parts*; but the *Skin* is shaped according to the *Parts*. The *Creatures* that cast their *Skin* are, the *Snake*, the *Viper*, the *Grashopper*, the *Lizard*, the *Silk-worm*, *&c.* Those that cast their *Shell* are, the *Lobster*, the *Crab*, the *Cra-fish*, the *Hodmandod* or *Dedman*, the *Tortoise*, &c. The *old Skins* are found, but the *old Shells* never: So as it is like they scale off, and crumble away by degrees. And they are known by the extream *tenderness* and *softness* of the *new Shell*; and somewhat by the *freshness* of the *colour* of it. The *cause* of the *casting* of *Skin* and *Shell* should seem to be the great *quantity* of *matter* in those *Creatures*, that is fit to make *Skin* or *Shell*: And again, the *looseness* of the *Skin* or *Shell*, that sticketh not close to the *Flesh*. For it is certain, that it is the *new Skin* or *Shell*, that putteth off the *old*. So we see that in *Deer*, it is the *young Horn* that putteth off the *old*. And in *Birds*, the *young Feathers* put off the *old*; and so *Birds* that have much *matter* for their *Beak*, cast their *Beaks*, the *new Beak* putting off the *old*.

733. Experiment in Consort, touching *Postures of the Body*.

Lying not *Erect* but *Hollow*, which is in the making of the Bed, or with the *Legs gathered up*, which is in the posture of the Body, is the more wholsome. The *reason* is, the better *comforting* of the *Stomach*, which is by that less pensile; and we see that in weak *Stomachs*, the laying up of the Legs high, and the Knees almost to the Mouth, helpeth and comforteth. We see also, that *Gally-slaves*, notwithstanding their misery otherwise, are commonly fat and fleshy; and the reason is, because the *Stomach* is supported somewhat in *sitting*, and is pensile in *standing* or *going*. And therefore for *Prolongation* of *Life*, it is good to chuse those *Exercises* where the *Limbs* move more than the *Stomach* and *Belly*; as in *Rowing* and in *Sawing*, being set.

734. *Megrims* and *Giddiness* are rather when we *Rise*, after long *sitting*, than while we *sit*. The *cause* is, for that the *Vapors* which were gathered by *sitting*, by the sudden *Motion* flie more up into the *Head*.

735. *Leaning long* upon any *Part* maketh it *Num*, and, as we call it, A sleep.

The

The *cause* is, for that the *Compression* of the *Part* suffereth not the *Spirits* to have free access; and therefore, when we come out of it, we feel a *stinging* or *pricking*, which is the *re-entrance* of the *Spirits*.

736. Experiment Solitary, touching *Pestilential Years*.

IT hath been noted, That those *Years* are *pestilential* and *unwholsome*, when there are great numbers of *Frogs*, *Flies*, *Locusts*, &c. The *cause* is plain; for that those Creatures being ingendred of *Putrefaction*, when they abound, shew a general *disposition* of the *Year*, and *constitution* of the *Air* to *Diseases* of *Putrefaction*. And the same *Prognostick* (as hath been said before) holdeth, if you find *Worms* in *Oak-Apples*. For the *Constitution* of the *Air* appeareth more subtilly in any of these *things*, than to the *sense* of *Man*.

737. Experiment Solitary, touching the *Prognosticks of Hard Winters*.

IT is an observation amongst *Country people*, that *Years* of *store* of *Haws* and *Heps*, do commonly portend *cold Winters*; and they ascribe it to *Gods Providence*, that (as the *Scripture* saith) reacheth even to the *falling of a Sparrow*, and much more is like to reach to the *Preservation* of *Birds* in such *Seasons*. The *Natural cause* also may be the want of *Heat*, and *abundance* of *Moisture* in the *Summer* precedent, which putteth forth those *Fruits*, and must needs leave great *quantity* of *cold Vapors* not dissipate, which causeth the *cold* of the *Winter* following.

738. Experiment Solitary, touching *Medicines that Condence and Relieve the Spirits*.

THey have in *Turkey* a *Drink* called *Coffee*, made of a *Berry* of the same name, as black as *Soot*, and of a *strong scent*, but not *aromatical*, which they take, beaten into powder, in *Water* as hot as they can drink it: And they take it, and sit at it in their *Coffee-Houses*, which are like our *Taverns*. This *Drink* comforteth the *Brain* and *Heart*, and helpeth *Digestion*. Certainly this *Berry Coffee*, the *Root* and Leaf *Betel*, the Leaf *Tobacco*, and the *Tear* of *Poppy*, (*Opium*) of which, the *Turks* are great takers (supposing it expelleth all fear); do all condence the *Spirits*, and make them strong and aleger. But it seemeth they are taken after several manners; for *Coffee* and *Opium* are taken down, *Tobacco* but in *Smoak*, and *Betel* is but champed in the *Mouth* with a little *Lime*. It is like, there are more of them, if they were well found out, and well corrected. *Quære*, of *Henbane seed*, of *Mandrake*, of *Saffron*, Root and Flower, of *Folium Indum*, of *Ambergreece*, of the *Assyrian Amomum*, if it may be had; and of the *Scarlet Powder* which they call *Kermez*; and (generally) of all such things as do inebriate and provoke *sleep*. Note, that *Tobacco* is not taken in *Root* or *Seed*, which are more forcible ever than *Leaves*.

739. Experiment Solitary, touching *Paintings of the Body*.

THe *Turks* have a *black Powder* made of a *Mineral* called *Alcohole*, which with a fine long Pencil they lay under their *Eye-lids*, which doth colour them black, whereby the *White* of the *Eye* is set off more *white*. With the same *Powder* they colour also the *Hairs* of their *Eye-lids*, and of their *Eye-brows*, which they draw into embowed *Arches*. You shall find that *Xenophon* maketh mention, that the *Medes* used to paint their *Eyes*. The *Turks* use with the same *Tincture* to colour the *Hair* of their *Heads* and *Beards* black: And divers with us that are grown *Gray*, and yet would appear *young*, find means to make their *Hair* black, by combing it (as they say) with a Leaden Comb, or the like. As for the *Chineses*, who are of an ill Complexion, (being *Olivaster*) they paint their *Cheeks* Scarlet, especially their *King* and *Grandees*. Generally, *Barbarous People* that go naked, do not only paint themselves

themſelves, but they pounce and raſe their skin, that the *Painting* may not be taken forth, and make it into Works: So do the *Weſt-Indians*, and ſo did the ancient *Picts* and *Britons*. So that it ſeemeth, *Men* would have the *colours* of *Birds Feathers*, if they could tell how, or at leaſt, they will have *gay Skins* in ſtead of *gay Cloaths*.

740. Experiment Solitary, touching the *Uſe of Bathing and Anointing.*

IT is ſtrange that the *uſe* of *Bathing*, as a part of *Diet*, is left. With the *Romans* and *Grecians* it was as uſual, as *Eating* or *Sleeping*; and ſo is it amongſt the *Turks* at this day; whereas with us it remaineth but as a *part* of *Phyſick*. I am of opinion, that the uſe of it, as it was with the *Romans*, was hurtful to health; for that it made the Body ſoft and eaſie to waſte. For the *Turks* it is more proper, becauſe their *drinking Water*, and *feeding* upon *Rice*, and other Food of ſmall nouriſhment, maketh their *Bodies* ſo ſolid and hard, as you need not fear that *Bathing* ſhould make them *frothy*. Beſides, the *Turks* are great *ſitters*, and ſeldom walk; whereby they ſweat leſs, and need *Bathing more*. But yet certain it is, that *Bathing*, and eſpecially *Anointing*, may be ſo uſed, as it may be a great help to *Health*, and *Prolongation* of *Life*. But hereof we ſhall ſpeak in due place, when we come to handle *Experiments Medicinal*.

741. Experiments Solitary, touching *Chamoletting of Paper.*

THe *Turks* have a pretty Art of *Chamoletting* of *Paper*, which is not with us in uſe. They take divers *Oyled Colours*, and put them ſeverally (in drops) upon *Water*, and ſtir the *Water* lightly, and then wet their *Paper* (being of ſome thickneſs) with it; and the *Paper* will be waved and veined like *Chamolet*, or *Marble*.

742. Experiment Solitary, touching *Cuttle-Ink*

IT is ſomewhat ſtrange, that the *Blood* of all *Birds*, and *Beaſts*, and *Fiſhes*, ſhould be of a *Red colour*, and only the *Blood* of the *Cuttle* ſhould be as *black* as *Ink*. A man would think that the *cauſe* ſhould be the *high Concoction* of that *Blood*; for we ſee in ordinary *Puddings*, that the *Boyling* turneth the *Blood* to be *black*; and the *Cuttle* is accounted a delicate *Meat*, and is much in requeſt.

743. Experiments Solitary, touching *Encreaſe of Weight in Earth*

IT is reported of credit, That if you take *Earth* from Land adjoyning to the *River* of *Nile*, and preſerve it in that manner, that it neither come to be wet nor waſted, and weigh it daily, it will not alter *weight* until the Seventeenth of *June*, which is the day when the *River* beginneth to riſe, and then it will grow more and more *ponderous* till the *River* cometh to his height. Which, if it be true, it cannot be cauſed but by the *Air*, which then beginneth to condenſe; and ſo turneth within that ſmall *Mould* into a degree of *Moiſture*, which produceth weight. So it hath been obſerved, that *Tobacco* cut and weighed, and then dryed by the Fire, loſeth weight; and after being laid in the open *Air*, recovereth *weight* again. And it ſhould ſeem, that as ſoon as ever the *River* beginneth to increaſe, the whole *Body* of the *Air* thereabouts ſuffereth a change: For (that which is more ſtrange) it is credibly affirmed, that upon that very day, when the *River* firſt riſeth, great *Plagues* in *Cairo* uſe ſuddenly to break up.

744. Experiments in Conſort touching *Sleep.*

THoſe that are very *cold*, and eſpecially in their *Feet*, cannot get to *ſleep*. The *cauſe* may be, for that in *Sleep* is required a *free reſpiration*, which *cold* doth ſhut in and hinder: For we ſee, that in great *Colds*, one can ſcarce draw

draw his *Breath*. Another *cauſe* may be, for that *Cold* calleth the *Spirits* to ſuccor; and therefore they cannot ſo well cloſe, and go together in the *Head*, which is ever requiſite to *Sleep*. And for the ſame *cauſe*, *Pain* and *noiſe* hinder *ſleep*, and *darkneſs* (contrariwiſe) furthereth *ſleep*.

Some *noiſes*, (whereof we ſpake in the 112 *Experiment*) help *Sleep*; as the *blowing* of the *Wind*, the *trickling* of *Water*, *humming* of *Bees*, *ſoft ſinging*, *reading*, &c. The *cauſe* is, for that they move in the *Spirits* a gentle *attention*; and whatſoever moveth *attention*, without too much labor; ſtilleth the natural and diſcurſive *motion* of the *Spirits*. 745.

Sleep nouriſheth, or at leaſt preſerveth *Bodies*, a long time, without other *nouriſhment*. *Beaſts* that ſleep in *Winter*, (as it is noted of *wild Bears*) during their *ſleep* wax very fat, though they eat nothing. *Bats* have been found in Ovens, and other hollow cloſe places, matted one upon another; and therefore it is likely that they *ſleep* in the *Winter time*, and eat nothing. *Quære* whether *Bees* do not *ſleep* all Winter, and ſpare their *Honey*. *Butter-flies*, and other *Flies*, do not only *ſleep*, but lie as *dead* all *Winter*; and yet with a little *heat* of *Sun* or *Fire* revive again. A *Dormouſe*, both *Winter* and *Summer* will *ſleep* ſome days together, and eat *nothing*. 746.

TO reſtore *Teeth* in *Age*, were *Magnale Naturæ*, it may be thought of; but howſoever, the *nature* of the *Teeth* deſerveth to be enquired of, as well as the other *parts* of *Living Creatures Bodies*. 747. Experiments in Conſort, touching *Teeth and hard Subſtances in the Bodies of Living Creatures*.

There be five *parts* in the *Bodies* of *Living Creatures* that are of *hard ſubſtance*; the *Skull*, the *Teeth*, the *Bones*, the *Horns*, and the *Nails*. The greateſt *quantity* of *hard ſubſtance* continued, is towards the *Head*; for there is the *Skull* of one entire *Bone*, there are the *Teeth*, there are the *Maxillary Bones*, there is the *hard Bone*, that is, the *Inſtrument* of *Hearing*, and thence iſſue the *Horns*. So that the *building* of *Living Creatures Bodies* is like the *building* of a *Timber houſe*, where the *Walls* and other *parts* have *Columns* and *Beams*; but the *Roof* is in the better ſort of *Houſes*, all *Tile*, or *Lead*, or *Stone*. As for *Birds*, they have three other *hard ſubſtances* proper to them; the *Bill*, which is of like matter with the *Teeth*, for no *Birds* have *Teeth*; the *Shell* of the *Egg*, and their *Quills*; for as for their *Spur*, it is but a *Nail*. But no *Living Creatures* that have *Shells* very hard (as *Oyſters*, *Cockles*, *Muſſles*, *Scalops*, *Crabs*, *Lobſters*, *Craw-fiſh*, *Shrimp*, and eſpecially the *Tortoiſe*) have *Bones* within them, but only little *Griſtles*.

Bones, after full growth, continue at a ſtay, and ſo doth the *Skull*. *Horns*, in ſome *Creatures* are caſt and renewed: *Teeth* ſtand at a ſtay, except their wearing. As for *Nails*, they grow continually, and *Bills* and *Beaks* will overgrow, and ſometimes be caſt, as in *Eagles* and *Parrots*. 748.

Moſt of the *hard ſubſtances* fly to the *extreams* of the *Body*; as *Skull*, *Horns*, *Teeth*, *Nails*, and *Beaks*; only the *Bones* are more *inward*, and clad with *Fleſh*. As for the *Entrails*, they are all without *Bones*, ſave that a *Bone* is ſometimes found in the *Heart* of a *Stag*, and it may be in ſome other *Creature*. 749.

The *Skull* hath *Brains*, as a kind of *Marrow* within it. The *Back-bone* hath one kind of *Marrow*, which hath an affinity with the *Brain*; and other *Bones* of the *Body* have another. The *Jaw-bones* have no *Marrow* ſevered, but a little *Pulp* of *Marrow* diffuſed. *Teeth* likewiſe are thought to have a kind of *Marrow* diffuſed, which cauſeth the *Senſe* and *Pain*: But it 750.

is rather *Sinew*; for *Marrow* hath no *Senſe*, no more than *Blood*. *Horn* is alike throughout, and ſo is the *Nail*.

751. None other of the *hard ſubſtances* have *Senſe*, but the *Teeth*; and the *Teeth* have *Senſe*, not only of *Pain*, but of *Cold*.

But we will leave the Enquiries *of other* Hard Subſtances *unto their ſeveral places, and now enquire only of the* Teeth.

752. The *Teeth* are in *Men* of three kinds, *Sharp*, as the *Fore-teeth*; *Broad*, as the *Back-teeth*, which we call the *Molar-teeth*, or *Grinders*; and *Pointed-teeth*, or *Canine*, which are between both. But there have been ſome *Men* that have had their *Teeth* undivided, as of one whole *Bone*, with ſome little mark in the place of the Diviſion, as *Pyrrhus* had. Some *Creatures* have *over-long*, or *out-growing Teeth*, which we call *Fangs* or *Tuſks*; as *Boars*, *Pikes*, *Salmons*, and *Dogs*; though leſs. Some *Living Creatures* have *Teeth* againſt *Teeth*, as *Men* and *Horſes*; and ſome have *Teeth*, eſpecially their *Maſter-teeth*, indented one within another like *Saws*, as *Lions*; and ſo again have *Dogs*. Some *Fiſhes* have divers *Rows* of *Teeth* in the *Roofs* of their *Mouths*: as *Pikes*, *Salmons*, *Trouts*, &c. and many more in *Salt-waters*. *Snakes* and other *Serpents* have *venemous Teeth*, which are ſometimes miſtaken for their *Sting*.

753. No *Beaſt* that hath *Horns* hath *upper-teeth*; and no *Beaſt* that hath *Teeth* above, wanteth them below. But yet if they be of the ſame kind, it followeth not, that if the *hard matter* goeth not into *upper-teeth*, it will go into *Horns*; nor yet *è converſo*, for *Does* that have no *Horns*, have no *upper-teeth*.

754. *Horſes* have, at three years old, a *Tooth* put forth which they call the *Colts tooth*; and at four years old, there cometh the *Mark-tooth*, which hath a *hole* as big as you may lay a *Peaſe* within it; and that weareth ſhorter and ſhorter every year, till that at eight years old the *Tooth* is ſmooth, and the *hole* gone; and then they ſay, That *the Mark is out of the Horſes Mouth*.

755. The *Teeth* of *Men* breed firſt; when the *Child* is about a year and half old, and then they caſt them, and new come about ſeven years old. But divers have *Backward teeth* come forth at twenty, yea, ſome at thirty, and forty. *Quære* of the manner of the *coming* of them forth. They tell a tale of the old *Counteſs* of *Deſmond*, who lived till ſhe was Sevenſcore years old, that ſhe did *Dentire* twice or thrice, caſting her old *Teeth*, and others coming in their place.

756. *Teeth* are much hurt by *Sweet-meats*, and by *Painting* with *Mercury*, and by *things over hot* and by *things over-cold*, and by *Rheums*. And the *pain* of the *Teeth*, is one of the ſharpeſt of *pains*.

757. Concerning *Teeth*, theſe things are to be conſidered. 1. The *preſerving* of them. 2. The *keeping* of them *white*. 3. The *drawing* of them with *leaſt pain*. 4. The *ſtaying* and *eaſing* of the *Tooth-ach*. 5. The *binding* in of *Artificial Teeth*, where *Teeth* haue been ſtrucken out. 6. And laſt of all, that great one, of *reſtoring Teeth* in *Age*. The *inſtances* that give any likelihood of *reſtoring Teeth* in *Age*, are, The *late coming* of *Teeth* in ſome, and the *renewing* of the *Beaks* in *Birds*, which are commaterial with *Teeth*. *Quære* therefore more particularly how that cometh. And again, the *renewing* of *Horns*. But yet that hath not been known to have been provoked by *Art*; therefore let *tryal* be made, whether *Horns* may be procured to grow in *Beaſts* that are not *horned*, and how; and whether they may be procured to come *larger* than uſual; as to make an *Ox* or a *Deer* have

have a greater *Head* of *Horns*; and whether the *Head* of a *Deer*, that by *age* is more *ſpitted*, may be brought again to be more *branched*. For theſe *tryals* and the like will ſhew, Whether by *art* ſuch *hard matter* can be called and provoked. It may be tryed alſo, whether *Birds* may not have ſomething done to them when they are *young*, whereby they may be made to have *greater* or *longer Bills*, or *greater* and *longer Talons*: And whether *Children* may not have ſome *Waſh*, or ſomething to make their *Teeth better* and *ſtronger*. *Coral* is in uſe as an help to the *Teeth* of *Children*.

758. Experiments in Conſort, touching the *Generation and Bearing of Living Creatures in the Womb.*

SOme *Living Creatures generate* but at certain *ſeaſons* of the *year*; as *Deer*, *Sheep*, *Wilde Coneys*, &c. and moſt ſorts of *Birds* and *Fiſhes*: Others at *any time* of the *year*, as *Men*; and all *Domeſtick* Creatures, as *Horſes*, *Hogs*, *Dogs*, Cats, &c. The *cauſe* of *Generation* at *all ſeaſons*, ſeemeth to be *Fulneſs*; for *Generation* is from *Redundance*. This *Fulneſs* ariſeth from two *cauſes*; Either from the *Nature* of the Creature, if it be *Hot*, and *Moiſt*, and *Sanguine*; or from *Plenty* of *Food*. For the firſt *Men*, *Horſes*, *Dogs*, &c. which breed at all ſeaſons, are full of *Heat* and *Moiſture*; *Doves* are the fulleſt of *Heat* and *Moiſture* amongſt *Birds*, and therefore breed often, the *Tame Dove* almoſt continually. But *Deer* are a *Melancholy dry* Creature, as appeareth by their *fearfulneſs*, and the *hardneſs* of the *Fleſh*. *Sheep* are a *cold* Creature, as appeareth by their *mildneſs*, and for that they ſeldom *drink*. Moſt ſorts of *Birds* are of a dry *ſubſtance* in compariſon of *Beaſts*; *Fiſhes* are cold. For the ſecond *cauſe*, *Fulneſs* of *Food*; *Men*, *Kine*, *Swine*, *Dogs*, &c. feed full. And we ſee, that thoſe Creatures, which, being *Wilde*, generate ſeldom, being *tame*, generate often; which is from *warmth* and *fulneſs* of *food*. We find that the time of *going* to *Rut* of *Deer* is in *September*, for that they need the whole *Summers Feed*, and *Graſs* to make them fit for *Generation*, and if *Rain* come early about the middle of *September* they go to *Rut* ſomewhat the ſooner; if *Drought*, ſomewhat the later. So *Sheep*, in reſpect of their ſmall *heat*, generate about the ſame time, or ſomewhat before. But for the moſt part, Creatures, that generate at certain *ſeaſons*, generate in the *Spring*; as *Birds* and *Fiſhes*: For that the *end* of the *Winter*, and the *heat* and *comfort* of the *Spring* prepareth them. There is alſo another *reaſon* why ſome Creatures generate at certain *ſeaſons*: and that is, the *Relation* of their time of *Bearing* to the time of Generation; for no Creature goeth to generate whileſt the *Female* is full, nor whileſt ſhe is buſie in *ſitting*, or *rearing* her *young*; and therefore it is found by experience, that if you take the *Eggs* or *Youngones* out of the *Neſts* of *Birds*, they will fall to generate again three or four times one after another.

759.

Of *Living* Creatures, ſome are *longer time* in the *Womb*, and *ſome ſhorter*. *Women* go commonly nine *Moneths*, the *Cow* and the *Ewe* about ſix Moneths, *Does* go about nine Moneths, *Mares* eleven Moneths, *Bitches* nine Weeks; *Elephants* are ſaid to go two *years*, for the received *Tradition* of ten years is *fabulous*. For *Birds* there is double enquiry; the *diſtance* between the *treading* or *coupling*, and the *laying* of the *Egg*; and again, between the *Egg laid*, and the *diſcloſing* or *hatching*. And among *Birds* there is leſs *diverſity* of *time* then amongſt other *Creatures*, yet ſome there is; for the *Hen* ſitteth but three weeks, the *Turkie-Hen*, *Gooſe* and *Duck*, a moneth. *Quære* of others. The *cauſe* of the great *difference* of *times* amongſt *Living Creatures* is, either from the *nature* of the *Kind*,

or from the *constitution* of the *Womb*. For the former, those that are longer in *coming* to their *maturity* or *growth*, are longer in the *Womb*, as is chiefly seen in *Asses*; and so *Elephants*, which are long in the *Womb*, are long time in *coming* to their full *growth*. But in most other Kinds, the *constitution* of the *Womb* (that is, the *hardness* or *dryness* thereof) is concurrent with the former *cause*. For the *Colt* hath about four years of *growth* and so the *Fawn*, and so the *Calf*: but *Whelps*, which come to their *growth* (commonly) within three quarters of an year, are but nine weeks in the *Womb*. As for *Birds*, as there is less diversity amongst them in the time of their *bringing forth*, so there is less diversity in the time of their *growth*, most of them coming to their *growth* within a twelve-month.

760. Some *Creatures* bring forth many *young ones* at a *Burthen*; as *Bitches*, *Hares*, *Coneys*, &c. some (ordinarily) but *one*; as *Women*, *Lionesses*, &c. This may be caused, either by the *Quantity* of *Sperm* required to the *producing* one of that Kind; which if less be required, may admit greater number; if more, fewer: Or by the *Partitions* and *Cells* of the *Womb*, which may sever the *Sperm*.

761. Experiments in Consort, touching *Species visible*. THere is no doubt but *Light* by *Reflection* will shew greater, as well as *things coloured*, for like as a *shilling* in the *bottom* of the *Water* will shew greater, so will a *Candle* in a *Lanthorn* in the *bottom* of the *Water*. I have heard of a practice, that *Gloworms* in *Glasses* were put in the *Water* to make the *Fish* come. But I am not yet informed, whether when a *Diver* diveth, having his *eyes* open, and swimmeth upon his *back*, whether (I say) he seeth *things* in the *Air*, greater or less. For it is manifest, that when the eye standeth in the *finer Medium*, and the *object* is in the *grosser*, things shew greater; but contrariwise, when the *eye* is placed in the *grosser Medium*, and the *object* in the *finer*, how it worketh I know not.

762. It would be well boulted out, whether great *Refractions* may not be made upon *Reflections*, as well as upon *direct beams*. For example, we see, that take an *empty Bason*, put an *Angel* of *Gold*, or what you will into it; then go so far from the *Bason* till you cannot see the *Angel*, because it is not in a *right Line*: then fill the *Bason* with *Water*, and you shall see it out of his place, because of the *Reflection*. To proceed therefore, put a *Looking-Glass* into a *Basin* of *Water*; I suppose you shall not see the *Image* in a *right Line*, or at equal *Angles*, but aside. I know not whether this *Experiment* may not be extended so, as you might see the *Image*, and not the *Glass* which for *beauty* and *strangeness* were a fine proof, for then you shall see the *Image* like a *Spirit* in the *Air*. As for example, if there be a *Cistern* or *Pool* of *Water* you shall place over against it a *picture* of the *Devil*, or what you will, so as you do not see the *Water*, then put a *Looking-Glass* in the *Water*: Now if you can see the *Devils picture* aside, not seeing the *Water*, it will look like a *Devil* indeed. They have an old tale in *Oxford*, That *Fryar Bacon* walked between two *Steeples*; which was thought to be done by *Glasses*, when he walked upon the *Ground*.

763. Experiments in Consort, touching the *Impulsion* and *Percussion*. A *Weighty Body* put into *motion*, is more easily impelled then at first when it *resteth*. The *cause* is, partly because *Motion* doth discuss the *Torpour* of *solid Bodies*, which beside their *Motion* of *Gravity*, have in them a *Natural Appetite* not to move at all; and partly, because a *Body* that resteth doth get, by the *resistance* of the *Body* upon which it resteth, a stronger *compression*

compression of *parts* than it hath of it self, and therefore needeth more force to be put in *motion*. For if a *weighty Body* be pensile, and hang but by a *thread*, the *percussion* will make an *impulsion* very near, as easily as if it were already in *motion*.

764. A *Body over-great*, or *over-small*, will not be thrown so far as a *Body* of a *middle size*; so that (it seemeth) there must be a *commensuration* or *proportion* between the *Body moved*, and the *force*, to make it move well. The *cause* is, because to the *Impulsion* there is requisite the *force* of the *Body* that *moveth*, and the *resistance* of the *Body* that is *moved*; and if the *Body* be *too great*, it yieldeth too little; and if it be *too small*, it resisteth too little.

765. It is *common experience*, that no *weight* will press or cut so strong, being laid upon a *Body*, as falling or strucken from above. It may be the *Air* hath some part in furthering the *percussion*: But the chief *cause* I take to be, for that the *parts* of the *Body moved*, have by *impulsion*, or by the *motion* of *gravity continued*, a *compression* in them as well downwards, as they have when they are thrown or shot through the *Air* forwards. I conceive also, that the quick *loose* of that *motion* preventeth the *resistance* of the *Body* below; and *priority* of the *force* (always) is of great *efficacy*, as appeareth in infinite *instances*.

766. Experiment Solitary, touching *Titillation*.

Tickling is most in the *Soles* of the *Feet*, and under the *Arm-holes*, and on the *Sides*. The *cause* is, the *thinness* of the *Skin* in those *parts*, joyned with the rareness of being touched there; for all *Tickling* is a light *motion* of the *Spirits*, which the *thinness* of the *Skin*, and *suddenness*, and rareness of *touch* do further: For we see a *Feather* or a *Rush* drawn along the *Lip* or *Cheek*, doth tickle; whereas a *thing* more *obtuse*, or a *touch* more *hard*, doth not. And for *suddenness*, we see no *man* can tickle himself: We see also, that the *Palm* of the *Hand*, though it hath as *thin* a *Skin* as the other *parts* mentioned, yet is not tickliſh, because it is accustomed to be touched. *Tickling* also causeth *Laughter*. The *cause* may be the *emission* of the *Spirits*, and so of the *Breath* by a *slight* from *Titillation*; for upon *Tickling*, we see there is ever a *starting* or *shrinking* away of the part to avoid it; and we see also, that if you tickle the *Nostrils* with a *Feather* or *Straw*, it procureth *Sneezing*, which is a *sudden emission* of the *Spirits*, that do likewise expel the *moisture*. And *Tickling* is ever painful, and not well endured.

767. Experiment Solitary touching the *Scarcity of Rain in Egypt*.

IT is strange, that the *River* of *Nilus* overflowing, as it doth the *Countrey* of *Egypt*, there should be nevertheless little or no *Rain* in that *Countrey*. The *cause* must be, either in the *Nature* of the *Water*, or in the *Nature* of the *Air*, or of both. In the *Water*, it may be ascribed either unto the *long race* of the *Water*; for *swift-running Waters* vapor not so much as *standing Waters*, or else to the *concoction* of the *Water*; for *VVaters* well *concocted*, vapor not so much as *Waters raw*, no more than *VVaters* upon the fire do vapor so much, after some time of boyling, as at the first. And it is true, that the *VVater* of *Nilus* is sweeter than other *VVaters* in taste, and it is excellent good for the *Stone*, and *Hypochondriacal Melancholy*, which sheweth it is *lenifying*, and it runneth through a *Countrey* of a *hot Climate*, and flat, without shade either of *VVoods* or *Hills*, whereby the *Sun* must needs have great power to *concoct* it. As for the *Air* (from whence I conceive this want of Showers cometh chiefly) the *cause* must be,

for that the *Air* is of it self *thin* and *thirsty*, and as soon as ever it getteth any *moisture* from the *Water*, it imbibeth, and dissipateth it in the whole Body of the *Air*, and suffereth it not to remain in *Vapor*, whereby it might breed *Rain*.

768. Experiment Solitary, touching *Clarification*.

IT hath been touched in the *Title* of *Percolations*, (namely, such as are *inwards*) that the *Whites* of *Eggs* and *Milk* do clarifie; and it is certain, that in *Egypt* they prepare and clarifie the *Water* of *Nile*, by putting it into great *Jars* of *Stone*, & stirring it about with a few stamped *Almonds*, wherewith they also besmear the Mouth of the *Vessel*; and so draw it off, after it hath rested some time. It were good to try this *Clarifying* with *Almonds* in *new Beer*, or *Must*, to hasten and perfect the *Clarifying*.

769. Experiment Solitary, touching *Plants without Leaves*.

THere be scarce to be found any *Vegetables* that have *Branches* and no *Leaves*, except you allow *Coral* for one. But there is also in the *Desarts* of S. *Macario* in *Egypt*, a *Plant* which is long, Leafless, brown of colour, and branched like *Coral*, save that it closeth at the *top*. This being set in *Water* within the *House*, spreadeth and displayeth strangely; and the people there about have a superstitious belief, that in the *Labor* of *Women* it helpeth to the *ease* *Deliverance*.

770. Experiment Solitary, touching the *Materials* of *Glass*.

THe *Crystalline Venice Glass* is reported to be a mixture, in equal portions, of *Stones* brought from *Pavia*, by the River *Ticinum*, and the *Ashes* of a *Weed* called by the *Arabs*, *Kali*, which is gathered in a *Desart* between *Alexandria* and *Rosetta*; and is by the *Egyptians* used first for Fuel, and then they crush the *Ashes* into lumps like a *Stone*, and so sell them to the *Venetians* for their *Glass-works*.

771. Experiments Solitary, touching *Prohibition of Putrefaction, and the long Conservation of Bodies*.

IT is strange, and well to be noted, how long *Carcasses* have continued *uncorrupt*, and in their former *Dimensions*, as appeareth in the *Mummies* of *Egypt*, having lasted, as is conceived (some of them) three thousand years. It is true, they find means to draw forth the *Brains*, and to take forth the *Entrails*, which are the *parts* aptest to corrupt. But that is nothing to the wonder; for we see what a soft and corruptible *substance* the *Flesh* of all the other *parts* of the *Body* is. But it should seem, that according to our *observation* and *axiom*, in our hundredth *Experiment*. *Putrefaction*, which we conceive to be so *natural* a *Period* of *Bodies*, is but an *accident*, and that *Matter* maketh not that haste to *Corruption* that is conceived, and therefore *Bodies* in *shining Amber*, in *Quick-silver*, in *Balms*, (whereof we now speak) in *Wax*, in *Honey*, in *Gums*, and (it may be) in *Conservatories* of *Snow*, &c. are preserved very long. It need not go for repetition, if we resume again that which we said in the aforesaid *Experiment* concerning *Annihilation*: namely, That if you provide against three *causes* of *Putrefaction*, *Bodies* will not corrupt. The first is that the *Air* be *excluded*; for that undermineth the *Body*, and conspireth with the *Spirit* of the *Body* to dissolve it. The second is, that the *Body adjacent* and *ambient* be not Commaterial, but meerly Heterogeneal towards the Body that is to be preserved; for if nothing can be received by the one, nothing can issue from the other; such are *Quick-silver* and *White Amber* to *Herbs* and *Flies*, and such *Bodies*. The third is, that the *Body* to be preserved, be not of that *gross*, that it may corrupt within it self, although no part of it issue into the *Body adjacent*, and therefore it must be rather *thin*

and

and *small* than of *Bulk*. There is a fourth *Remedy* also; which is, That if the *Body* to be preserved, be of *bulk*, as a *Corps* is, then the *Body* that incloseth it must have a virtue to draw forth and dry the *moisture* of the *inward Body*; for else the *Putrefaction* will play within, though nothing issue forth. I remember *Livy* doth relate, that there were found at a time two *Coffins* of *Lead* in a *Tomb*, whereof the one contained the *Body* of *King Numa*, it being some Four hundred years after his death; and the other, his *Books* of *Sacred Rites* and *Ceremonies*, and the *Discipline* of the *Pontiffs*: And that in the *Coffin* that had the *Body*, there was nothing (at all) to be seen but a little light *Cinders* about the *sides*: but in the *Coffin* that had the *Books*, they were found as fresh as if they had been but newly written being written in *Parchment*, and covered over with *Watch-candles* of *Wax* three or four fold. By this it seemeth, that the *Romans* in *Numa*'s time were not so good *Embalmers* as the *Egyptians* were; which was the *cause* that the Body was utterly consumed. But I find in *Plutarch* and others, that when *Augustus Cæsar* visited the *Sepulchre* of *Alexander* the *Great* in *Alexandria*, he found the *Body* to keep his *Dimension*; but withal, that notwithstanding all the *Embalming* (which no doubt was of the best) the *Body* was so tender, as *Cæsar* touching but the *Nose* of it, defaced it. Which maketh me find it very strange, that the *Egyptian Mummies* should be reported to be as hard as *Stone-pitch*: For I find no difference but one, which indeed may be very material; namely, that the ancient *Egyptian Mummies* were shrowded in a number of folds of *Linnen*, besmeared with *Gums*, in manner of *Sear-cloth*; which it doth not appear, was practised upon the *Body* of *Alexander*.

772. Experiment Solitary, touching the *Abundance of Nitre in certain Sea-shores.*

NEar the *Castle* of *Catie*, and by the *Wells* of *Assan*, in the *Land* of *Idumæa*, a great part of the way, you would think the *Sea* were near hand, though it be a good distance off: And it is nothing, but the *shining* of the *Nitre* upon the *Sea sands*; such *abundance* of *Nitre* the *Shores* there do put forth.

773. Experiment Solitary, touching *Bodies that are born up by Water.*

THe *Dead-Sea*, which vomiteth up *Bitumen*, is of that *Crassitude*, as *Living Bodies*, bound hand and foot, and cast into it, have been born up and not sunk: Which sheweth, that all *sinking* into *Water*, is but an *overweight* of the *Body* put into the *Water*, in respect of the *Water*; so that you may make *Water* so strong and heavy of *Quick-silver*, (perhaps) or the like, as may bear up *Iron*; of which I see no use, but Imposture. We see also, that all *Metals*, except *Gold*, for the same reason swim upon *Quick-silver*.

774. Experiment Solitary, touching *Fuel that consumeth little or nothing.*

IT is reported, that at the *Foot* of a *Hill* near the *Mare mortuum*, there is a *Black Stone* (whereof *Pilgrims* make Fires) which burneth like a *Coal* and diminisheth not, but only waxeth brighter and whiter. That it should do so, is not strange; for we see *Iron* red hot burneth and consumeth not. But the strangeness is, that it should continue any time so; for *Iron*, as soon as it is out of the Fire, deadeth straight-ways. Certainly, it were a thing of great use and profit, if you could find out *Fuel* that would burn hot, and yet last long: Neither am I altogether incredulous, but there may be such *Candles* as (they say) are made of *Salamanders Wool*, being a kind of *Mineral* which whiteneth also in the burning, and consumeth not. The Question is this, *Flame* must be made of somewhat; and commonly it

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is made of some *tangible* Body which hath *weight*; but it is not impossible, perhaps, that it should be made of *Spirit* or *Vapor* in a *Body*, (which *Spirit* or *Vapor* hath no *weight*) such as is the matter of *Ignis fatuus*. But then you will say, that that *Vapor* also can last but a short time. To that it may be answered, That by the help of *Oyl* and *VVax*, and other *Candle-stuff*, the flame may continue, and the *wiek* not burn.

775. Experiment Solitary, *Oeconomical touching cheap Fewel.*

Sea-coal last longer than *Char-coal*; and *Char-coal* of *Roots*, being coaled into great pieces, last longer than ordinary *Char-coal*. *Turf*, and *Peat*, and *Cow-sheards* are cheap *Fewels*, and last long. *Small-coal* or *Briar-coal* poured upon *Char coal* make them last longer. *Sedge* is a cheap *Fewel* to brew or Bake with, the rather, because it is good for nothing else. Tryal would be made of some mixture of *Sea-coal* with *Earth*, or *Chalk*; for if that *mixture* be, as the *Sea-coal men* use it privily, to make the Bulk of the *Coal* greater, it is deceit; but if it be used purposely, and be made known, it is saving.

776. Experiment Solitary, touching the *Gathering of Wind for Freshness.*

IT is at this day in use in *Gaza*, to couch *Pot-sherds* or *Vessels* of *Earth* in their *Walls*, to gather the *VVind* from the top, and to pass it down in Spouts into *Rooms*. It is a device for *freshness* in great Heats. And it is said, there are some *Rooms* in *Italy* and *Spain* for *freshness*, and *gathering* the *VVinds* and *Air* in the *Heats* of *Summer*; but they be but *Pennings* of the *Winds*, and inlarging them again, and *making* them *reverberate*, and *go round* in *Circles*, rather than this *device* of *Spouts* in the *VVall*.

777. Experiment Solitary, touching the *Tryals of Airs.*

THere would be used much diligence in the choice of some *Bodies* and *Places* (as it were) for the *tasting* of *Air*, to discover the *wholsomeness* or *unwholesomness*, as well of *Seasons*, as of the *Seats* of *Dwellings*. It is certain, that there be some *Houses* wherein *Confitures* and *Pies*, will gather *Mould* more than in others; and I am perswaded, that a *piece* of *raw Flesh* or *Fish*, will sooner corrupt in some *Airs* than in others. They be noble *Experiments* that can make this *discovery*; for they serve for a *Natural Divination* of *Seasons*, better than the *Astronomers* can by their *Figures*, and again, they teach *men* where to chuse their *dwelling* for their better *health*.

778. Experiment Solitary, touching *Encreasing of Milk in Milk beasts.*

THere is a kind of *Stone* about *Bethlehem* which they grind to *powder*, and put into *Water*, whereof *Cattel* drink, which maketh them give more *Milk*. Surely, there would be some better Tryals made of *Mixtures* of *Water* in *Ponds* for *Cattel*, to make them more *Milch*, or to *fatten* them, or to *keep* them from *Murrain*. It may be, *Chalk* and *Nitre* are of the best.

779. Experiment Solitary, touching *Sand of the Nature of Glass.*

IT is reported, that in the *Valley* near the *Mountain Carmel* in *Judea*, there is a *Sand*, which of all other, hath most affinity with *Glass*; insomuch, as other *Minerals* laid in it, turn to a *glossie substance* without the *fire*; and again, *Glass* put into it, turneth into the *Mother-sand*. The thing is very strange, if it be true; and it is likeliest to be caused by some *natural Furnace* of *Heat* in the *Earth*, and yet they do not speak of any *Eruption* of *Flames*. It were good to try in *Glass-works*, whether the *crude-Materials* of *Glass* mingled with *Glass*, already made and re-moulten, do not facilitate the *making* of *Glass*, with less *heat*.

In

780. Experiment Solitary, touching the Growth of Coral.

IN the *Sea* upon the *South-West* of *Sicily*, much *Coral* is found. It is a *Submarine Plant*, it hath no *leaves*, it brancheth onely when it is under *Water*; it is *soft*, and *Green* of *Colour*; but being brought into the *Air*, it becometh *hard*, and *shining* red, as we see. It is said also to have a *white Berry*, but we find it not brought over with the *Coral*: Belike it is cast away as nothing worth. Inquire better of it, for the *discovery* of the *Nature* of the *Plant*.

781. Experiment Solitary, touching the Gathering of Manna.

THe *Manna* of *Calabria* is the best, and in most plenty. They gather it from the *Leaf* of the *Mulberry-tree*; but not of such *Mulberry trees* as grow in the *Valleys*: and *Manna* falleth upon the *Leaves* by *night*, as other *Dews* do. It should seem, that before those *Dews* come upon *Trees* in the *Valleys*, they dissipate and cannot hold out. It should seem also, the *Mulberry-leaf*, it self hath coagulating virtue, which inspissateth the *Dew*, for that it is not found upon other *Trees*,: And we see by the *Silk-worm*, which feedeth upon that *Leaf*, what a dainty smooth *Juyce* it hath; and the *Leaves* also (especially of the Black *Mulberry*) are somewhat bristly, which may help to preserve the *Dew*. *Certainly*, it were not amiss to observe a little better the *Dews* that fall upon *Trees* or *Herbs* growing on *Mountains*; for it may be, many *Dews* fall that spend before they come to the *Valleys*. And I suppose, that he that would gather the best *May Dew* for *Medicine*, should gather it from the *Hills*.

782. Experiment Solitary, touching the Correcting of Wine.

IT is said, they have a manner to prepare their *Greek Wines*, to keep them from *Fuming* and *Inebriating*, by adding some *Sulphur* or *Allome*; whereof the one is *Unctuous*, and the other is *Astringent*. And certain it is, that those two *Natures* do best repress *Fumes*. This *Experiment* would be transferred unto other *Wine* and *Strong-Beer*, by putting in some like *Substances* while they work; which may make them both to *Fume* less, and to *inflame* less.

783. Experiment Solitary, touching Materials of Wildefire.

IT is conceived by some, (not improbably) that the reason why *Wildfires* (whereof the principal ingredient is *Bitumen*) do not quench with *Water*, is, for that the first *concretion* of *Bitumen*, is a *mixture* of a *fiery* and *watry substance*; so it is not *Sulphur*. This appeareth, for that in the *place* near *Puteoli*, which they call the *Court* of *Vulcan* you shall hear under the *Earth* a horrible thundring of *Fire* and *Water* conflicting together, and there break forth also *Sprouts* of *boiling Water*. Now that *Place* yieldeth great *Quantities* of *Bitumen*; whereas *Ætna*, and *Vesuvius*, and the like, which consist upon *Sulphur*, shoot forth *Smoak*, and *Ashes*, and *Pumice*, but no *Water*. It is reported also, that *Bitumen* mingled with *Lime*, and put under *Water*, will make, as it were, an *artificial Rock*, the *substance* becometh so hard.

784. Experiment Solitary, touching Plaister growing as hard as Marble.

THere is a *Cement* compounded of *Flower*, *whites* of *Eggs*, and *Stone powdred*, that becometh hard as *Marble*, wherewith *Piscina Mirabilis* near *Cuma*, is said to have the *Walls* plaistered. And it is certain, and tried, that the *Powder* of *Load-stone* and *Flint*, by the addition of *Whites* of *Eggs* and *Gum-dragon*, made into *Paste*, will in a few days harden to the hardness of a *Stone*.

It

785. Experiment Solitary, touching *Judgement of the Cure in some Ulcers and Hurts.*

IT hath been noted by the *Ancients*, that in *full* or *impure* Bodies, *Ulcers* or hurts in the *Legs* are hard to cure, and in the *Head* more easie. The *cause* is, for that *Ulcers* or *Hurts* in the *Legs* require *Desiccation*, which by the *destillation* of *Humors* to the *lower parts*, is hindred, whereas *Hurts* and *Ulcers* in the *Head* require it not; but, contrariwise, *Dryness* maketh them more apt to Consolidate. And in Modern observation, the like difference hath been found between *French-men* and *Englishmen*; whereof the ones *Constitution* is more *dry*, and the others more *moist*: And therefore a *Hurt* of the *Head* is harder to cure in a *French-man*, and of the *Leg* in an *Englishman*.

786. Experiment Solitary, * touching the *Healthfulness or Unhealthfulness of the Southern Wind.*

IT hath been noted by the *Ancients*, that *Southern-Winds* blowing much without *Rain*, do cause a *Feverous disposition* of the *Yeer*; but with *Rain*, not. The *cause* is, for that *Southern-Winds* do of themselves qualifie the *Air* to be apt to cause *Fevers*; but when *Showers* are joyned, they do refrigerate in part, and check the soultry *Heat* of the *Southern-Wind*. Therefore this holdeth not in the *Sea-coasts*, because the *vapor* of the *Sea* without *showers* do refresh.

787. Experiment Solitary, touching *Wounds.*

IT hath been noted by the *Ancients*, that *Wounds* which are made with *Brass*, heal more easily then *Wounds* made with *Iron*. The *cause* is, for that *brass* hath in it self a *Sanative virtue*, and so in the very instant helpeth somewhat; but *Iron* is *Corrosive*, and not *Sanative*. And therefore it were good that the Instruments which are used by *Chirurgions* about *Wounds* were rather of *Brass* then *Iron*.

788. Experiment Solitary, touching *Mortification by Cold.*

IN the *cold Countries*, when Mens *Noses* and *Ears* are mortified, and (as it were) Gangrened with *cold*, if they come to a Fire, they rot off presently. The *cause* is, for that the few *Spirits* that remain in those *parts* are suddenly drawn forth, and so *Putrefaction* is made compleat. But *Snow* put upon them helpeth, for that it preserveth those *Spirits* that remain till they can revive; and besides, *Snow* hath in it a secret *warmth*; as the *Monk* proved out of the *Text*, *Qui dat Nivem sicut Lanam, Gelu sicut Cineres spargit*; whereby he did infer, that *Snow* did warm like *Wool*, and *Frost* did fret like *Ashes*. *Warm Water* also doth good, because by little and little it openeth the pores, without any sudden working upon the *Spirits*. This *Experiment* may be transferred unto the *cure* of *Gangrenes*, either coming of themselvs. or induced by too much applying of *Opiates*; wherein you must beware of *dry heat*, and resort to things that are *Refrigerant*, with an inward *warmth* and *virtue* of Cherishing.

789. Experiment Solitary, touching *Weight.*

WEigh *Iron* and *Aqua fortis* severally, then dissolve the *Iron* in the *Aqua-fortis*, and weigh the *Dissolution*; and you shall find it to bear as good *weight* as the *Bodies* did severally, notwithstanding a good deal of waste by a thick *vapor* that issueth during the *working*; which sheweth, that the *opening* of a *Body* doth increase the *weight*. This was tryed once or twice, but I know not whether there were any *Error* in the *tryal*.

790. Experiments Solitary, touching the *Super-Natation of Bodies.*

TAke of *Aqua-fortis* two *Ounces*, of *Quick-silver* two *Drachms*, (for that charge the *Aqua-fortis* will bear) the *Dissolution* will not bear a *Flint* as big as a *Nutmeg*; yet (no doubt) the increasing of the *weight* of

Water

Water will increase his *power* of *bearing*; as we see *Broyn*, when it is salt enough, will bear an *Egg*. And I remember well a *Physitian*, that used to give some Mineral *Baths* for the *Gout*, &c. And the *Body* when it was put into the Bath, could not get down so easily as in ordinary *Water*. But it seemeth, the *weight* of the *Quick silver*, more than the *weight* of a *Stone*; doth not compense the *weight* of a *Stone*, more than the *weight* of the *Aqua-fortis*.

791. Experiment Solitary, touching the *Flying of unequal Bodies in the Air.*

LEt there be a Body of *unequal weight*, (as of *Wood* and *Lead*, or *Bone* and *Lead*;) if you throw it from you with the *light end* forward, it will turn, and the *weightier end* will recover to be forwards, unless the *Body* be over-long. The *cause* is, for that the more *Dense Body* hath a more violent *pressure* of the parts from the first *impulsion*; which is the *cause* (though heretofore not found out, as hath been often said) of all *Violent Motions*: And when the *hinder part* moveth swifter (for that it less endureth *pressure of parts*) than the *forward part* can make way for it, it must needs be that the *Body* turn over; for (turned) it can more easily draw forward the *lighter* part. *Galilæus* noteth it well, That if an *open Trough*, wherein *Water* is, be driven faster than the *Water* can follow, the *Water* gathereth upon an heap towards the *hinder end*, where the *motion* began; which he supposeth (holding confidently the *motion* of the *Earth*) to be the *cause* of the *Ebbing* and *Flowing* of the *Ocean*, because the *Earth* over-runneth the *Water*. Which *Theory* though it be false, yet the first *Experiment* is true; as for the *inequality* of the *pressure* of *parts*, it appeareth manifestly in this, That if you take a *body* of *Stone* or *Iron*, and another of *Wood*, of the same *magnitude* and *shape*, and throw them with equal force, you cannot possibly throw the *Wood* so far as the *Stone* or *Iron*.

792. Experiment Solitary, touching *Water, that it may be the Medium of Sounds.*

IT is certain (as it hath been formerly in part touched) that *Water* may be the *Medium* of *Sounds*. If you dash a *Stone* against a *Stone* in the *bottom* of the *Water*, it maketh a *Sound*; so a long *Pole* struck upon *Gravel*, in the *bottom* of the *Water*, maketh a *Sound*. Nay, if you should think that the *Sound* cometh up by the *Pole*, and not by the *Water*, you shall find that an *Anchor* let down by a *Rope* maketh a *Sound*; and yet the *Rope* is no solid *Body*, whereby the *Sound* can ascend.

793. Experiment Solitary, *of the Flight of the Spirits upon odious Objects.*

ALl *objects* of the *Senses* which are very *offensive*, do cause the *Spirits* to retire, and upon their *flight*, the *parts* are (in some degree) destitute, and so there is induced in them a *trepidation* and *horror*. For *Sounds*, we see, that the *grating* of a *Saw*, or any very *harsh noise*, will set the *Teeth* on edge, and make all the *Body* shiver. For *Tastes*, we see, that in the taking of a *Potion*, or *Pills*, the *Head* and the *Neck* shake. For *odious smells*, the like effect followeth, which is less perceived, because there is a remedy at hand, by stopping of the *Nose*. But in *Horses* that can use no such help, we see the *smell* of a *Carrion*, especially of a *dead Horse*, maketh them fly away, and take on almost, as if they were mad. For *Feeling*, if you come out of the *Sun* suddenly into a *shade*, there followeth a *chilness* or *shivering* in all the *Body*. And even in *Sight*, which hath (in effect) no *odious object*, coming into *sudden darkness*, induceth an *offer* to *shiver*.

794. Experiment Solitary, touching the *Super-Reflexion of Ecchoes.*

THere is in the *City* of *Ticinum* in *Italy*, a *Church* that hath Windows only from above; it is in Length an hundred Feet, in Breadth twenty Feet, and in Height near fifty, having a *Door* in the midst. It reporteth, the

the *voice* twelve or thirteen times. If you ſtand by the cloſe *End-wall* over againſt the *Door*, the *Eccho* fadeth and dieth by little and little, as the *Eccho* at *Font-Charenton* doth, and the *voice* ſoundeth, as if it came from above the *Door*; and if you ſtand at the *lower end*, or on either *ſide* of the *Door*, the *Eccho* holdeth; but if you ſtand in the *Door*, or in the *midſt* juſt over againſt the *Door*, not. Note, that all *Eccheos* ſound better againſt *old Walls* than *new*, becauſe they are more *dry* and *hollow*.

795. Experiment Solitary, touching the *force of Imagination*. Imitating that of the Senſe.

THoſe *effects*, which are wrought by the *percuſſion* of the *Senſe*, and by *things* in *Act*, are produced likewiſe in ſome degree by the *Imagination*: Therefore if a man ſee another eat *ſowre* or *acide things*, which ſet the *Teeth* on edge, this *object* tainteth the *Imagination*; ſo that he that ſeeth the *thing* done by another, hath his own *Teeth* alſo ſet on edge. So if a man ſee another turn ſwiftly and long, or if he look upon *Wheels* that turn, himſelf waxeth *Turn ſick*. So if a man be upon a *high place*, without *Rails*, or good hold, except he be uſed to it, he is ready to fall; for *imagining* a *fall*, it putteth his *ſpirits* into the very *action* of a *fall*. So many upon the *ſeeing* of others *Bleed*, or *Strangled*, or *Tortured*, themſelves are ready to faint, as if they *bled*, or were in *ſtrife*.

796. Experiment Solitary, touching *Preſervation of Bodies*.

TAke a *Stock-Gilliflower*, and tye it gently upon a ſtick, and put them both into a *Steep-glaſs* full of *Quick-ſilver*, ſo that the *Flower* be covered; then lay a little *weight* upon the top of the *Glaſs*, that may keep the ſtick down; and look upon them after four or five days, and you ſhall find the *Flower* freſh, and the *Stalk* harder and leſs *flexible* than it was. If you compare it with another *Flower*, gathered at the ſame time, it will be the more manifeſt. This ſheweth, that *Bodies* do preſerve excellently in *Quick-ſilver*; and not preſerve only, but by the *coldneſs* of the *Quick-ſilver*, *indurate*. For the *freſhneſs* of the *Flower* may be meerly *Conſervation*, (which is the more to be obſerved, becauſe the *Quick ſilver* preſſeth the *Flower*) but the *ſtifneſs* of the *Stalk* cannot be without *Induration* from the cold (as it ſeemeth) of the *Quick-ſilver*.

797. Experiment Solitary, touching the *Growth or Multiplying of Metals*.

IT is reported by ſome of the *Ancients*, That in *Cyprus* there is a *kind* of *Iron*, that being cut into *little pieces*, and put into the ground, if it be well *watered*, will encreaſe into *greater pieces*. This is certain, and known of old, that *Lead* will multiply and encreaſe; as hath been ſeen in *old Statues* of *Stone*, which have been put in *Cellars*, the *Feet* of them being bound with *Leaden-bands*; where (after a time) there appeared, that the *Lead* did ſwell, inſomuch, as it hanged upon the *Stone* like *Warts*.

798. Experiment Solitary, touching the *Drowning of the more Baſe Metal, in the more Precious*.

I Call *drowning* of *Metals*, when that the *baſer Metal* is ſo incorporate with the more *rich*, as it can by no means be ſeparated again; which is a kind of *Verſion*, though falſe; as if *Silver* ſhould be inſeparably incorporated with *Gold*, or *Copper* and *Lead* with *Silver*. The *Ancient Electrum* had in it a fifth of *Silver* to the *Gold*, and made a *Compound Metal*, as fit for moſt uſes as *Gold*, and more reſplendent, and more qualified in ſome other properties; but then that was eaſily ſeparated. This to do privily, or to make the *Compound* paſs for the *rich Metal* ſimple, is an *adulteration* or *counterfeiting*; but if it be done avowedly and without diſguiſing, it may be a great *ſaving* of the *richer Metal*. I remember to have heard of a man skilful in *Metals*, that a fifteenth part of *Silver* incorporate with

Gold

799. Experiment Solitary, touching *Fixation of Bodies*.

Gold is the onely *Substance* which hath nothing in it *Volatile*, and yet melteth without much difficulty. The *Melting* sheweth, that it is not jejune or scarce in *Spirit*. So that the *fixing* of it is not *want* of *Spirit* to fly out, but the *equal spreading* of the *Tangible parts*, and the *close coacervation* of them; whereby they have the less appetite, and no means (at all) to issue forth. It were good therefore to try whether *Glass Re-moulten*, do lose any *weight*; for the *parts* in *Glass* are evenly spread, but they are not so close as in *Gold*; as we see by the easie admission *Light*, *Heat*, and *Cold*, and by the *smalness* of the *weight*. There be other *Bodies fixed*, which have little, or no *Spirit*, so as there is nothing to fly out; as we see in the *Stuff*, whereof *Coppels* are made, which they put into *Furnaces*, upon which *Fire* worketh not. So that there are three *causes* of *Fixation*; *Even spreading* both of the *Spirits* and *Tangible parts*; the *Closeness* of the *Tangible parts*; and the *Jejuneſs* or *extream comminution* of *Spirits*: Of which three, the two first may be joyned with a *Nature Liquefiable*, the last not.

800. Experiment Solitary, touching the *Restless Nature of Things in themselves, and their Desire to Change*.

IT is a profound *Contemplation* in *Nature*, to consider of the *Emptiness* (as we may call it) or *Insatisfaction* of *several Bodies*, and of their *appetite* to take in others. *Air* taketh in *Lights*, and *Sounds*, and *Smells*, and *Vapors*: And it is most manifest, that it doth it with a kind of Thirst, as not satisfied with his own former Consistence; for else it would never receive them in so suddenly and easily. *Water* and all *Liquors* do hastily receive *dry* and more *Terrestrial Bodies* proportionable; and *dry Bodies*, on the other side, drink in *Waters* and *Liquors*: So that (as it was well said of one of the *Ancients* of *Earthy* and *Watry Substance*,) *one is a Glue to another*. *Parchments*, *Skins*, *Cloth* &c. drink in *Liquors*; though themselves be entire *Bodies*, and not *comminuted*, as *Sand* and *Ashes*, nor apparently porous. *Metals* themselves do receive in readily *Strong-waters*, and *Strong-waters* likewise do readily pierce into *Metals* and *Stones*; and that *Strong-waters* will touch upon *Gold*, that will not touch upon *Silver*, and *è converso*. And *Gold*, which seemeth by the *weight* to be the closest and most solid *Body*, doth greedily drink in *Quick-silver*. And it seemeth, that this *Reception* of other *Bodies* is not violent, for it is (many times) reciprocal, and as it were, with consent. Of the *cause* of this, and to what *Axiom* it may be referred, consider attentively; for as for the pretty assertion, that *Matter* is like a *Common Strumpet* that desireth all *Forms*, it is but a *Wondring Motion*. Onely *Flame* doth not content it self to take in any other *Body*; but either to overcome, turn another *Body* in it self, as by victory, or it self to die and go out.

NATURAL HISTORY;

Century IX.

IT is certain, That all *Bodies* whatsoever, though they have no *Sense*, yet they have *Perception*: For when one *Body* is applied to another, there is a kind of *Election*, to embrace that which is agreeable, and to exclude or expel that which is ingrate: And whether the *Body* be *alterant* or *altered*, evermore a *Perception* precedeth *Operation*; for else all *Bodies* would be alike one to another. And sometimes this *Perception* in some kind of *Bodies* is far more subtil then the *Sense*; so that the *Sense* is but a dull thing in comparison of it. We see a *Weather glass* will find the least difference of the *Weather* in *Heat* or *Cold*, when Men find it not. And this *Perception* also is sometimes at *distance*, as well as upon the *touch*; as when the *Loadstone* draweth *Iron*, or *Flame* fireth *Naphtha* of *Babylon*, a great distance off. It is therefore a *subject* of a very *Noble Enquiry* to enquire of the more *subtil Perceptions*; for it is another *Key* to open *Nature*, as well as the *Sense*, and sometimes better: And besides, it is a principal *means* of *Natural Divination*; for that, which in these *Perceptions* appeareth early, in the great *effects* cometh long after. It is true also, that it serveth to *discover* that which is *hid*, as well as to *foretel* that which is to *come*, as it is in many *subtil Trials*: As to try whether *Seeds* be old or new, the *Sense* cannot inform; but if you boil them in *Water*, the new *Seeds* will sprout sooner. And so of *Water*, the *taste* will not discover the best *Water*; but the *speedy consuming* of it, and many other *means*, which we have heretofore set down, will discover it. So in all *Physiognomy*, the *Lineaments* of the *Body* will discover those *Natural Inclinations* of the *Mind*, which *Dissimilation* will conceal, or *Discipline* will suppress. We shall therefore now handle onely those two *Perceptions* which pertain to *Natural Divination* and *Discovery*, leaving the handling of

Experiment in Consort, touching *Perception in Bodies Insensible, tending to Natural Divination or Subtil Tryals.*

Perception in other things to be disposed elsewhere. Now it is true, that *Divination* is attained by other *means*; as if you know the *causes*, if you know the *Concomitants*, you may judge of the *effect* to follow; and the like may be said of *Discovery*. But we tye our selves here to that *Divination* and *Discovery* chiefly, which is caused by an *early* or *subtil Perception*.

The *aptness* or *propension* of *Air* or *Water* to corrupt or putrefie, (no doubt) is to be found before it break forth into manifest *Effects* of *Diseases*, *Lastings*, or the like. We will therefore set down some *Prognosticks* of *Pestilential* and *unwholsome years*.

801. The *Wind* blowing much from the *South* without *Rain*, and *Worms*, in the *Oak-Apple*, have been spoken of before. Also the *plenty* of *Frogs*, *Grashoppers*, *Flies*, and the like *Creatures* bred of *Putrefaction*, doth portend *Pestilential years*.

802. *Great* and *early Heats* in the *Spring*, (and namely in *May*) without *Winds*, portend the same. And generally so do *years* with little *Wind* or *Thunder*.

803. *Great Droughts* in *Summer*, lasting till towards the *end* of *August*, and some *gentle showers* upon them, and then some *dry weather* again, do portend a *Pestilent Summer* the *year* following: For about the *end* of *August*, all the *sweetness* of the *Earth* which goeth into *Plants* or *Trees* is exhaled (and much more if the *August* be dry) so that nothing then can breath forth of the *Earth* but a gross *vapor*, which is apt to corrupt the *Air*; and that *vapor* by the first *showers*, if they be *gentle*, is released, and cometh forth abundantly. Therefore they that come abroad soon after those *showers* are commonly taken with *sickness*. And in *Africk* no Body will stir out of doors after the first *showers*. But if the *showers* come vehemently, then they rather wash and fill the *Earth*, then give it leave to breath forth presently. But if *dry weather* come again, then it fixeth and continueth the *corruption* of the *Air* upon the first *showers* begun, and maketh it of ill *influence* even to the next *Summer*, except a very *Frosty Winter* discharge it, which seldome succeedeth such *Droughts*.

804. The *lesser Infections* of the *Small Pox*, *Purple Feavers*, *Agues* in the *Summer precedent*, and hovering all *Winter*, do portend a great *Pestilence* in the *Summer* following: For *Putrefaction* doth not rise to its height at once.

805. It were good to lay a *piece* of *raw Flesh* or *Fish* in the *open Air*; and if it putrefie quickly, it is a *sign* of a *disposition* in the *Air* to *Putrefaction*. And because you cannot be informed, whether the *Putrefaction* be quick or late, except you compare this *Experiment* with the like *Experiment* in another *year*; it were not amiss in the same *year*, and at the same *time*, to lay one *piece* of *Flesh* or *Fish* in the *open Air*; and another of the same kind and bigness within *doors*: For I judge, that if a general *disposition* be in the *Air* to putrefie, the *Flesh*, or in *Fish* will sooner putrefie abroad, where the more *Air* hath power, then the *House*, where it hath less, being many ways corrected. And this *Experiment* would be made about the *End* of *March*; for that *season* is likest to discover what the *Winter* hath done, and what the *Summer* following will do upon the *Air*. And because the *Air* (no doubt) receiveth great *tincture* and *Infusion* from the *Earth*, it were good to try that *exposing* of *Flesh*

or

or *Fish* both upon a *Stake* of *Wood*, some height above the *Earth*, and upon the *flat* of the *Earth*.

806. Take *May-Dew*, and see whether it putrefie quickly, or no; for that likewise may disclose the *quality* of the *Air*, and *vapor* of the *Earth*, more or less *corrupted*.

807. A *dry March*, and a *dry May*, portend a *wholsom Summer*, if there be a *flowring April* between; but otherwise it is a *sign* of a *Pestilential year*.

808. As the *discovery* of the *disposition* of the *Air* is good for the *Prognosticks* of *wholsom* and *unwholsom years*; so it is of much more use for the *choice* of *places* to dwell in; at the least for *Lodges* and *Retiring-places* for *Health* (for *Mansion-Houses* respect *provisions* as well as *health*) wherein the *Experiments* above-mentioned may serve.

809. But for the *choice* of *Places* or *Seats*, it is good to make tryal, not only of *aptness* of *Air* to corrupt, but also of the *moisture* and *dryness* of the *Air*, and the *temper* of it in *heat* or *cold*, for that may concern *health* diversly. We see that there be some *Houses* wherein *Sweet meats* will relent, and *Baked Meats* will mould, more than in others; and *Wainscots* will also sweat more, so that they will almost run with *Water*: All which (no doubt) are caused chiefly by the *moistness* of the *Air* in those *Seats*. But because it is better to know it before a *Man* buildeth his *House*, than to find it after, take the *Experiments* following.

810. Lay *Wool*, or a *Sponge*, or *Bread* in the *place* you would try, comparing it with some other *places*, and see whether it doth not moisten, and make the *Wool* or *Sponge* &c. more ponderous than the other: And if it do, you may judge of that place, as situate in a *gross* and *moist Air*.

811. Because it is certain that in some *places*, either by the *Nature* of the *Earth*, or by the *situation* of *Woods* and *Hills*, the *Air* is more unequal than in others; and *inequality* of *Air* is ever an enemy to *health*: It were good to take two *Weather-glasses*, matches in all things, and to set them for the same hours of one day in several *places* where no *shade* is, nor *enclosures*; and to mark, when you set them, how far the *Water* cometh; and to compare them, when you come again, how the *Water* standeth then. And, if you find them *unequal*, you may be sure, that the *place*, where the *Water* is lowest, is in the *warmer Air*, and the other in the *Colder*. And the greater the *inequality* be of the *ascent* or *descent* of the *Water*, the greater is the *inequality* of the *temper* of the *Air*.

812. The *Predictions* likewise of *cold* and *long VVinters*, and *hot* and *dry Summers*, are good to be known, as well for the *discovery* of the *causes*, as for divers *Provisions*. That of *Plenty* of *Haws*, and *Heps*, and *Bryar-Berries*, hath been spoken of before. If *Wainscot* or *Stone*, that have used to sweat, be more dry in the beginning of *Winter*, or the *drops* of the *Eaves* of *Houses* come more slowly down than they use, it portendeth a *hard* and *frosty Winter*. The *cause* is, for that it sheweth an *inclination* of the *Air* to *dry Weather*, which in *Winter* is ever joyned with *Frost*.

813. Generally a *moist* and *cool Summer*, portendeth a *hard VVinter*. The *cause* is, for that the *vapors* of the *Earth* are not dissipated in the *Summer* by the *Sun*; and so they rebound upon the *Winter*.

814. A *hot* and *dry Summer* and *Autumn*, and especially if the *heat* and *drought* extend far into *September*, portendeth an open beginning of *Winter*, and *colds* to succeed toward the latter part of the *Winter*, and the beginning of the *Spring*. For till then the former *heat* and *drought* bear the sway, and the *vapors* are not sufficiently multiplied.

815. An *open* and *warm VVinter* portendeth a *hot* and *dry Summer*: For the *Vapors* disperse into the *VVinter showers*; whereas *Cold* and *Frost* keepeth them in, and transporteth them into the late *Spring* and *Summer* following.

816. *Birds* that use to change *Countreys* at certain *Seasons*, if they come earlier, do shew the *temperature* of *VVeather*, according to that *Countrey* whence they came: As the *VVinter*-Birds, (namely, *VVoodcocks*, *Feldefares*, &c.) if they come earlier, and out of the *Northern Countreys*, with us shew *cold VVinters*. And if it be in the same *Countrey*, then they shew a *temperature* of *Season*, like unto that *Season* in which they come; as *Swallows*, *Bats*, *Cuckoes*, &c. that come towards *Summer*, if they come early, shew a *hot Summer* to follow.

817. The *Prognosticks* more immediate of *Weather* to follow soon after, are more certain than those of *Seasons*: The *Resounding* of the *Sea* upon the *Shore*, and the *Murmur* of *Winds* in the *Woods*, without apparent *Wind*, shew *Wind* to follow. For such *Winds*, breathing chiefly out of the *Earth*, are not at the first perceived, except they be pent by *Water* or *Wood*. And therefore a *Murmur* out of *Caves* likewise portendeth as much.

818. The *Upper Regions* of the *Air*, perceive the *Collection* of the *matter* of *Tempest* and *Winds* before the *Air* here below. And therefore the *obscuring* of the *smaller Stars*, is a sign of *Tempests* following. And of this kind you shall find a number of *instances* in our *Inquisition de Ventis*.

819. *Great Mountains* have a *Perception* of the *disposition* of the *Air* to *Tempests*, sooner than the *Valleys* or *Plains* below. And therefore they say in *Wales*, When certain Hills have their Night-caps on, they mean mischief. The *cause* is, for that *Tempests*, which are for the most part bred above in the *Middle Region*, (as they call it) are soonest perceived to collect in the *places* next it.

820. The *Air* and *Fire* have *subtil Perceptions* of *Wind rising*, before Men find it. We see the the *trembling* of a *Candle* will discover a *Wind*, that otherwise we do not feel; & the *Flexious burning* of *Flames* doth shew the *Air* beginneth to be unquiet; and so do *Coals* of *fire*, by casting off the *ashes* more than they use. The *cause* is, for that no *Wind* at the first, till it hath struck and driven the *Air*, is apparent to the *Sense*; but *flame* is easier to move than *Air*. And for the *Ashes*, it is no marvel though *Wind* unperceived shake them off: for we usually try which way the *Wind* bloweth, by casting up *Grass* or *Chaff*, or such light things into the Air.

821. When *Wind* expireth from under the *Sea*, as it causeth some *resounding* of the *Water*, (whereof we spake before) so it causeth some *light motions* of *Bubbles*, and *white Circles* of *Froth*. The *cause* is, for that the *Wind* cannot be perceived by the *Sense*, until there be an *Eruption* of a great *quantity* from under the *Water*, and so it getteth into a *Body*, whereas in the first *putting up*, it cometh in little portions.

822. We spake of the *Ashes* that *Coals* cast off, and of *Grass* and *Chaff* carried by the *Wind*; so any *light thing* that moveth, when we find no *Wind*, sheweth a *Wind* at hand: As when *Feathers* or *Down* of *Thistles* fly to and fro in the *Air*.

For *Prognosticks* of *Weather* from *Living Creatures*, it is to be noted, That *Creatures* that live in the *open Air* (*sub dio*) must needs have a quicker *impression* from the *Air*, than Men that live most within *doors*, and especially *Birds*, who live in the *Air* freest and clearest, and are aptest by their *voice* to tell tales what they find, and likewise by the *motion* of their *flight* to express the same.

Water fowls (as *Sea-Gulls*, *Moor-Hens*, &c.) when they flock and flie together from the *Sea* towards the *Shores*; and contrariwise *Land Birds*, (as *Crows*, *Swallows*, &c.) when they flie from the *Land* to the *Waters*, and beat the *Waters* with their *Wings*, do foreshew *Rain* and *Wind*. The *cause* is, *Pleasure* that both kinds take in the *moistness* and *density* of the *Air*, and so desire to be in *motion*, and upon the *Wing*, whither-soever they would otherwise go: For it is no marvel, that *Water-fowl* do joy most in that *Air*, which is likest *Waters*; and *Land Birds* also (many of them) delight in *Bathing* and *moist Air*. For the same reason also, many *Birds* do prune their *Feathers*, and *Geese* do gaggle, and *Crows* seem to call upon *Rain*. All which is but the comfort they seem to receive in the *relenting* of the *Air*. 823.

The *Heron* when she soareth high, (so as sometimes she is seen to pass over a *Cloud*) sheweth *Winds*: But *Kites* flying aloft, shew *fair* and *dry weather*. The *cause* may be, for that they both mount most into the *Air* of that temper wherein they delight. And the *Heron*, being a *Water-fowl*, taketh pleasure in the *Air* that is condensed; and besides, being but heavy of *Wing*, needeth the help of the *grosser Air*. But the *Kite* affecteth not so much the *grossness* of the *Air*, as the *cold* and *freshness* thereof; for being a *Bird of Prey*, and therefore *hot*, she delighteth in the *fresh Air*, and (many times) flieth against the *Wind*; as *Trouts* and *Salmons* swim against the stream. And yet it is true also, that all *Birds* find an ease in the depth of the *Air*, as *Swimmers* do in a deep *Water*. And therefore when they are aloft, they can uphold themselves with their *Wings spread*, scarce moving them. 824.

Fishes, when they play towards the *top* of the *Water*, do commonly foretel *Rain*. The *cause* is, for that a *Fish* hating the *dry*, will not approach the *Air* till it groweth *moist*; and when it is *dry* will fly it, and *swim* lower. 825.

Beasts do take comfort (generally) in a *moist Air*, and it maketh them eat their *Meat* better; and therefore *Sheep* will get up betimes in the morning to feed against *Rain*; and *Cattle*, and *Deer*, and *Coneys* will feed hard before *Rain*, and a *Heifer* will put up his *Nose*, and snuff in the *Air* against *Rain*. 826.

The *Trifoil* against *Rain*, swelleth in the *Stalk*, and so standeth more upright; for by *wet*, *Stalks* do erect, and *Leaves* bow down. There is a small Red *Flower* in the *Stubble Fields*, which Countrey people call the *Wincopipe*; which, if it open in the *Morning*, you may be sure of a fair *day* to follow. 827.

Even in *Men*, *Aches*, and *Hurts*, and *Corns*, do engrieve either towards *Rain*, or towards *Frost*; for the one maketh the *Humors* more to abound, and the other maketh them sharper. So we see both *extreams* bring the *Gout*. 828.

Worms, *Vermine*, &c. do foreshew (likewise) *Rain*; for *Earth-worms* will come forth, and *Moles* will cast up more, and *Fleas* bite more against *Rain*. 829.

Solid Bodies likewise foreshew *Rain*: as *Stones* and *Wainscot* when they *sweat*, and *Boxes* and *Pegs* of *Wood* when they draw and *wind hard*; though the former be but from an outward cause, for that the *Stone* or *Wainscot* turneth and beateth back the *Air* against it self; but the latter is an *inward swelling* of the *Body* of the *Wood* it self. 830.

Appetite

831. Experiment Solitary, touching the *Nature of Appetite in the Stomach.*

Appetite is moved chiefly by things that are *cold* and *dry*. The *cause* is, for that *Cold* is a kind of *indigence* of *Nature*, and calleth upon supply, and so is *Dryness*: And therefore all *sowre things* (as *Vinegar*, *Juyce* of *Lemmons*, *Oyl* of *Vitriol* &c) provoke *Appetite*. And the *Disease* which they call *Appetitus Caninus*, consisteth in the *Matter* of an *Acide* and *Glassy Phlegm* in the *Mouth* of the *Stomach*. *Appetite* is also moved by *sowre things*, for that *sowre things* induce a *contraction* in the *Nerves*, placed in the *Mouth* of the *Stomach*, which is a great *cause* of *Appetite*. As for the *cause* why *Onions*, and *Salt*, and *Pepper* in Baked Meats move *Appetite*, it is by *Vellication* of those *Nerves*; for *Motion* whetteth. As for *Wormwood*, *Olives*, *Capers*, and others of that kind, which participate of *Bitterness*, they move *Appetite* by *Abstersion*. So as there be four principal *causes* of *Appetite*; the *Refrigeration* of the *Stomach* joyned with some *Dryness*, *Contraction*, *Vellication*, and *Abstersion*; besides *Hunger*, which is an *emptiness*; and yet *over-fasting* doth (many times) cause the *Appetite* to cease; for that *want* of *Meat* maketh the *Stomach* draw *Humors*, and such *Humors* as are light and Cholerick, which quench *Appetite* most.

832. Experiment Solitary, touching *Sweetness of Odor from the Rainbow.*

It hath been observed by the *Ancients*, that where a *Rainbow* seemeth to hang over, or to touch, there breatheth forth a *sweet smell*. The *cause* is, for that this happeneth but in certain matters which have in themselves some *Sweetness*, which the *gentle Dew* of the *Rainbow* doth draw forth; and the like do *soft Showers*, for they also make the *Ground* sweet: But none are so delicate as the *Dew* of the *Rainbow* where it falleth. It may be also, that the *Water* it self hath some *Sweetness*; for the *Rainbow* consisteth of a *Glomeration* of *small drops*, which cannot possibly fall but from the *Air* that is very *low*, and therefore may hold the very *Sweetness* of the *Herbs* and *Flowers* as a *Distilled Water*: For *Rain* and other Dew that fall from high cannot preserve the smell, being dissipated in the drawing up: neither do we know, whether some *Water* it self may not have some degree of *Sweetness*. It is true, that we find it sensibly in no *Pool*, *River*, nor *Fountain*; but good *Earth* newly turned up, hath a *freshness* and good *scent*; which *Water*, if it be not too *equal*, (for *equal objects* never move the *Sense*) may also have. Certain it is, that *Bay salt*, which is but a kind of *Water congealed*, will sometimes smell like *Violets*.

833. Experiment Solitary, touching *Sweet Smells.*

To *sweet Smells*, *heat* is requisite to concoct the *Matter*, and some *Moisture* to spread the *Breath* of them: For *heat*, we see that *Woods* and *Spices* are more *odorate* in the *Hot Countreys*, than in the *Cold*. For *Moisture*, we see that things too much dryed lose their *Sweetness*, and *Flowers* growing smell better in a *Morning* or *Evening*, than at *Noon*. Some *sweet smells* are destroyed by approach to the *Fire*; as *Violets*, *Wall-flowers*, *Gilliflowers*, *Pinks*, and generally all *Flowers* that have *cool* and *delicate Spirits*. Some continue both on the *fire*, and from the *fire*, as *Rose water*, &c. Some do scarce come forth, or at least not so pleasantly, as by means of the *fire*, as *Juniper*, *Sweet Gums*, &c. and all *smells* that are enclosed in a *fast Body* but (generally) those *smells* are the most grateful, where the *degree* of *heat* is small, or where the *strength* of the *smell* is allayed; for these *things* do rather woo the *Sense*, than satiate it. And therefore the *smell* of *Violets* and *Roses* exceedeth in *sweetness* that of *Spices*; and *Gums*, and the strongest sort of *smells*, are best in a west afar off.

It

834. Experiment Solitary, touching the *Corporeal Substance of Smells.*

IT is certain, that no *smell* issueth but with *emission* of some *corporeal substance*; not as it is in *Light*, and *Colours*, and in *Sounds*: For we see plainly that *smells* doth spred nothing that distance that the other do. It is true, that some *Woods* of *Orenges*, and *Heaths* of *Rosemary*, will smell a great way into the *Sea*, perhaps twenty Miles; but what is that, since a *peal* of *Ordnance* will do as much, which moveth in a small compass, whereas those *Woods* and *Heaths* are of vast spaces? Besides, we see that *smells* do adhere to *hard Bodies*; as in *perfuming* of *Gloves*, &c. which sheweth them *corporeal*; and do last a great while, which *Sounds* and *Light* do not.

835. Experiment Solitary, touching *Fetide and Fragrant Odors.*

THe *Excrements* of most *Creatures* smell ill; chiefly to the same *Creature* that voideth them: For we see, besides that of *Man*, that *Pigeons*, and *Horses* thrive best, if their *Houses* and *Stables* be kept sweet and; so of *Cage-Birds* and the *Cat* burieth that which she voideth. And it holdeth chiefly in those *Beasts* which feed upon *Flesh*. *Dogs* (almost) only of *Beasts* delight in *fetide odors*; which sheweth there is somewhat in their *sense* of *smell* differing from the *smells* of other *Beasts*. But the *cause* why *Excrements* smell ill is manifest, for that the *Body* it self rejecteth them, much more the *Spirits*: and we see, that those *Excrements* that are of the *first digestion* smell the worst, as the *Excrements* from the *Belly*; those that are from the *second digestion* less ill, as *Urine*; and those that are from the *third*, yet less; for *Sweat* is not so bad as the other two, especially of some *persons* that are full of *heat* likewise most *Putrefactions* are of an *odious smell*, for they smell either *fetide* or *mouldy*. The *cause* may be, for that *Putrefaction*, doth bring forth such a *consistence*, as is most contrary to the *consistence* of the *Body*, whilest it is sound, for it is a meer dissolution of that *form*. Besides, there is another reason, which is profound: And it is, That the *objects* that please any of the *senses* have (all) some *equality*, and (as it were) *order* in their *composition*, but where those are wanting the *object* is ever ingrate. So *mixture* of many *disagreeing colours* is ever unpleasant to the *eye*: *Mixture* of *discordant sounds* is unpleasant to the *Ear*; *Mixture* or *hotch-potch* of many *tastes* is unpleasant to the *taste*; *harshness* and *ruggedness* of *Bodies* is unpleasant to the *touch*. Now it is certain, that all *Putrefaction*, being a *dissolution* of the first *form*, is a meer *confusion*, and *unformed mixture* of the *part*. Nevertheless it is strange, and seemeth to cross the former *observation*, that some *Putrefactions* and *Excremence* do yield *excellent Odors* as *Civit* and *Musk*, and, as some think, *Amber-greese*, for divers take it (though unprobable) to come from the *Sperm* of *Fish*; and the *Moss* we spake of from *Apple-trees* is little better than an *Excretion*. The reason may be, for that there passeth in the *Excrements*, and remaineth in the *Putrefactions* some good *spirits*, especially where they proceed from *Creatures* that are very *hot*. But it may be also joyned with a further *cause*, which is more subtil; and it is, that the *Senses* love not to be over pleased, but to have a *commixture*, of somewhat that is in it self ingrate. Certainly, we see how *Discords* in *Musick*, falling upon *Concords*, make the *sweetest strains*: And we see again what strange *tastes* delight the *taste*; as *Red-herrings*, *Caviare*, *Permesan*, &c. And it may be the same holdeth in *smells*. For those kind of *smells* that we have mentioned are all strong, and do pull and vellicate the *Sense*. And we find also, that *places* where men *Urine* commonly have some *smell* of *Violets*. And *Urine* if one hath eaten *Nutmeg* hath so to.

The

The slothful, general, and indefinite *Contemplations* and *Notions* of the *Elements*, and their *Conjugations* of the *Influences* of *Heaven*, of *Heat*, *Cold*, *Moisture*, *Drought*, *Qualities Active*, *Passive*, and the like, have swallowed up the true *Passages*, and *Processes*, and *Affects*, and *Consistences* of *Matter*, and *Natural Bodies*. Therefore they are to be set aside, being but *notional*, and *ill limited*; and definite *axioms* are to be drawn out of *measured instances*, and so assent to be made to the more *general axioms* by Scale. And of these kinds of *Processes* of *Natures*, and *Characters* of *Matter*, we will now set down some *instances*.

836. Experiment Solitary, touching the *Causes of Putrefaction*.

ALL *Putrefactions* come chiefly from the *inward Spirits* of the *Body*, and partly also from the *Ambient Body*, be it *Air*, *Liquor*, or whatsoever else. And this last, by two *means*; either by *ingress* of the *substance* of the *Ambient Body* into the *Body putrefied*, or by *excitation*, and *solicitation* of the *Body putrefied*, and the *parts* thereof, by the *Body Ambient*. As for the received opinion, that *Putrefaction* is caused either by *Cold*, or *Peregrine* and *Preternatural Heat*, it is but nugation: For *Cold* in *things inanimate*, is the greatest enemy that is to *Putrefaction*, though it extinguisheth *Vivification*, which ever consisteth in *Spirits attenuate*, which the *Cold* doth congeal and coagulate. And as for the *Peregrine Heat*, it is thus far true, That if the *proportion* of the *adventive Heat*, be greatly predominant to the *Natural heat*, and *Spirits* of the *Body*, it tendeth to *dissolution*, or notable *alteration*. But this is wrought by *Emission*, or *Suppression*, or *Suffocation* of the *Native Spirits*, and also by the *Disordination* and *Discomposture* of the *Tangible parts*, and other *passages* of *Nature*, and not by a *conflict* of *Heats*.

837. Experiment Solitary, touching *Bodies unperfectly mixt*.

IN *versions* or main *Alterations* of *Bodies*, there is a *Medium* between the *Body*, as it is at first, and the *Body resulting*; which *Medium* is *Corpus imperfectè Mistum*, and is transitory, and not durable; *Mists*, *Smoaks*, *Vapors*, *Chylus* in the *Stomach*, *Living Creatures* in the first *Vivification*; and the *middle action*, which produceth such *Imperfect Bodies*, is fitly called (by some of the *Ancients*) *Inquination* or *inconcoction*, which is a kind of *Putrefaction*; for the *parts* are in *confusion*, till they settle, one way or other.

838. Experiment Solitary, touching *Concoction* and *Crudity*.

THE word *Concoction* or *Digestion*, is chiefly taken into use from *Living Creatures*, and their *Organs*, and from thence extended to *Liquors* and *Fruits*, &c. Therefore they speak of *Meat concocted*, *Urine* and *Excrements concocted*; and the *Four Digestions* (in the *stomach*, in the *Liver*, in the *Arteries* and *Nerves*, and in the *several parts* of the *Body*) are likewise called *Concoctions*; and they are all made to be the works of *Heat*. All which *notions* are but ignorant catches of a few things, which are most obvious to *Mens observations*. The constantest *notion* of *Concoction* is, that it should signifie the *degrees of alteration* of one *Body* into another, from *Crudity* to *Perfect concoction*, which is the *ultimity* of that *action* or *process*. And while the *Body* to be *converted* and *altered*, is too strong for the *efficient*, that should *convert* or *alter* it, (whereby it resisteth, and holdeth fast in some degree the first *Form* or *Consistence*) it is (all that while) *Crude* and *Inconcoct*, and the *Process* is to be called *Crudity* and *Inconcoction*. It is true, that *Concoction* is in great part the *work of Heat*; but not the *work of Heat* alone: For all things that further the *Conversion* or *Alteration* (as *Rest*, *Mixture* of a *Body* already *concocted*, &c.) are also *means* to *Concoction*. And

there

there are of *Concoction* two *Periods*, the one *Assimilation*, or *absolute Conversion* and *Subaction*; the other *Maturation*: Whereof, the former is most conspicuous in the *Bodies* of *Living Creatures*, in which there is an *Absolute Conversion* and *Assimilation* of the *Nourishment* into the *Body*, and likewise in the *Bodies* of *Plants*; and again in *Metals*, where there is a full *Transmutation*. The other (which is *Maturation*) is seen in *Liquors* and *Fruits*; wherein there is not desired, nor pretended, an utter *Conversion*, but onely an *Alteration* to that *Form*, which is most sought for Mans use; as in *Clarifying* of *Drinks*, *Ripening* of *Fruits*, &c. But note, that there be two kinds of *Absolute Conversions*. The one is, when a *Body* is converted into another *Body* which was before; as when *Nourishment* is turned into *Flesh*, that is it which we call *Assimilation*. The other is, when the *Conversion* is into a *Body* meerly new, and which was not before; as if *Silver* should be turned to *Gold*, or *Iron* to *Copper*. And this *Conversion* is better called, for distinction sake, *Transmutation*.

839. Experiment Solitary, touching *Alterations which may be called Majors.*

There are also divers other *great alterations* of *Matter* and *Bodies*, besides those that tend to *Concoction* and *Maturation*: for whatsoever doth so alter a *Body*, as it returneth not again to that it was, may be called *Alteratio Major*: As when *Meat* is Boiled, or Rosted, or Fryed, &c. Or when *Bread* and *Meat* are Baked; or when *Cheese* is made of Curds, or *Butter* of *Cream*, or *Coals* of Wood, or *Bricks* of Earth; and a number of others. But to apply *Notions Philosophical* to *Plebeian Terms*; or to say, where the *Notions* cannot fitly be reconciled, that there wanteth a *Term* or *Nomenclature* for it, (as the *Ancients* used) they be but shifts of *Ignorance*: For *Knowledge* will be ever a *Wandring* and *Indigested thing*, if it be but a *commixture* of a few *Notions* that are at hand, and occur, and not excited from sufficient number of instances, and those well collated.

The *Consistencies of Bodies* are very divers: *Dense*, *Rare*, *Tangible*, *Pneumatical*; *Volatile*, *Fixed*, *Determinate*, *not Determinate*; *Hard*, *Soft*, *Cleaving not Cleaving*, *Congealable*, not *Congealable*, *Liquefiable*, not *Liquefiable*; *Fragile*, *Tough*, *Flexible Inflexible*; *Tractile*, or to be drawn forth in length, *Intractile*, *Porous*, *Solide*, *Equal* and *Smooth*, *Unequal*, *Venous*, and *Fibrous*, and with *Grains Entire*, and divers others. All which to refer to *Heat* and *Cold*, and *Moisture*, and *Drought*, is a Compendious and Inutile *Speculation*. But of these see principally our *Abecedarium Naturæ*, and otherwise *sparsim* in this our *Silva Silvarum*. Nevertheless, in some good part, we shall handle divers of them now presently.

840. Experiment Solitary, touching *Bodies Liquefiable, and not Liquefiable.*

That *Liquefiable* and *not Liquefiable* proceed from these *causes*. *Liquefaction* is ever caused by the *Detention* of the *Spirits*, which play within the *Body*, and open it. Therefore such *Bodies* as are more *Turgid* of *Spirit*, or that have their *Spirits* more *straightly imprisoned*, or again, that hold them *better Pleased* and *content*, are *Liquefiable*: For these three *Disposition of Bodies* do arrest the *Emission* of the *Spirits*. An example of the first two *Properties* is in *Mettals*, and of the last in *Grease*, *Pitch*, *Sulphur*, *Butter*, *Wax*, &c. The *Disposition* not to *Liquefie*, proceedeth from the *easie Emission* of the *Spirits*, whereby the *grosser parts* contract; and therefore *Bodies jejune* of *Spirits*, or which part with their *Spirits* more *willingly*, are not *Liquefiable*, as *Wood*, *Clay*, *Free-stone*, &c. But yet even many of those *Bodies* that will not *Melt*, or will hardly *melt*, will notwithstanding *soften*; as *Iron* in the Forge

Forge, and a *Stick* bathed in hot *Ashes*, which thereby becometh more Flexible. Moreover, there are some *Bodies* which do *Liquefie* or dissolve by *Fire*; as *Metals*, *Wax*, &c. and other *Bodies* which dissolve in *Water*, as *Salt*, *Sugar*, &c. The *cause* of the former proceedeth from the *Dilatation* of the *Spirits* by *Heat*: The *cause* of the latter proceedeth from the *opening* of the *Tangible parts*, which desire to receive the *Liquor*. Again, there are some *Bodies* that dissolve with both; as *Gum*, &c. And those be such *Bodies* as on the one side have good store of *Spirits*, and on the other side have the *Tangible parts indigent* of *Moisture*; for the former helpeth to the *dilating* of the *Spirits* by the *Fire*, and the latter stimulateth the parts to receive the *Liquor*.

841. Experiments Solitary, touching *Bodies Fragile and Tough.*

OF *Bodies* some are *Fragile*, and some are *Tough* and *not Fragile*; and in the *breaking*; some *Fragile bodies* break, but where the *force* is, some shatter and fly in many pieces. Of *Fragility*, the *cause* is an *impotency* to be *extended*, and therefore *Stone* is more *Fragile* then *Metal*, and so *Fictile Earth* is more *Fragile* than *Crude Earth*, and *Dry Wood* than *Green*. And the *cause* of this *unaptness* to *Extension*, is the small *quantity* of *Spirits* (for it is the *Spirit* that furthereth the *Extension* or *Dilatation* of *Bodies*;) and it is ever concomitant with *Porosity*, and with *Dryness* in the *Tangible parts*. *Contrariwise*, *Tough Bodies* have more *Spirit*, and fewer *Pores*, and *Moister Tangible parts*: Therefore we see, that *Parchment* or *Leather* will stretch, *Paper* will not; *Woollen-Cloth* will tenter, *Linnen* scarcely.

842. Experiment Solitary, touching *Two kindes of Pneumaticals in Bodies.*

ALL *solid Bodies* consist of *Parts* of two several *Natures*; *Pneumatical*, and *Tangible*: and it is well to be noted, that the *Pneumatical Substance* is in some *Bodies*, the *Native Spirit* of the *Body*; and in some other, plain *Air* that is gotten in; as in *Bodies desiccate*, by *Heat* or *Age*: For in them, when the *Native Spirit* goeth forth, and the *Moisture* with it, the *Air* with time getteth into the *Pores*. And those *Bodies* are ever the more *Frugile*; for the *Native Spirits* is more *Yielding* and *Extensive* (especially to follow the *Parts*) than *Air*. The *Native Spirits* also admit great diversity; as *Hot*, *Cold*, *Active*, *Dull*, &c. Whence proceed most of the *Vertues*, and *Qualities* (as we call them) of *Bodies*: But the *Air* intermixt, is without *Vertues*, and maketh things *insipid*, and without any *extimulation*.

843. Experiment Solitary, touching *Concretion and Dissolution of Bodies.*

THE *Concretion* of *Bodies* is (commonly) solved by the *contrary*; as *Ice*, which is congealed by *Cold*, is dissolved by *Heat*; *Salt* and *Sugar*, which are excocted by *Heat*, are dissolved by *Cold* and *Moisture*. The *cause* is, for that these *operations* are rather *returns* to their former *Nature*, than *alterations*; to that the *contrary* cureth. As for *Oyl*, it doth neither easily congeal with *Cold*, nor thicken with *Heat*. The *cause* of both *effects*, though they be produced by contrary *efficients*, seemeth to be the same; and that is, because the *Spirit* of the *Oyl*, by either means, exhaleth little: For the *Cold* keepeth it in, and the *Heat* (except it be vehement) doth not call it forth. As for *Cold*, though it take hold of the *Tangible parts*, yet as to the *Spirits*, it doth rather make them swell, than congeal them: As when *Ice* is congealed in a *Cup*, the *Ice* will swell instead of contracting, and sometimes rift.

Of

844. Experiment Solitary, touching *Hard and Soft Bodies.*

OF *Bodies*, some (we see) are *hard*, and some *soft*: The *hardness* is caused (chiefly) by the *Jejuneness* of the *Spirits*, and their *imparity* with the *Tangible parts*: Both which, if they be in a greater degree, maketh them not only *hard*, but *fragile*, and less enduring of *pressure*; as *Steel*, *Stone*, *Glass*, *Dry Wood*, &c. *Softness* cometh (contrariwise) by the greater *quantity* of *Spirits*, (which ever helpeth to induce *yielding* and *cession*;) and by the more *equal spreading* of the *Tangible parts*, which thereby are more *sliding*, and *following*; as in *Gold*, *Lead*, *Wax*, &c. But note, that *soft Bodies* (as we use the word) are of two *kinds*; the one, that easily giveth place to another *Body*, but altereth not *Bulk* by rising in other *places*; and therefore we see that *Wax*, if you put any thing into it, doth not rise in *Bulk*, but only giveth place: For you may not think, that in *Printing* of *Wax*, the *Wax* riseth up at all; but only the *depressed part* giveth place, and the other remaineth as it was. The other that altereth *Bulk* in the *Cession*, as *Water*, or other *Liquors*, if you put a *Stone*, or any thing into them, they give place (indeed) easily, but then they rise all over; which is a false *Cession*, for it is in *place*, and not in *Body*.

845. Experiment Solitary, touching *Bodies ductile and Tensile.*

ALL *Bodies Ductile*, and *Tensile*, (as *Metals* that will be drawn into *Wires*; *Wool* and *Tow* that will be drawn into *Yarn* or *Thread*;) have in them the *Appetite* of *Not discontinuing*, strong; which maketh them follow the force that pulleth them out; and yet so, as not to *discontinue* or forsake their own *Body*. *Viscous Bodies* (likewise) as *Pitch*, *Wax*, *Birdlime*, *Cheese* toasted, will draw forth and roap. But the difference between *Bodies fibrous*, and *Bodies viscous*, is plain; For all *Wool*, and *Tow*, and *Cotton*, and *Silk* (especially raw *Silk*) have, besides their desire of *continuance*, in regard of the *tenuity* of their *Thread*, a *greediness* of *Moisture*, and by *Moisture* to joyn and incorporate with other *Thread*, especially, if there be a little *Wreathing*, as appeareth by the *twisting* of *Thread*, and the practice of *Twirling* about of *Spindles*. And we see also, that *Gold* and *Silver Thread* cannot be made without *Twisting*.

846. Experiment Solitary, touching *Other Passions of Matter, and Characters of Bodies.*

THE *differences* of *impressible*, and *not impressible*; *figurable*, and *not figurable*; *mouldable*, and *not mouldable*; *scissile*, and *not scissile*; and many other *Passions* of *Matter*, are *Plebeian Notions*, applied unto the *Instruments* and *Uses* which Men ordinarily practise; but they are all but the *effects* of some of these *causes* following, which we will enumerate without applying them, because that would be too long. The first is the *Cession*, or *not Cession* of *Bodies*, into a *smaller space*, or *room*, keeping the outward *Bulk*, and not flying up. The second is, the *stronger* or *weaker Appetite*, in *Bodies*, to *continuity*, and to fly *discontinuity*. The third is, the *disposition* of *Bodies* to *contract*, or not *contract*; and again, to *extend*, or *not extend*. The fourth is, the *small quantity*, or *great quantity* of the *Pneumatical* in *Bodies*. The fifth is, the *nature* of the *Pneumatical*, whether it be *Native Spirit* of the *Body*, or *common Air*. The sixth is, the *Nature* of the *Native Spirits* in the *Body*, whether they be *Active*, and *Eager*, or *Dull*, and *Gentle*. The seventh is, the *emission* or *detension* of the *Spirits* in *Bodies*. The eighth is, the *dilatation* or *contraction* of the *Spirits* in *Bodies*, while they are detained. The ninth is, the *collocation* of the *Spirits* in *Bodies*, whether the *collocation* be *equal* or *unequal*; and again, whether the *Spirits* be *coacervate* or *diffused*. The tenth is, the *density* or *rarity* of the *Tangible parts*

the eleventh is the *Equality* or *Inequality* of the *Tangible parts*; the twelfth is the *Diſgeſtion* or *Crudity* of the *Tangible parts*; the thirteenth is the *Nature* of the *Matter*, whether *Sulphureous*, or *Mercurial*, *Watry*, or *Oily*, *Dry*, and *Terreſtrial*, or *Moiſt* and *Liquid*; which *Natures* of *Sulphureous* and *Mercurial*, ſeem to be *Natures Radical* and *Principal*; the fourteenth is the *placing* of the *Tangible parts*, in *Length* or *Tranſverſe* (as it is in the *Warp*, and the *Woof* of *Textiles*;) *more inward* or *more outward*, &c. The fifteenth is the *Poroſity* or *Imporoſity* betwixt the *Tangible parts*, and the *greatneſs* or *ſmallneſs* of the *Pores*; the ſixteenth is the *Collocation* and *poſture* of the *Pores*. There may be more *cauſes*, but theſe do occur for the preſent.

847. Experiment Solitary, touching *Induration by Sympathy*.

TAke *Lead* and melt it, and in the midſt of it, when it beginneth to congeal, make a little dint or hole, and put *Quick-ſilver* wrapped in a piece of *Linnen* into that hole, and the *Quick-ſilver* will fix, and run no more, and endure the Hammer. This is a noble *inſtance* of *Induration*, by *conſent* of one *Body* with another, and *Motion* of *Excitation* to *imitate*; for to aſcribe it only to the *vapor* of *Lead*, is leſs probable. *Quære*, whether the *fixing* may be in ſuch a degree, as it will be figured like other *Metals*? For if ſo, you may make Works of it for ſome purpoſes, ſo they come not near the *Fire*.

848. Experiment Solitary, touching *Honey and Sugar*.

Sugar hath put down the uſe of *Honey*, inſomuch, as we have loſt thoſe *obſervations* and *preparations* of *Honey*, which the *Ancients* had, when it was more in price. Firſt, it ſeemeth, that there was in old time *Tree-honey*, as well as *Bee-honey*, which was the *Tear* or *Blood* iſſuing from the *Tree*; inſomuch, as one of the *Ancients* relateth, that in *Trebiſond*, there was *Honey* iſſuing from the *Fox-trees*, which made *Men* mad. Again, in ancient time, there was a kind of *Honey*, which either of the own Nature, or by Art, would grow as hard as *Sugar*, and was not ſo luſcious as ours; they had alſo a *Wine* of *Honey*, which they made thus. They cruſhed the *Honey* into a great *quantity* of *Water*, and then ſtrained the *liquor*, after they boiled it in a Copper to the half; then they poured it into *Earthen Veſſels* for a ſmall time, and after tunned it into *Veſſels* of *Wood*, and kept it for many years. They have alſo, at this day in *Ruſſia*, and thoſe *Northern Countreys*, *Mead-Simple*, which (well made and ſeaſoned) is a good wholeſom *Drink*, and very clear. They uſe alſo in *Wales*, a Compound *Drink* of *Mead*, with *Herbs* and *Spices*. But mean while it were good, in recompence of that we have loſt in *Honey*, there were brought in uſe a *Sugar-Mead* (for ſo we may call it) though without any *mixture* at all of *Honey*; and to brew it, and keep it ſtale, as they uſe *Mead*; for certainly, though it would not be ſo *abſterſive*, and *opening*, and *ſolutive* a *Drink* as *Mead*; yet it will be more grateful to the *Stomach*, and more *lenitive*, and fit to be uſed in *ſharp Diſeaſes*: For we ſee, that the uſe of *Sugar* in *Beer* and *Ale*, hath good *effects* in ſuch caſes.

849. Experiment Solitary, touching the *Finer ſort of Baſe Metals*.

IT is reported by the *Ancients*, that there was a kind of *Steel*, in ſome places, which would poliſh almoſt as white and bright as *Silver*. And that there was in *India* a kind of *Braſs*, which (being poliſhed) could ſcarce be diſcerned from *Gold*. This was in the *Natural Ore*, but I am doubtful, whether Men have ſufficiently refined *Metals*, which we count *Baſe*: As, whether *Iron*, *Braſs*, and *Tin*, be refined to the height? But when they come

come to such a fineness, as serveth the ordinary use, they try no further.

850. Experiment Solitary, touching *Cements* and *Quaries*.

THere have been found certain *Cements* under *Earth*, that are very soft, and yet taken forth into the Sun, harden as hard as *Marble*: There are also ordinary *Quarries* in *Somerset-shire*, which in the *Quarry* cut soft to any bigness, and in the *Building* prove firm, and hard.

851. Experiment Solitary, touching the *Altering of the colour of Hairs and Feathers*.

Living Creatures (generally) do change their *Hair* with *Age*, turning to be *Gray* and *White*; as is seen in *Men*, though some earlier, some later; in *Horses*, that are Dappled and turn *White*; in *Old Squirrels*, that turn *Grisly*, and many others. So do some *Birds*; as *Cygnets* from *Gray* turn *White*; *Hawks* from *Brown* turn more *White*: And some *Birds* there be, that upon their *Moulting*, do turn *Colour*; as *Robin Redbreasts*, after their *Moulting* grow to be *Red* again by degrees; so do *Gold-Finches* upon the *Head*. The *cause* is, for that *Moisture* doth (chiefly) colour *Hair*, and *Feathers*, and *Dryness* turneth them *Gray* and *White*; now *Hair* in *Age* waxeth *Dryer*, so do *Feathers*. As for *Feathers*, after *Moulting*, they are *young Feathers*, and so all one as the *Feathers of young Birds*. So the *Beard* is younger than the *Hair* of the *Head*, and doth (for the most part) wax *hoary* later. Out of this ground, a *Man* may devise the *Means* of *altering* the *colour* of *Birds*, and the *Retardation* of *Hoary-Hairs*. But of this see the *Fifth Experiment*.

852. Experiment Solitary, touching the *Differences of Living Creatures, Male and Female*.

THe *difference* between *Male* and *Female*, in some *Creatures*, is not to be discerned, otherwise than in the *parts* of *Generation*; as in *Horses* and *Mares*, *Dogs* and *Bitches*, *Doves he* and *she*, and others. But some differ in *magnitude*, and that diversly: For in most the *Male* is the greater; as in *Man*, *Pheasants*, *Peacocks*, *Turkies*, and the like; and in some few, as in *Hawks*, the *Female*. Some differ in the *Hair* and *Feathers*, both in the *quantity*, *crispation*, and *colours* of them; as *He-Lions* are *Hirsute*, and have great *Mains*; the *She's* are smooth like *Cats*, *Bulls*, are more *crisp* upon the *Forehead* than *Cows*; the *Peacock*, and *Pheasant-cock*, and *Goldfinch cock*, have glorious and fine *colours*; the *Hens* have not. Generally, the he's in *Birds* have the fairest *Feathers*. Some differ in divers *features*; as *Bucks* have *Horns*, *Does* none; *Rams* have more *wreathed Horns* than *Ews*; *Cocks* have great *Combs* and *Spurs*. *Hens* little or none; *Boars* have great *Fangs*, *Sows* much less; the *Turkey-cock* hath great and swelling *Gills* the *Hen* hath less; *Men* have generally deeper and stronger *voices* than *Women*. Some differ in *faculty*, as the *Cocks* amongst *singing Birds*, are the best *singers*. The chief *cause* of all these (no doubt) is, for that the *Males* have more strength of *heat* than the *Females*, which appeareth manifestly in this, that all young *Creatures Males* are like *Females*, and so are *Eunuchs*, and *Gelt Creatures* of all kinds, liker *Females*. Now *heat* causeth *greatness* of *growth*, generally, where there is *moisture* enough to work upon: But if there be found in any *Creature* (which is seen rarely) an over-great *heat* in proportion to the *moisture*, in them the *Female* is the greater; as in *Hawks* and *Sparrows*. And if the *heat* be ballanced with the *moisture*, then there is no *difference* to be seen between *Male* and *Female*; as in the *instances* of *Horses* and *Dogs*. We see also, that the *Horns* of *Oxen* and *Cows*, for the most part, are larger than the *Bulls*, which is caused by abundance of *moisture*, which in the *Horns* of the *Bull* faileth. Again, *Heat* causeth *Pilosity*, and *Crispation*; and so likewise *Beards* in *Men*. It also expelleth

finer *moisture*, which want of heat cannot expel; and that is the *cause* of the *beauty* and *variety* of *Feathers*: Again, *Heat* doth put forth many *Excrescences*, and much solid *matter*, which want of *Heat* cannot do. And this is the *cause* of *Horns*, and of the *greatness* of them; and of the *greatness* of the *Combs*, and *Spurs* of *Cocks*, *Gills* of *Turkey-Cocks*, and *Fangs* of *Boars*. *Heat* also dilateth the *Pipes* and *Organs*, which causeth the *deepness* of the *Voice*. Again, *Heat* refineth the *Spirits*, and that causeth the *Cock singing Bird* to excel the *Hen*.

853. Experiment Solitary, touching the *Comparative Magnitude of Living Creatures*.

THere be *Fishes* greater than any *Beasts*; as the *Whale* is far greater than the *Elephant*. And *Beasts* are (generally) greater than *Birds*. For *Fishes*, the *cause* may be, that because they live not in the *Air*, they have not their *moisture* drawn, and soaked by the *Air*, and *Sun Beams*. Also they rest always, in a manner, and are supported by the *Water*; whereas *Motion* and *Labor* do consume. As for the *greatness* of *Beasts*, more than of *Birds*, it is caused, for that *Beasts* stay longer time in the *Womb* than *Birds*, and there nourish, and grow; whereas in *Birds*, after the Egg laid, there is no further *growth*, or *nourishment* from the *Female*; for the *sitting* doth *vivifie*, and not nourish.

854. Experiment Solitary, touching *Exossation of Fruits*.

WE have partly touched before the *Means* of *producing Fruits*, without *Coars*, or *Stones*. And this we add further, that the *cause* must be *abundance* of *moisture*; for that the *Coar*, and *Stone*, are made of a *dry Sap*: And we see, that it is possible to make a *Tree* put forth only in *Blossom* without *Fruit*; as in *Cherries* with *double Flowers*, much more in *Fruit* without *Stones*, or *Coars*. It is reported, that a *Cions* of an *Apple*, grafted upon a *Colewort-stalk*, sendeth forth a great *Apple* without a *Coar*. It is not unlikely, that if the *inward Pith* of a *Tree* were taken out, so that the Juyce came only by the *Bark*, it would work the *effect*. For it hath been observed, that in *Pollards*, if the *Water* get in on the *top*, and they become hollow, they put forth the more. We add also, that it is delivered for certain by some, that if the *Cions* be grafted, the small ends downwards, it will make *Fruit* have little or no Coars, and *Stones*.

855. Experiment Solitary, touching the *Melioration of Tobacco*.

Tobacco is a thing of great price, if it be in request. For an *Acre* of it will be worth (as is affirmed) Two hundred pounds by the year towards charge. The charge of making the Ground, and otherwise, is great, but nothing to the profit. But the *English Tobacco* hath small credit, as being too *dull* and *earthy*: Nay, the *Virginian Tobacco*, though that be in a *hotter climate*, can get no credit for the same *cause*. So that a tryal to make *Tobacco* more *Aromatical*, and better concocted here in *England*, were a thing of great profit. Some have gone about to do it, by drenching the *English Tobacco*, in a *Decoction* or *Infusion* of *Indian Tobacco*. But those are but sophistications and toyes; for nothing that is once perfect, and hath run his race, can receive much amendment; you must ever resort to the beginnings of things for *Melioration*. The way of *Maturation* of *Tobacco* must (as in other *Plants*) be from the *Heat*, either of the *Earth*, or of the *Sun*. We see some leading of this in Musk-Melons, which are sown upon a *hot Bed*, dunged below, upon a Bank turned upon the *South Sun*, to give *Heat* by *Reflection*; laid upon *Tiles*, which increaseth the *Heat*; and covered with *Straw*, to keep them from *Cold*; they remove them also, which addeth some *Life*: And by these helps they become as good in

England,

England, as in *Italy*, or *Provence*. These and the like means may be tried in *Tobacco*. Enquire also of the steeping of the *Roots*, in some such *Liquor*, as may give them Vigor to put forth strong.

856. Experiment Solitary, touching *Several Heats working the same Effects.*

HEat of the *Sun*, for the *Maturation* of *Fruits*; yea, and the *heat* of *Vivification* of *Living Creatures*, are both represented and supplied by the *heat* of *Fire*; and likewise, the *heats* of the *Sun*, and *life*, are represented one by the other. *Trees* set upon the *Backs* of *Chimneys*, do ripen *Fruit* sooner. *Vines*, that have been drawn in at the Window of a *Kitchin*, have sent forth *Grapes*, ripe a month (at least) before others. *Stowes*, at the Back of Walls, bring forth *Orenges* here with us. *Eggs*, as is reported by some, have been hatched in the warmth of an *Oven*. It is reported by the *Ancients*, that the *Estrich* layeth her *Eggs* under *Sand*, where the *heat* of the *Sun* discloseth them.

857. Experiment Solitary, touching *Swelling and Dilatation in Boyling.*

BArley in the *Boyling* swelleth not much; *Wheat* swelleth more, *Rize* exceamly; insomuch, as a quarter of a Pint (unboiled) will arise to a Pint boiled. The *cause* (no doubt) is, for that the more close and compact the *Body* is, the more it will dilate. Now *Barley* is the most hollow, *Wheat* more solid than that, and *Rize* most solid of all. It may be also, that some *Bodies* have a kind of *Lentor*, and more *depertible nature* than others; as we see it evident in *colouration*; for a small *quantity* of *Saffron*; will tinct more, than a very great *quantity* of *Brasil*, or *Wine*.

858. Experiment Solitary, touching the *Dulceration of Fruits.*

FRuit groweth *sweet* by *Rowling* or *Pressing* them gently with the *Hand*; as *Rowling Pears*, *Damasins*, &c. By *Rottenness*; as *Medlars*, *Services*, *Sloes*, *Heps*, &c. By *Time*; as *Apples*, *Wardens*, *Pomegranates*, &c. By certain special *Maturations*; as by *laying* them in *Hay*, *Straw* &c. And by *Fire*; as in *Roasting*, *Stewing*, *Baking*, &c. The *cause* of the *sweetness* by *Rowling*, and *Pressing* is, *Emollition*, which they properly enduce; as in beating of *Stockfish*, *Flesh*, &c. By *Rottenness* is, for that the *Spirits* of the *Fruit*, by *Putrefaction*, gather *heat*, and thereby digest the harder part: For in all *Putrefactions* there is a *degree* of *heat*. By *Time* and *Keeping* is, because the *Spirits* of the *Body*, do ever feed upon the *tangible parts*, and attenuate them. By several *Maturations* is, by some *degree* of *heat*. And by *Fire* is, because it is the proper work of *Heat* to refine, and to incorporate; and all *sowrness* consisteth in some *grosseness* of the *Body*: And all *incorporation* doth make the *mixture* of the *Body*, more *equal* in all the *parts*, which ever enduceth a milder *taste*.

859. Experiment Solitary, touching *Flesh Edible, and not Edible.*

OF *Fleshes*, some are *edible*; some, except it be in *Famine*, not. For those that are not *edible*, the *cause* is, for that they have (commonly) too much *bitterness* of *taste*; and therefore those *Creatures*, which are fierce and cholerick, are not *edible*; as *Lions*, *Wolves*, *Squirrels*, *Dogs*, *Foxes*, *Horses*, &c. As for *Kine*, *Sheep*, *Goats*, *Deer*, *Swine*, *Conneys*, *Hares*, &c. We see they are *mild*, and *fearful*. Yet it is true, that *Horses* which are *Beasts* of courage, have been and are eaten by some *Nations*; as the *Scythians* were called *Hippophagi*; and the *Chineses* eat *Horse-flesh* at this day; and some *Gluttons* have used to have *Colts-flesh* baked. In *Birds*, such as are *Carnivorae* and *Birds* of *Prey*, are commonly no good *Meat*; but the reason is, rather the *Cholerick Nature* of those *Birds*, than their *Feeding* upon *Flesh*; for *Puits*, *Gulls*, *Shovelers*, *Ducks*, do feed upon *Flesh*, and yet are

good *Meat*. And we see, that those *Birds* which are of *Prey*, or feed upon *Flesh*, are good *Meat*, when they are very Young; as *Hawks*, *Rooks* out of the *Nest*, *Owls*, &c. *Mans flesh* is not eaten. The Reasons are three.

First, Because *Men* in *Humanity* do abhor it.

Secondly, Because no *Living Creature*, that *dieth* of *it self*, is good to eat; and therefore the *Canibals* (themselves) eat no *Mans flesh*, of those that *die* of *themselves*, but of such as are *slain*.

The third is, Because there must be (generally) some *disparity* between the *Nourishment*, and the *Body nourished*; and they must not be over-near, or like: Yet we see, that in great *weaknesses* and *Consumptions*, *Men* have been sustained with *Womans Milk*. And *Picinus* fondly (as I conceive) adviseth, for the *Prolongation* of *Life*, that a *Vein* be opened in the *Arm* of some wholsom *young man*, and the *blood* to be sucked. It is said, that *Witches* do greedily eat *Mans flesh*, which if it be true, besides a *devillish Appetite* in them, it is likely to proceed; for that *Mans flesh* may send up high and pleasing *Vapors*, which may stir the *Imagination*, and *Witches* felicity is chiefly in *Imagination*, as hath been said.

860. Experiment Solitary, touching the *Salamander*.

THere is an ancient received *Tradition* of the *Salamander*, that it liveth in the *Fire*, and hath force also to extinguish the *fire*. It must have two things, if it be true, to this *operation*. The one, a very *close skin*, whereby *flame*, which in the midst is not so hot, cannot enter: For we see, that if the *Palm* of the *Hand* be anointed thick with *White* of *Eggs*, and then *Aquavitæ* be poured upon it, and *enflamed*, yet one may endure the *flame* a pretty while. The other is some *extream cold* and *quenching vertue*, in the *Body* of that *Creature* which choaketh the *fire*. VVe see that *Milk* quencheth *Wild fire* better than *Water*, because it entreth better.

861. Experiment Solitary, touching the *Contrary operations of Time, upon Fruits and Liquors*.

TIme doth change *Fruit* (as *Apples*, *Pears*, *Pomegranates*, &c.) from more *sowre* to more *sweet*; but contrariwise, *Liquors*, (even those that are of the *Juyce* of *Fruit*) from more *sweet* to more *sowre*; as, *Wort*, *Must*, *New Verjuyce*, &c. The *cause* is, the *Congregation* of the *Spirits* together; for in both kinds, the *Spirit* is attenuated by *Time*; but in the first kind, it is more *diffused*, and more *mastered* by the *grosser parts*, which the *Spirits* do but digest: But in *Drinks* the *spirits* do reign, and finding less opposition of the *parts*, become themselves more *strong*, which causeth also more strength in the *Liquor*; such, as if the *Spirits* be of the hotter sort, the *Liquor* becometh apt to *burn*; but in time, it causeth likewise, when the higher *Spirits* are evaporated more *sowrness*.

862. Experiment Solitary, touching *Blows and bruises*.

IT hath been observed by the *Ancients*, that *Plates* of *Metal*, and especially of *Brass*, applyed presently to a *blow*, will keep it down from *swelling*. The *cause* is *Repercussion*, without *Humectation*, or *entrance* of any *Body*: For the *Plate* hath only a *virtual cold*, which doth not search into the *hurt*; whereas all *Plaisters* and *Oyntments* do enter. Surely, the *cause* that *blows* and *bruises* induce *swellings* is, for that the *Spirits* resorting to succor the *part* that laboreth, draw also the *humors* with them: For we see, that it is not the *repulse*, and the *return* of the *humor* in the *part strucken* that causeth it, for that *Gouts*, and *Tooth-achs* cause *swelling*, where there is no *Percussion* at all.

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863. Experiments Solitary, touching the *Orris Root.*

THe *nature* of the *Orris Root*, is almost singular, for there be few *odoriferous Roots*; and in those that are in any degree *sweet*, it is but the same *sweetness* with the *Wood* or *Leaf*; But the *Orris* is not *sweet* in the *Leaf*, neither is the *Flower* any thing so *sweet* as the *Root*. The *Root* seemeth to have a tender dainty *heat*, which when it cometh above ground to the *Sun*, and the *Air*, vanisheth: For it is a great *Mollifier*, and hath a smell like a *Violet*.

864. Experiment Solitary, touching the *Compression of Liquors.*

IT hath been observed by the *Ancients* that a great *Vessel* full, drawn into *Bottles*; and then the *Liquor* put again into the *Vessel*, will not fill the *Vessel* again, so full as it was, but that it may take in more *Liquor*; and that this holdeth more in *Wine*, than in *Water*. The *cause* may be trivial, namely, by the *expence* of the *Liquor*, in regard some may stick to the sides of the *Bottles*: But there may be a *cause* more subtil, which is, that the *Liquor* in the *Vessel*, is not so much *compressed*, as in the *Bottle*; because in the *Vessel*, the *Liquor* meeteth with *Liquor* chiefly; but in the *Bottles*, a small quantity of *Liquor* meeteth with the sides of the *Bottles*, which compress it so, that it doth not open again.

865. Experiment Solitary, touching the *Working of Water upon Air contiguous.*

WAter being contiguous with *Air* cooleth it, but moisteneth it not, except it *Vapor*. The *cause* is, for that *Heat* and *Cold* have a *Virtual Transition*, without *Communication* of *substance*, but *moisture* not; and to all *madefaction* there is required an *imbibition*: But where the *Bodies* are of such several Levity, and Gravity, as they mingle not, they can follow no *imbibition*. And therefore, *Oyl* likewise lieth at the *top* of the *Water*, without commixture: And a *drop* of *Water* running swiftly over a *Straw* or *smooth Body*, wetteth not.

866. Experiment Solitary, touching the *Nature of Air.*

STarlight *Nights*, yea, and bright *Moonshine Nights*, are colder than *Cloudy Nights*. The *cause* is, the *dryness* and *Fineness* of the *Air*, which thereby becometh more *piercing* and *sharp*; and therefore *great Continents* are colder than *Islands*. And as for the *Moon*, though it self inclineth the *Air* to *moisture*, yet when it shineth bright, it argueth the *Air* is dry. Also *close Air* is warmer than *open Air*, which (it may be) is, for that the true *cause* of *cold*, is an *expiration* from the *Globe* of the *Earth*, which in open *places* is stronger. And again, *Air* it self, if it be not altered by that *expiration*, is not without some secret *degree* of *heat*; as it is not likewise without some secret *degree* of *Light*: For otherwise *Cats* and *Owls*, could not see in the *Night*; but that *Air* hath a little *Light*, proportionable to the *Visual Spirits* of those *Creatures*.

867. Experiment in Consort, touching the *Eyes and Sight.*

THe *Eyes* do move one and the same way; for when one *Eye* moveth to the *Nostril*, the other moveth from the *Nostril*. The *cause* is, *Motion* of *Consent*, which in the *Spirits*, and *Parts Spiritual*, is strong. But yet use will induce the contrary; for some can *squint* when they will. And the common *Tradition* is, that if *Children* be set upon a Table with a Candle behind them, both *Eyes* will move outwards, as affecting to see the *Light*, and so induce *Squinting*.

868.

We see more exquisitely with *one Eye shut*, than with *both open*. The *cause* is, for that the *Spirits Visual* unite themselves more, and so become stronger.

ſtronger. For you may ſee, by looking in a *Glaſs*, that when you ſhut one *Eye*, the *Pupil* of the other *Eye*, that is open, dilateth.

869. The *Eyes*, if the *ſight* meet not in one *Angle*, *ſee things double*. The *cauſe* is, for that *ſeeing* two things, and *ſeeing* one thing twice, worketh the ſame *effect*: And therefore a little *Pellet*, held between two *Fingers*, laid a croſs, ſeemeth *double*.

870. *Pore-blind Men*, ſee beſt in the *dimmer lights*; and likewiſe have their *ſight* ſtronger near hand, than thoſe that are not *Pore-blind*, and can read and write ſmaller *Letters*. The *cauſe* is, for that the *Spirits Viſual*, in thoſe that are *Pore-blind*, are thinner and rarer, than in others; and therefore the greater *light* diſperſeth them. For the ſame *cauſe* they need contracting; but being *contracted*, are more ſtrong than the *Viſual Spirits* of ordinary *eyes* are; as when we ſee thorow a *Level*, the *ſight* is the ſtronger: And ſo is it, when you gather the *Eye-lids* ſomewhat cloſe: And it is commonly ſeen in thoſe that are *Pore-blind*, that they do much gather the *eye-lids* together. But old Men, when they would ſee to read, put the Paper ſomewhat a far off. The *cauſe* is, for that *old Mens Spirits Viſual*, contrary to thoſe of *Pore blind Men* unite not, but when the *object* is at ſome good diſtance from their *Eyes*.

871. *Men* ſee better when their *Eyes* are over-againſt the *Sun* or a *Candle*, if they put their *Hand* a little before their *Eye*. The *Reaſon* is, for that the *Glaring* of the *Sun*, or the *Candle*, doth weaken the *Eye*; whereas the *Light circumfuſed* is enough for the *Perception*. For we ſee, that an *over-light* maketh the *Eyes* dazel, inſomuch as perpetual looking againſt the *Sun*, would cauſe *Blindneſs*. Again, if *Men* come out of a *great light*, into a *dark room*; and contrariwiſe, if they come out of a *dark room* into a *light room*, they ſeem to have a *Miſt* before their *Eyes*, and ſee worſe than they ſhall do after they have ſtaid a little while, either in the *light*, or in the *dark*. The *cauſe* is, for that the *Spirits Viſual* are upon a ſudden change diſturbed, and put out of order; and till they be recollected, do not perform their Function well. For when they are much *dilated* by *light*, they cannot *contract* ſuddenly; and when they are much *contracted* by *darkneſs*, they cannot *dilate* ſuddenly. And exceſs of both theſe, (that is, of the *Dilatation*, and *Contraction* of the *Spirits Viſual*) if it be long, deſtroyeth the *Eye*. For as long looking againſt the *Sun*, or *Fire*, hurteth the *Eye* by *Dilatation*, ſo *curious painting* in *ſmall Volumes*, and *reading* of *ſmall Letters*, do hurt the *Eye* by *contraction*.

872. It hath been obſerved, that in *Anger* the *Eyes* wax *red*; and in *Bluſhing*, not the *Eyes*, but the *Ears*, and the *parts* behind them. The *cauſe* is, for that in *Anger*, the *Spirits* aſcend and wax eager; which is moſt eaſily ſeen in the *Eyes*, becauſe they are tranſlucide, though withal it maketh both the *Cheeks*, and the *Gils red*; but in *Bluſhing*, it is true. the *Spirits* aſcend likewiſe to ſuccor, both the *Eyes* and the *Face*, which are the *parts* that labor: But when they are repulſed by the *Eyes*, for that the *Eyes*, in ſhame do put back the *Spirits* that aſcend to them, as unwilling to look abroad: For no *Man*, in that *paſſion*, doth look ſtrongly, but dejectedly; and that *repulſion* from the *Eyes*, diverted the *Spirits* and *heat* more to the *Ears*, and the parts by them.

873. The *objects* of the *Sight*, may cauſe a great *pleaſure* and *delight* in the *Spirits*, but no *pain* or great *offence*; except it be by *Memory*, as hath been ſaid. The *Glimpſes* and *Beams* of *Diamonds* that ſtrike the *Eye*. *Indian Feathers*, that have glorious colours, the *coming* into a *fair Garden*, the *coming*

into

into a *fair Room* richly furnished; a *beautiful* person, and the like, do delight and exhilarate the *Spirits* much. The *reason*, why it holdeth not in the *offence* is, for that the *Sight* is the most *spiritual* of the *Senses*, whereby it hath no *object gross* enough to offend it. But the *cause* (chiefly) is, for that there be no *active objects* to offend the *Eye*. For *Harmonical Sounds*, and *Discordant Sounds*, are both *Active* and *Positive*; so are *sweet smells*, and *stinks*; so are *bitter*, and *sweets*, in *tastes*; so are *over-hot*, and *over-cold*, in *touch*; but *blackness*, and *darkness*, are indeed but *privatives*; and therefore have little or no *Activity*. Somewhat they do contristate, but very little.

874. Experiment Solitary, touching the *Colour of the Sea, or other Water.*

Water of the *Sea*, or otherwise, looketh *blacker* when it is moved, and *whiter* when it resteth. The *cause* is, for that by means of the *Motion*, the *Beams* of Light pass not straight, and therefore must be darkned; whereas when it resteth, the *Beams* do pass straight. Besides, *splendor* hath a *degree* of *whiteness*, especially, if there be a little *repercussion*, for a *Looking-Glass* with the *Steel* behind, looketh *whiter* than *Glass simple*. This *Experiment* deserveth to be driven further, in trying by what means *Motion* may hinder Sight.

875. Experiment Solitary, touching *Shellfish.*

Shell-fish have been by some of the *Ancients*, compared and sorted with the *Insecta*; but I see no reason why they should, for they have *Male* and *Female*, as other *Fish* have; neither are they bred of *Putrefaction*, especially such as do move. Nevertheless it is certain, that *Oysters* and *Cockles*, and *Mussels*, which move not, have no discriminate *Sex*. *Quære*, in what time, and how they are bred? It seemeth, that *Shells* of *Oysters* are bred where none were before; and it is tryed, that the great *Horse-Mussel*, with the fine shell, that breedeth in *Ponds*, hath bred within thirty years: But then, which is strange, it hath been tryed, that they do not only gape and shut as the *Oysters* do, but remove from one place to another.

876. Experiment Solitary, touching the *Right side and the Left.*

THe *Senses* are alike strong, both on the *right side*, and on the *left*; but the *Limbs* on the *right side* are stronger. The *cause* may be, for that the *Brain*, which is the *Instrument* of *Sense*, is alike on both *sides*; but *Motion*, and *habilities* of *moving*, are somewhat holpen from the *Liver*, which lieth on the *right side*. It may be also, for that the *Senses* are put in *exercise*, indifferently on both *sides* from the time of our Birth; but the *Limbs* are used most on the *right side*, whereby *custom* helpeth: For we see, that some are *left-handed*, which are such as have used the *left-hand* most.

877. Experiment Solitary, touching *Frictions.*

Frictions make the *parts* more *fleshy*, and *full*: As we see both in *Men*, and in the *Currying* of *Horses*, &c. The *cause* is, for that they draw greater *quantity* of *Spirits* and *Blood* to the *parts*; and again, because they draw the *Aliment* more forcibly from within, and again because they relax the *Pores*, and so make better *passage* for the *Spirits*, *Blood*, and *Aliment*: Lastly, because they dissipate, and disgest any *Inutile*, or *Excrementitious moisture*, which lieth in the *Flesh*; all which help *Assimulation*. *Frictions* also do more *fill* and *impinguate* the *Body*, than *Exercise*. The *cause* is, for that in *Frictions*, the *inward parts* are at rest; which in *exercise* are beaten (many times) too much: And for the same reason (as we have noted heretofore) *Gallislaves* are *fat* and *fleshy*, because they stir the *Limbs* more, and the *inward parts* less.

All

878 Experiment Solitary, touching *Globes appearing Flat at distance*

ALl *Globes* a far off, appear *flat*. The *cause* is, for that *distance*, being a *secundary object* of *sight*, is not otherwise discerned, than by more or less *light*; which *disparity*, when it cannot be discerned, all seemeth *one*: As it is (generally) in *objects* not distinctly discerned; for so Letters, if they be so far off, as they cannot be discerned, shew but as *duskish Paper*; and all *Engravings* and *Embossings* (a far off) appear *plain*.

879. Experiment Solitary, touching *Shadows*.

THe *uttermost parts* of *Shadows*, seem ever to *tremble*. The *cause* is, for that the little *Moats* which we see in the *Sun*, do ever stir, though there be no *Wind*; and therefore those moving, in the meeting of the *Light* and the *Shadow*, from the *Light* to the *Shadow*, and from the *Shadow* to the *Light*, do shew the *shadow* to move, because the *Medium* moveth.

880. Experiment Solitary, touching the *Rowling and Breaking of the Seas*.

SHallow and *Narrow Seas*, break more than *deep* and *large*. The *cause* is, for that the *Impulsion* being the same in both; where there is a greater *quantity* of *Water*, and likewise *space* enough, there the *Water* rouleth, and moveth, both more slowly, and with a sloper rise and fall: But where there is less *Water*, and less *space*, and the *Water* dasheth more against the bottom; there it moveth more swiftly, and more in *Precipice*: For in the *breaking* of the *Waves*, there is ever a *Precipice*.

881. Experiment Solitary, touching the *Dulcoration of Salt-water*.

IT hath been observed by the *Ancients*, that *Salt-water boiled*, or *boiled* and *cooled* again, is more *potable*, than of it self *raw*; and yet the *taste* of *Salt*, in *Distillations* by *Fire*, riseth not: For the *Distilled Water* will be *fresh*. The *cause* may be, for that the *Salt part* of the *Water*, doth partly rise into a kind of *Scum* on the *top*, and partly goeth into a *Sediment* in the *bottom*; and so is rather a *separation*, than an *evaporation*. But it is too gross to rise into a *vapor*; and so is a *bitter taste* likewise: For simple *distilled Waters* of *Wormwood*, and the like, are not bitter.

882. Experiment Solitary, touching the *Return of Saltness in Pits upon the Seashore*.

IT hath been set down before, that *Pits* upon the *Sea-shores* turn into *fresh Water*, by *Percolation* of the *Salt* through the *Sand*: But it is further noted, by some of the *Ancients*, that in some places of *Africk*, after a time, the *Water* in such *Pits* will become *brackish* again. The *cause* is, for that after a time, the very *Sands*, thorow which the *Salt Water* passeth, become *Salt*; and so the *Strainer* it self is tincted with *Salt*. The remedy therefore is to dig still *new Pits*, when the old wax *brackish*; as if you would change your *Strainer*.

883. Experiment Solitary, touching *Attraction by Similitude of Substance*.

IT hath been observed by the *Ancients*, that *Salt-water* will dissolve *Salt* put into it, in less time, than *Fresh Water* will dissolve it. The *cause* may be, for that the *Salt* in the *precedent Water*, doth by *similitude* of *Substance*, draw the *Salt* new put in, unto it; whereby it diffuseth in the *Liquor* more speedily. This is a noble *Experiment*, if it be true; for it sheweth means of more quick and easie *Infusions*, and it is likewise a good *instance* of *Attraction* by *Similitude* of *Substance*. Try it with *Sugar* put into *Water*, formerly *sugred*, and into other *Water unsugred*.

884. Experiment Solitary, touching *Attraction*.

PUt *Sugar* into *Wine*, part of it above, part under the *Wine*; and you shall find (that which may seem strange) that the *Sugar* above the *Wine*, will soften and dissolve sooner than that within the *Wine*. The *cause* is, for that the

the *Wine* entreth that *part* of the *Sugar* which is under the *Wine*, by ſimple *Infuſion* or *Spreading*; but that *part* above the *Wine* is likewiſe forced by *Sucking*: For all *Spongy Bodies* expel the *Air*, and draw in *Liquor*, if it be contiguous; as we ſee it alſo in *Sponges*, put part above the *Water*. It is worthy the inquiry, to ſee how you may make more *accurate Infuſions*, by help of *Attraction*.

885. Experiment Solitary, touching *Heat under Earth*.

Water in *Wells* is *warmer* in *Winter* than in *Summer*; and ſo *Air* in *Caves*. The *cauſe* is, for that in the hither *parts*, under the *Earth*, there is a *degree* of ſome *heat* (as appeareth in *ſulphureous Veins*, &c.) which ſhut cloſe in (as in *Winter*) is the more; but if it perſpire (as it doth in *Summer*) it is the leſs.

886. Experiment Solitary, touching *Flying in the Air*.

IT is reported, that amongſt the *Leucadians*, in *ancient* time, upon a ſuperſtition, they did uſe to precipitate a *Man* from a *high Cliff* into the *Sea*; tying about him with ſtrings, at ſome diſtance, many great *Fowls*; and fixing unto his *Body* divers *Feathers* ſpread, to break the *fall*. Certainly many *Birds* of good *Wing* (as *Kites*, and the like) would bear up a good *weight* as they flie; and *ſpreading* of *Feathers* thin and cloſe, and in great breadth, will likewiſe bear up a great *weight*, being even laid without tilting upon the ſides. The further *extenſion* of this *Experiment* for *Flying*, may be thought upon.

887. Experiment Solitary, touching the *Dye of Scarlet*.

THere is in ſome places (namely, in *Cephalonia*) a little *Shrub*, which they call *Holy-Oak*, or *Dwarf Oak*. Upon the *Leaves* whereof there riſeth a *Tumor*, like a *Bliſter*; which they gather, and rub out of it, a certain *red duſt*, that converteth (after a while) into *Worms*, which they kill with *Wine*, (as is reported) when they begin to quicken: With this *Duſt* they Die *Scarlet*.

888. Experiment Solitary, touching *Maleficiating*.

IN *Zant* it is very ordinary, to make *Men impotent*, to accompany with their *Wives*. The like is practiſed in *Gaſcony*, where it is called *Nouër l'eguillete*. It is practiſed always upon the *Wedding day*. And in *Zant*, the Mothers themſelves do it by way of prevention, becauſe thereby they hinder other *Charms*, and can undo their own. It is a thing the *Civil Law* taketh knowledge of, and therefore is of no light regard.

889. Experiment Solitary, touching the *Riſe of Water by Means of Flame*.

IT is a common *Experiment*, but the *cauſe* is miſtaken. Take a *Pot*, (or better a *Glaſs*, becauſe therein you may ſee the *Motion*) and ſet a *Candle* lighted in the *Bottom* of a *Baſon* of *Water*; and turn the *Mouth* of the *Pot* or *Glaſs* over the *Candle*, and it will make the *Water* riſe. They aſcribe it to the *drawing* of *heat*, which is not true: For it appeareth plainly to be but a *Motion* of *Nexe*, which they call *Ne detur vacuum*, and it proceedeth thus; The *Flame* of the *Candle* as ſoon as it is covered, being ſuffocated by the *cloſe Air*, leſſeneth by little and little: During which time, there is ſome little aſcent of *Water*, but not much; for the *Flame* occupying leſs and leſs room, as it leſſeneth, the *Water* ſucceedeth. But upon the *inſtant* of the *Candles going out*, there is a ſudden *riſe* of a great deal of *Water*; for that the *Body* of the *Flame* filleth no more place, and ſo the *Air* and the *Water* ſucceed. It worketh the ſame *effect*, if inſtead of *Water*, you put *Flower*, or *Sand*, into the *Baſon*: Which ſheweth, that it is not the *Flames* drawing the *Liquor*, as *Nouriſhment*, as it is ſuppoſed; for all *Bodies* are alike

alike unto it, as it is ever in *motion* of *Nexe*; insomuch, as I have seen the *Glass*, being held by the hand, hath lifted up the *Bason*, and all: The *motion* of *Nexe* did so clasp the *bottom* of the *Bason*. That *Experiment*, when the *Bason* was lifted up, was made with *Oyl*, and not with *Water*. Nevertheless this is true, that at the very first *setting* of the *Mouth* of the *Glass*, upon the *bottom* of the *Bason*, it draweth up the *Water* a little and then standeth at a stay, almost till the *Candles going out*, as was said. This may shew some *Attraction* at first; but of this we will speak more, when we handle *Attractions* by *Heat*.

Experiments in Consort, touching the *Influences of the Moon.*

OF the *Power* of the *Celestial Bodies*, and what more secret influences they have, besides the two manifest *influences* of *Heat* and *Light* we shall speak, when we handle *Experiments* touching the *Celestial Bodies*: Mean while, we will give some Directions for more certain *Tryals* of the *Vertue* and *Influences* of the *Moon*, which is our *neerest Neighbour*.

The *Influences* of the *Moon* (most observed) are four; the *drawing forth* of *Heat*; the *Inducing* of *Putrefaction*; the *increase* of *Moisture*; the *exciting* of the *Motions* of *Spirits*.

890. For the *drawing forth* of *Heat*, we have formerly prescribed to take *Water warm*, and to set part of it against the *Moon-beams*, and part of it with a *Skreen* between; and to see whether that which standeth exposed to the *Beams* will not *cool* sooner. But because this is but a small *interposition*, (though in the *Sun* we see a small *shade* doth much) it were good to try it when the *Moon* shineth, and when the *Moon* shineth not at all; and with *Water warm* in a *Glass-bottle* as well as in a *Dish*, and with *Cinders*, and with *Iron red hot*, &c.

891. For the *inducing* of *Putrefaction*, it were good to try it with *Flesh* or *Fish* exposed to the *Moon-beams*, and again exposed to the *Air* when the *Moon* shineth not, for the like time, to see whether will corrupt sooner; and try it also with *Capon*, or some other *fowl* laid abroad, to see whether it will mortifie and become tender sooner. Try it also with dead *Flies* or dead *Worms*, having a little *Water* cast upon them, to see whether will *putrefie* sooner. Try it also with an *Apple* or *Orenge*, having *holes* made in their *tops*, to see whether will rot or mould sooner. Try it also with *Holland Cheese*, having *Wine* put into it, whether will breed *Mites* sooner or greater.

892. For the *increase* of *Moisture*, the opinion received is, that *Seeds* will grow soonest, and *Hair*, and *Nails*, and *Hedges*, and *Herbs*, cut, *&c.* will grow soonest, if they be set or cut in the *increase* of the *Moon*: Also, that *Brains* in *Rabits*, *Wood-cocks*, *Calves*, &c. are fullest in the *Full* of the *Moon*; and so of *Marrow* in the *Bones*, and so of *Oysters* and *Cockles*; which of all the rest are the easiest tried, if you have them in *Pits*.

893. Take some *Seeds* or *Roots* (as *Onions*, &c.) and set some of them immediately after the *Change*, and others of the same kind immediately after the *Full*: Let them be as like as can be, the *Earth* also the same as near as may be, and therefore best in *Pots*: Let the *Pots* also stand where no *Rain* or *Sun* may come to them, lest the *difference* of the *Weather* confound the *Experiment*. And then see in what time the *Seeds set*, in the *increase* of the *Moon*, come to a certain height, and how they differ from those that are *set* in the *decrease* of the *Moon*.

It is like, that the *Brain of Man* waxeth *Moister*, and *Fuller*, upon the *Full* of the *Moon*: And therefore it were good for those that have *moist brains*, and are great *Drinkers*, to take *Fume* of *Lignum Aloes*, *Rose-mary*, *Frankincense*, &c. about the full of the *Moon*. It is like also that the *Humors* in *mens bodies*, increase and decrease, as the *Moon* doth; and therefore it were good to purge some day or two after the *Full*, for that then the *Humors* will not replenish so soon again. 894.

As for the *exciting* of the *motion* of the *spirits*, you must note that the *Growth of Hedges*, *Herbs*, *Hair*, &c. is caused from the *Moon*, by *Exciting* of the *spirits*, as well as by *increase* of the *moisture*. But for *Spirits* in particular, the great *Instance* is in *Lunacies*. 895.

There may be other secret *Effects* of the *Influence* of the *Moon*, which are not yet brought into *Observantion*. It may be, that if it so fall out, that the *Wind* be *North*, or *North-East*, in the *Full* of the *Moon*, it increaseth *Cold* and if *South* or *South-West*, it disposeth the *Air*, for a good while, to *Warmth*, and *Rain*; which would be observed. 896.

It may be, that *Children* and *young cattel*, that are *Brought forth* in the *Full* of the *Moon*, are stronger and larger, than those that are brought forth in the *Wane*: and those also which are *begotten* in the *Full* of the *Moon*: So that it might be good *Husbandry*, to put *Rams*, and *Bulls* to their *Females*, somwhat before the *Full* of the *Moon*. It may be also, that the *Eggs* lay'd in the *Full of the moon*, breed the better *Birds*: And a number of the like *Effects*, which may be brought into *Observation*: *Quære* also, whether great *Thunders*, and *Earth-Quakes*, be not most in the *Full* of the *Moon*. 897.

THe *Turning* of *Wine* to *Vinegar*, is a Kind of *Putrefaction*: And in *Making* of *Vinegar*, they use to set *Vessels* of *Wine* over against the *Noon-Sun*; which calleth out the more *Oyly Spirits*, and leaveth the *Liquor* more *sowre*, and *Hard*. We see also, that *Burnt-Wine* is more *Hard* and *Astringent* than *Wine-unburnt*. It is said, that *Cider* in *Navigations* under the *Line* ripeneth, when *Wine* or *Beer* sowreth. It were good to set a *Rundlet* of *Verjuyce* over against the *Sun*, in *Summer*, as they do *Vinegar*, to see whether it will Ripen, and Sweeten. 898. Experiment Solitary, touching Vinegar.

THere be divers *Creatures*, that *Sleep* all *Winter*; As the *Bear*, the *Hedge-hog*, the *Bat*, the Bee, &c. These all wax *Fat* when they *Sleep*, and digest not. The *Cause* of their *Fattening*, during their *Sleeping time*, may be the *Want* of *Assimilating*; For whatsoever *Assimilateth* not to *Flesh*, turneth either to *Sweat*, or *Fat*. These *Creatures*, for part of their *Sleeping time*, have been observed not to *Stirre* at all; And for the other part, to *Stirre*, but not to *Remove*. And they get *Warme* and *Close Places* to *sleep* in. When the *Flemmings* wintred in *Nova Zembla*, the *Bears*, about the middle of *November*, went to *sleep*; and then the *Foxes* began to come forth, which durst not before. It is noted by some of the *Ancients*, that the *she-bear* breedeth, and lyeth in with her young, during that time of *Rest*, and that a *Bear*, *big* with *Young*, hath seldome been seen. 899. Experiment Solitary touching the *Creatures that sleep all Winter*.

SOme *Living Creatures* are procreated by *Copulation* between *Male* and *Female*: some by *Putrefaction*; and of those which come by *Putrefaction* many do (nevertheless) afterwards procreate by *Copulation*. For the *cause* of both *Generations*: first, it is most certain, that the *Cause* of all *Vivification* 900. Experiment in Consort touching the *Generating of Creatures by Copulation and by Putrefaction*.

fication is a *gentle* and *proportionable heat*, working upon a *gluttinous* and *yielding substance*; for the *heat* doth bring forth *Spirit* in that substance, and the *substance* being *gluttinous*, produceth two *effects*; the one, That the *Spirit* is *detained*, and cannot *break forth*; the other, That the *matter* being *gentle* and *yielding*, is driven forwards by the *motion* of the *Spirits*, after some *swelling* into *shape* and *members*. Therefore all *Sperm*, all *Menstruous substance*, all *matter*, whereof *Creatures* are produced by *Putrefaction*, have evermore a *Closeness*, *Lentor*, and *Sequacity*. It seemeth therefore that the *Generation* by *Sperm* only, and by *Putrefaction*, have two different *causes*. The first is, for that *Creatures* which have a *definite* and *exact shape* (as those have which are procreated by *Copulation*) cannot be produced by a *weak* and *casual heat*; nor out of *matter*, which is not *exactly prepared* according to the *Species*. The second is, for that there is a greater *time* required for *Maturation* of *perfect Creatures*; for if the *time* required in *Vivification* be of any length, then the *Spirit* will exhale before the *Creature* be *mature*; except it be inclosed in a *place* where it may have *continuance* of the *heat*, *access* of some *nourishment* to maintain it, and *closeness* that may keep it from exhaling; and such places, or the Wombs and *Matrices* of the *Females*: And therefore all *Creatures* made of *Putrefaction*, are of more *uncertain shape*, and are made in *shorter time*, and need not so perfect an *enclosure*, though some *closeness* be commonly required. As for the *Heathen opinion*, which was, That upon great *mutations* of the *World*, *perfect Creatures* were first ingendred of *Concretion*, as well as *Frogs*, and *Worms*, and *Flies*, and such like, are now; we know it to be vain: But if any such thing should be admitted, discoursing according to *sense*, it cannot be, except you admit of a *Chaos* first, and *commixture* of *Heaven* and *Earth*; for the *Frame* of the *World* once in order, cannot effect it by any *excess* or *casualty*.

NATURAL

NATURAL HISTORY;

Century X.

THe *Philosophy* of *Pythagoras* (which was full of *Superstition*) did first plant a *Monstrous Imagination*, which afterwards was, by the *School* of *Plato*, and others, watered and nourished. It was, That *the World was one entire, perfect, Living Creature*; insomuch, as *Apollonius* of *Tyana*, a *Pythagorean Prophet*, affirmed, That the *Ebbing* and *Flowing* of the *Sea* was the *Respiration* of the *World*, drawing in *Water* as *Breath*, and putting it forth again. They went on, and inferred, That if the *World* were a *Living Creature*, it had a *Soul* and *Spirit*; which also they held, calling it *Spiritus Mundi*, the *Spirit* or *Soul* of the *World*, by which, they did not intend *God*, (for they did admit of a *Deity* besides) but only the *Soul*, or *Essential Form* of the *Universe*. This *Foundation* being laid, they thought build upon it what they would; for in a *Living Creature*, though never so great (as for example, in a great *Whale*) the *Sense* and the *Affects* of any one *part* of the *Body* instantly make a *Transcursion* throughout the whole *Body*: So that by this they did insinuate, that no *distance* of *place*, nor *want* or *indisposition* of *Matter* could hinder *Magical Operations*; but that (for example) we might here in *Europe* have *Sense* and *Feeling* of that which was done in *China*; and likewise, we might work any *effect without* and *against Matter*: And this not holden by the *co-operation* of *Angels* or *Spirits*, but only by the *Unity* and *Harmony* of *Nature*. There were some also that staid not here, but went further, and held, That if the *Spirit* of *Man* (whom they call the *Microcosm*) do give a fit touch to the *Spirit* of the *World*, by strong *Imaginations* and *Beliefs*, it might command *Nature*; for *Paracelsus*, and some darksome *Authors* of *Magick*, do ascribe to *Imagination exalted* the *Power* of *Miracle-working Faith*. With these vast and bottomless *Follies* *Men* have been (in part) entertained.

Experiments in Consort touching the *Transmission*, and *Influx*, of *Immateriate Vertues*, and *the Force of Imagination*.

But we, that hold firm to the *Works* of *God*, and to the *Senſe*, which is *Gods Lamp*, (*Lucerna Dei Spiraculum Hominis*;) will enquire with all Sobriety and Severity, whether there be to be found in the Foot-ſteps of *Nature* any ſuch *Tranſmiſſion*, and *Influx* of *Immateriate Virtues*; and what the *force* of *Imagination* is, either upon the *Body Imaginant*, or upon another *Body*: Wherein it will be like that *labour* of *Hercules* in purging the *Stable* of *Augeas*, to ſeparate from *Superſtitious* and *Magical Arts* and *Obſervations*, any thing that is clean and pure *Natural*, and not to be either contemned or condemned. And although we ſhall have occaſion to ſpeak of this in more places than one; yet we will now make ſome entrance thereinto.

901. Experiments in Conſort, *Monitory*, touching *Tranſmiſſion of Spirits*, and the *Force of Imagination*.

MEn are to be admoniſhed, that they do not withdraw credit from the *Operations* by *Tranſmiſſion* of *Spirits*, and *Force* of *Imagination*, becauſe the *effects fail ſometimes*. For as in *Infection* and *Contagion* from *Body* to *Body*, (as the *Plague*, and the like) it is moſt certain, that the *Infection* is received (many times) by the *Body Paſſive*, but yet is by the *ſtrength* and good *diſpoſition* thereof repulſed, and wrought out, before it be formed into a *Diſeaſe*; ſo much more in *Impreſſions* from *Mind* to *Mind*, or from *Spirit* to *Spirit*, the *Impreſſion* taketh, but is encountred and overcome by the *Mind* and *Spirit*, which is *Paſſive*, before it work any manifeſt *effect*: And therefore they work moſt upon *weak Minds* and *Spirits*; as thoſe of *Women*, *Sick Perſons*, *Superſtitious* and *fearful Perſons*, *Children*, and *young Creatures*.

Neſcio quis teneros oculus mihi faſcinat Agnos:

The *Poet* ſpeaketh not of *Sheep*, but of *Lambs*. As for the *weakneſs* of the *Power* of them upon *Kings* and *Magiſtrates*, it may be aſcribed (beſides the main, which is the *Protection* of *God* over thoſe that execute his place) to the *weakneſs* of the *Imagination* of the *Imaginant*; for it is hard for a *Witch* or a *Sorcerer* to put on a belief, that they can hurt ſuch *perſons*.

902. *Men* are to be admoniſhed on the other ſide, that they do not eaſily give place and credit to theſe *operations*, becauſe they *ſucceed many times*: For the *cauſe* of this *ſucceſs* is (oft) to be truly aſcribed unto the *force* of *Affection* and *Imagination* upon the *Body Agent*, and then by a *ſecondary means* it may work upon a *diverſe Body*. As for example, If a man carry a *Planets Seal* or a *Ring*, or ſome *part* of a *Beaſt*, believing ſtrongly that it will help him to obtain his *Love*, or to keep him from danger of hurt in *Fight*, or to prevail in a *Suit*, &c. it may make him more *active* and *induſtrious*; and again, more *confident* and *perſiſting*, than otherwiſe he would be. Now the great *effects* that may come of *Induſtry* and *Perſeverance* (eſpecially in *civil buſineſs*) who knoweth not? For we ſee *audacity* doth almoſt bind and mate the *weaker ſort* of *Minds*; and the *ſtate* of *Humane Actions* is ſo variable, that to try things oft, and never to give over, doth wonders: Therefore it were a meer *fallacy* and *miſtaking* to aſcribe that to the *Force* of *Imagination* upon another *Body*, which is but the *Force* of *Imagination* upon the proper *Body*; for there is no doubt but that *Imagination* and *vehement Affection* work greatly upon the *Body* of the *Imaginant*, as we ſhall ſhew in due place.

903. *Men* are to be admoniſhed, that as they are not to miſtake the *cauſes* of theſe *Operations*, ſo much leſs they are to miſtake the *Fact* or *Effect*, and raſhly to take that for done which is not done. And therefore, as divers wiſe *Judges* have preſcribed and cautioned, *Men* may not too raſhly believe

believe the *Confessions* of *Witches*, nor yet the *evidence* against them: For the *Witches* themselves are *Imaginative*, and believe oft-times they do that which they do not; and *people* are *credulous* in that point, and ready to impute *Accidents* and *Natural Operations* to *Witchcraft*. It is worthy the observing, that both in *Ancient* and *late times*, (as in the *Thessalian Witches*, and the meetings of *Witches*, that have been recorded by so many late *Confessions*) the great *wonders* which they tell of *carrying* in the *Air*, *transforming* themselves into other *Bodies*, &c. are still reported to be wrought, not by *Incantation* or *Ceremonies*, but by *Ointments* and *Anointing* themselves all over. This may justly move a *Man* to think, that these *Fables* are the *effects* of *Imagination*; for it is certain, that *Ointments* do all (if they be laid on any thing thick) by *stopping* of the *Pores*, shut in the *Vapors*, and send them to the *Head* extreamly. And for the particular *Ingredients* of those *Magical Ointments*, it is like they are *opiate* and *soporiferous*. For *Anointing* of the *Forehead*, *Neck*, *Feet*, *Back-bone*, we know is used for procuring *dead sleeps*. And if any *Man* say, that this *effect* would be better done by inward *potions*; answer may be made, that the *Medicines* which go to the *Ointments* are so strong, that if they were used inwards, they would kill those that use them; and therefore they work potently, though outwards.

We will divide the several kinds of the *operations* by *transmission* of *Spirits* and *Imagination*, which will give no small light to the *Experiments* that follow. All *operations* by *transmission* of *Spirits* and *Imagination* have this, that they *work* at *distance*, and not at *touch*; and they are these being distinguished.

904. The first is, the *Transmission* or *Emission* of the *thinner*, and more *airy parts* of *Bodies*, as in *Odors* and *Infections*; and this is, of all the rest, the most *corporeal*. But you must remember withal, that there be a number of those *Emissions*, both *wholesome* and *unwholesome*, that give no *smell* at all: For the *Plague* many times when it is taken giveth no *scent* at all, and there be many *good* and *healthful Airs*, that do appear by *Habitation*, and other proofs, that differ not in *Smell* from other *Airs*, and under this head you may place all *Imbibitions* of *Air*, where the *substance* is *material*, *odor-like*; whereof some nevertheless are strange, and very suddenly diffused; as the *alteration* which the *Air* receiveth in *Egypt* almost immediately upon the *rising* of the *River* of *Nilus*, whereof we have spoken.

905. The second is, the *Transmission* or *Emission* of those *things* that we call *Spiritual Species*, as *Visibles* and *Sounds*; the one whereof we have handled, and the other we shall handle in due place. These move swiftly and at great distance, but then they require a *Medium* well disposed, and their *Transmission* is easily stopped.

906. The third is, the *Emissions* which cause *Attraction* of *certain Bodies* at *distance*; wherein though the *Loadstone* be commonly placed in the first rank, yet we think good to except it, and refer it to another *Head*: But the *drawing* of *Amber*, and *Jet*, and other *Electrick Bodies*, and the *Attraction* in *Gold* of the *Spirit* of *Quick silver* at distance, and the *Attraction* of *Heat* at distance, and that of *fire* to *Naphtha*, and that of some *Herbs* to *Water*, though at distance, and divers others, we shall handle, but yet not under this present *title*, but under the *title* of *Attraction* in general.

907. The fourth is, the *Emission* of *Spirits*, and *Immateriate Powers* and *Virtues*, in those things which work by the *universal configuration* and *Sympathy* of the *World*; not by *Forms*, or *Celestial Influxes*, (as is vainly taught and received) but by the *Primitive Nature* of *Matter*, and the *seeds* of *things*. Of this kind is (as we yet suppose) the *working* of the *Loadstone*, which is by *consent* with the *Globe* of the *Earth*; of this kind is the *motion* of *Gravity*, which is by *consent* of *dense* Bodies with the *Globe* of the *Earth*: Of this kind is some *disposition* of *Bodies* to *Rotation*, and particularly from *East* to *West*; of which kind, we conceive the Main *Float* and *Reflow* of the *Sea* is, which is by *consent* of the *Universe*, as part of the *Diurnal Motion*. These *Immateriate Virtues* have this property differing from others, that the *diversity* of the *Medium* hindreth them not, but they pass, through all *Mediums*, yet at *determinate distances*. And of these we shall speak, as they are incident to several *Titles*.

908. The fifth is, the *Emission* of *Spirits*; and this is the principal in our intention to handle now in this place, namely, the *operation* of the *Spirits* of the *mind* of Man upon other *Spirits*; and this is of a *double nature*, the *operation* of the *Affections*, if they be vehement; and the *operation* of the *Imagination* if it be strong. But these two are so *coupled*, as we shall handle them together; for when *envious* or *amorous aspect* doth infect the *Spirits* of another, there is joyned both *Affection* and *Imagination*.

909. The sixth is, the influxes of the *Heavenly Bodies*, besides those two manifest ones of *Heat* and *Light*. But these we will handle, where we handle the *Celestial Bodies* and *Motions*.

910. The seventh is, the *operations* of *Sympathy*, which the *Writers* of *Natural Magick* have brought into an *Art* or *Precept*; and it is this, That if you desire to super-induce any *Virtue* or *Disposition* upon a *Person*, you should take the *Living Creature*, in which that *Virtue* is most *eminent* and in *perfection*; of that *Creature* you must take the *parts* wherein that *Virtue* chiefly is *collocate*. Again, you must take the *parts* in the *time*, and *act* when that *Virtue* is most in *exercise*, and then you must apply it to that *part* of Man, wherein that *Virtue* chiefly *consisteth*. As if you would super-induce *Courage* and *Fortitude*, take a *Lion*, or a *Cock*, and take the *Heart*, *Tooth* or *Paw* of the *Lion*; or the *Heart*, or *Spur* of the *Cock*: take those *parts* immediately after the *Lion* or the *Cock* have been in *sight*, and let them be worn upon a Mans *heart* or *wrist*. Of these and such like *Sympathies* we shall speak under this present *Title*.

911. The eighth and last is, an *Emission* of *Immateriate Virtues*, such as we are a little doubtful to propound it is so prodigious, but that it is so constantly avouched by many: And we have set it down as a Law to our selves to examine things to the bottom, and not to receive upon credit, reject upon improbabilities, until there hath passed a due examination. This is the *Sympathy* of *Individuals*; for as there is a *Sympathy* of *Species*, so (it may be) there is a *Sympathy* of *Individuals*; that is, that in *things*, or the *parts* of *things* that have been once *contiguous* or *entire*, there should remain a *transmission* of *Virtue* from the one to the other, as between the *Weapon* and the *Wound*. Whereupon is blazed abroad the *operation* of *Unguentum Tali*; and so of a *piece* of *Lard*, or *Stick*, of *Elder*, &c. That if *part* of it be consumed or putrefied, it will work upon the other *parts severed*. Now we will pursue the *instances* themselves.

The

912. Experiments in Consort, touching Emission of Spirits in Vapor or exhalation Odorlike.

THe *Plague* is many times taken without *manifest sense*, as hath been said; and they report, that where it is found it hath a sent of the *smell* of a *Mellow Apple*, and (as some say) of *May-flowers*: And it is also received, that smells of Flowers that are *Mellow* and *Lushious*, are ill for the *Plague*; as *Wite Lilies*, *Cowslips*, and *Hyacinths*.

913. The *Plague* is not easily received by such as continually are about them that have the *Plague*, as *Keepers* of the *Sick*, and *Physitians*; nor again by such as take *Antidotes*, either inward (as *Mithridate*, *Juniper-berries*, *Rue*, *Leaf*, and *Seed*, &c.) or outward (as *Angelica*, *Zedoary*, and the like in the Mouth; *Tar*, *Galbanum*, and the like in Perfume:) Nor again, by *old people* and such as are of a *dry* and *cold complexion*. On the other side, the *Plague*, taketh soonest hold of those that come out of a *fresh Air*, and of those that are *fasting*, and of *Children*; and it is likewise noted to go in a *Blood* more than to a *stranger*.

914. The most pernicious *Infection*, next the *Plague*, is the *Smell* of the *Jayl*, when *Prisoners* have been long, and close, and nastily kept; whereof we have had in our time, experience twice or thrice, when both the *Judges* that sat upon the *Jayl*, and numbers of those that attended the business, or were present, *sickned* upon it, and *died*. Therefore it were good wisdom, that in such cases the *Jayl* were aired before they be brought forth.

915. Out of question, if such *foul smells* be made by *Art*, and by the Hand, they consist cheifly of *Mans flesh*, or *sweat putrefied*; for they are not those *stinks* which the *Nostrils* straight abhor and expel, that are most *pernicious*, but such *Airs* as have some similitude with *Mans body*, and so insinuate themselves, and betray the *Spirits*. There may be great danger in using such Compositions in great Meetings of People within Houses; as in *Churches*, at *Arraignments*, at *Plays* and *Solemnities*, and the like: For *poysoning* of *Air* is no less dangerous, than *poysoning* of *Water*, which hath been used by the *Turks* in the Wars, and was used by *Emanuel Commenus* towards the *Christians*, when they passed through his *Countreys* to the *Holy Land*. And these *empoysonments* of *Air* are the more dangerous in *Meetings* of *People*, because the much *breath* of *People* doth further the *reception* of the *Infection*. And therefore when any such thing is feared, it were good those *publick places* were perfumed before the *Assemblies*.

916. The *empoysonment* of particular *persons* by *Odors*, hath been reported to be in *perfumed Gloves*, or the like. And it is like they mingle the *poyson* that is deadly with some *smells* that are sweet, which also maketh it the sooner received. *Plagues* also have been raised by *Anointings* of the *Chinks* of *Doors*, and the like; not so much by the touch, as for that it is common for *men*, when they find any thing wet upon their fingers, to put them to their *Nose*; which men therefore should take heed how they do. The best is, that these *Compositions of Infectious Airs* cannot be made without *dangers* of *death* to them that make them; but then again, they may have some *Antidotes* to save themselves; so that *men* ought not to be secure of it.

917. There have been in divers *Countreys* great *Plagues* by the *Putrefaction* of great *swarms* of *Grashoppers* and *Locusts*, when they have been dead and cast upon heaps.

918. It hapneth oft in *Mines*, that there are *Damps* which kill either by *Suffocation*, or by the *poysonous nature* of the *Mineral*; and those that deal

deal much in *Refining*, or other works about *Metals* and *Minerals*, have their *Brains* hurt and ſtupefied by the *Metalline Vapors*, Amongſt which, it is noted, that the *Spirits* of *Quick-ſilver* ever flie to the *Skull*, *Teeth*, or *Bones*, inſomuch, as *Gilders* uſe to have a piece of *Gold* in their *Mouth* to draw the *Spirits* of the *Quick-ſilver*; which *Gold* afterwards they find to be whitned. There are certain *Lakes* and *Pits*, ſuch as that of *Avernus*, that *poyſon Birds* (as is ſaid) which fly over them, or *Men* that ſtay too long about them.

919. The *Vapour* of *Char-coal* or *Sea-coal* in a cloſe room, hath killed many; and it is the more dangerous, becauſe it cometh without any *ill ſmell* but ſtealeth on by little and little, inducing onely a *faintneſs*, without any *manifeſt ſtrangling*. When the *Dutchmen* wintred at *Nova Zembla*, and that they could gather no more ſticks, they fell to make fire of ſome *Sea-coal* they had, wherewith (at firſt) they were much refreſhed; but a little after they had ſet about the *fire*, there grew a general ſilence and lothneſs to ſpeak amongſt them; and immediately after one of the *weakeſt* of the *Company* fell down in a ſwoon: Whereupon, they doubting what it was, opened their door to let in *Air*, and ſo ſaved themſelves. The *effect* (no doubt) is wrought by the *inſpiſſation* of the *Air*, and ſo of the *Breadth* and *Spirits*. The like enſueth in *Rooms* newly *Plaiſtred*, if a *fire* be made in them; whereof no leſs *Man* then the *Emperor Jovinianus* died.

920. *Vide the* Experiment 803. Touching the *Infectious Nature* of the *Air* upon the firſt *ſhowers* after long *Dronght*.

921. It hath come to paſs, that ſome *Apothecaries*, upon *ſtamping* of *Coloquintida*, have been put into a great *Scouring* by the *vapor* only.

922. It hath been a practice to burn a *Pepper* they call *Guiny Pepper*, which hath ſuch a ſtrong *Spirit*, that it provoketh a *continual Sneezing* in thoſe that are in the *Room*.

923. It is an *Ancient Tradition*, that *Blear eyes* infect *Sound eyes*, and that a *Menſtruous Woman* looking upon a *Glaſs* doth ruſt it: nay, they have an *opinion*, which ſeemeth *fabulous*, That *Monſtruous Women* going over a *Field* or *Garden*, do *Corn* and *Herbs* good by *killing* the *Worms*.

924. The *Tradition* is no leſs *ancient*, that the *Baſiliſk* killeth by *aſpect*; and that the *Woof*, if he ſeeth a *Man* firſt, by *aſpect* ſtriketh a *Man* horſe.

925. *Perfumes* convenient to dry and ſtrengthen the *Brain*, and ſtay *Rheums* and *Defluctions*; as we find in *Fume* of *Roſemary* dried, and *Lignum*, *Aloes*, and *Calamus* taken at the *Mouth* and *Noſtrils*. And no doubt, there be other *Perfumes* that do moiſten and refreſh, and are fit to be uſed in *Burning Agues*, *Conſumptions*, and too much *Wakefulneſs*; ſuch as are *Roſe-water*, *Vinegar*, *Lemmon-pills*, *Violets*, the *Leaves* of *Vines* ſprinkled with a little *Roſe-water* &c.

926. They do uſe in *ſudden Faintings* and *Swoonings*, to put a *Handkerchief*, with *Roſe-water*, or a *little Vinegar* to the *Noſe*, which gathereth together again the *Spirits*, which are upon point to reſolve and fall away.

927. *Tobacco* comforteth the *Spirits* and diſchargeth *wearineſs*; which it worketh, partly by opening, but chiefly by the *opiate Vertue*, which condenſeth the *Spirits*. It were good therefore to try the *taking* of *Fumes* by *Pipes* (as they do in *Tobacco*) of other *things*, as well to dry and comfort, as for other *intentions*. I wiſh tryal be made of the *drying Fume* of *Roſemary* and *Lignum Aloes*, before mentioned in *Pipe*; and ſo of *Nutmegs* and *Folium Indum*, &c.

The

928. The *following* of the *Plough* hath been approved for refreshing the *spirits*, and *procuring* Appetite; but to do it in the *Ploughing* for *Wheat* or *Rye* is not so good, because the *Earth* hath spent her sweet *breath* in *Vegetables* put forth in *Summer*. It is better therefore to do it when you sow *Barley*. But because Ploughing is tied to *Seasons*, it is best to take the *Air* of the *Earth* new turned up by *digging* with the Spade, or *standing* by him that *diggeth*. *Gentlewomen* may do themselves much good by kneeling upon a Cushion, and *Weeding*. And these things you may practise in the best *Seasons*, which is ever the *early Spring*, before the *Earth* putteth forth the *Vegetables*, and in the *sweetest Earth* you can chuse. It would be done also when the *Dew* is a little off the *Ground*, lest the *Vapor* be too moist. I knew a great *Man* that lived long, who had a clean *Clod* of *Earth* brought to him every *morning* as he sate in his *Bed*; and he would hold his *head* over it a good pretty while. I commend also sometimes in *digging* of *new Earth*, to pour in some *Malmsey* or *Greek* Wine, that the *Vapor* of the *Earth* and *Wine* together may comfort the *Spirits* the more; provided always it be not taken for a *Heathen Sacrifice* or *Libation* to the *Earth*.

929. They have in *Physick* use of *Pomanders*, and *knots* of *Powders* for *drying* of *Rheums*, *comforting* of the *Heart*, *provoking* of *Sleep*, &c. for though those *things* be not so strong as *Perfumes*, yet you may have them continually in your *hand*, whereas *Perfumes* you can take but at *times*; and besides, there be divers *things* that breath better of themselves than when they come to the *Fire*; as *Nigella Romana*, the Seed of *Melanthium*, *Amomum*, &c.

930. There be two *things* which (inwardly used) do cool and condense the *Spirits*; and I wish the same to be tried outwardly in *Vapors*. The one is *Nitre*; which I would have dissolved in *Malmsey*, or *Greek* Wine, and so the *smell* of the Wine taken; or, if you would have it more forcible, pour of it upon a *Fire-pan* well heated, as they do *Rose-water* and *Vinegar*. The other is, the *distilled* Water of *Wild Poppy*; which I wish to be mingled at half with *Rose water*, and so taken with some *mixture* of a few *Cloves* in a *Perfuming-pan*. The like would be done with the *distilled* Water of *Saffron-Flowers*.

931. *Smells* of *Musk*, and *Amber*, and *Civit*, are thought to further *Venereous Appetite*; which they may do by the *refreshing* and calling forth of the *Spirits*.

932. *Incense* and *Nidorous smells* (such as were of *Sacrifices*) were thought to intoxicate the *Brain*, and to dispose *men* to *devotion*; which they may do by a kind of *sadness* and *contristation* of the *Spirits*, and partly also by *Heating* and *Exalting* them. We see that amongst the Jews, the *principal perfume* of the *Sanctuary* was forbidden all *common uses*.

933. There be some *Perfumes* prescribed by the *Writers* of *Natural Magick*, which procure *pleasant Dreams*; and some others (as they say) that procure *Prophetical Dreams*, as the *Seeds* of *Flax*, *Fleawort*, &c.

934. It is certain, that *Odors* do in a small degree, nourish, especially the *Odor* of *Wine*; and we see *Men* an hungred do love to smell *hot* Bread. It is is related, that *Democritus* when he lay a dying, heard a *Woman* in the House complain, that she should be kept from being at a *Feast* and *Solemnity* (which she much desired to see) because there would be a *Corps* in the House: Whereupon he caused *Loaves* of *new Bread* to be sent for, and opened them, and poured a little *Wine* into them, and so kept himself alive with the

the *Odor* of them till the *Feast* was past. I knew a *Gentleman* that would fast (sometimes) three or four, yea, five days; without Meat, Bread, or Drink; but the same Man used to have continually a great Wisp of *Herbs* that he smelled on, and amongst those *Herbs* some *esculent Herbs* of strong *scent*, as *Onions*, *Garlick*, *Leeks*, and the like.

935. They do use for the *Accident* of the Mother to burn *Feathers*, and other *things* of *ill Odor*; and by those *ill smells* the *rising* of the Mother is put down.

936. There be *Airs* which the *Physitians* advise their *Patients* to remove unto in *Consumptions*, or upon *recovery* of *long sicknesses*, which (commonly) are *plain Champaigns*, but *Grasing*, and not overgrown with *Heath*, or the like; or else *Timber-shades*, as in *Forests*, and the like. It is noted also, that *Groves* of *Bays* do forbid *Pestilent Airs*; which was accounted a great *cause* of the wholesome *Air* of *Antiochia*. There be also some *Soyls* that put forth *Odorate Herbs* of themselvs, as *Wild Thime*, *Wild Majoram*, *Penny royal*, *Camomile*; and in which, the *Bryar-Roses* smell almost like *Musk Roses*; which (no doubt) are *signs* that do discover an *excellent Air*.

937. It were good for *men* to think of having *healthful Air* in their *Houses*; which will never be, if the *Rooms* be *low Roofted*, or full of *Windows* and *Doors*; for the one maketh the *Air close*, and not *fresh*; and the other maketh it exceeding *unequal*, which is a great enemy to *health*. The *Windows* also should not be high up to the *Roof* (which is in use for Beauty and Magnificence) but low. Also *Stone-Walls* are not wholesome; but *Timber* is more wholesome, and especially *Brick*. Nay, it hath been used by some with great success, to make their *Walls* thick, and to put a Lay of *Chalk* between the *Bricks* to take away all *dampishness*.

938. Experiment Solitary, touching *Emissions of Spiritual Species which affect the senses.*

THese *Emissions* (as we said before) are handled, and ought to be handled by themselvs, under their *Proper Titles*, that is, *Visibles*, and *Audibles*, each a part: In this place, it shall suffice to give some general *Observations* common to both. First, they seem to be *Incorporeal*. Secondly, they work *swiftly*. Thirdly, they work at *large distances*. Fourthly, in *curious varieties*. Fifthly, they are not *effective* of any *thing*, nor leave no *work* behind them, but are *energies* meerly; for their *working* upon *mirrors* and *places* of *Eccho* doth not alter any thing in those *Bodies*: but it is the same *Action* with the *Original*, onely *repercussed*. And as for the *shaking* of *Windows*, or *rarifying* the Air by *great noises*, and the *Heat* caused by *Burning-Glasses*, they are rather *Concomitants* of the *Audible* and *Visible Species*, than the *effects* of them. Sixthly, they seem to be of so *tender* and *weak* a *Nature*, as they effect onely such a Rare and Attenuate *Substance*, as is the *Spirit* of *Living Creatures*.

939. Experiments in Consort touching the *Emission of Immateriate Vertues from the Minds, and Spirits of Men, either by Affections, or by Imaginations, or by other Impressions.*

IT is mentioned in some *Stories*, that where *Children* have been *exposed* or taken away young from their *Parents*, and that afterward they have approached to their *Parents* presence, the *Parents* (though they have not known them) have had a *secret Joy*, or other *Alteration* thereupon,

940. There was an *Egyptian Sooth-sayer* that made *Anthonius* believe, that his *genius* (which otherwise was *brave* and confident) was, in the presence of *Octavianus Cæsar*, *poor* and *cowardly*, and therefore, he advised him to absent himself (as much as he could) and remove far from him. The *Sooth-sayer* was thought to be suborned by *Cleopatra*, to make him live in *Egypt*, and other remote

Remote *Places* from *Rome*. Howsoever the Conceit of a *Predominant* or *Mastering Spirit*, of one *Man* over another, is Ancient, and received still, even in *Vulgar Opinion*.

941. There are Conceits, that some *Men*, that are of an *Ill*, and *Melancholy Nature*, do incline the *Company*, into which they come, to be *Sad*, and *Ill disposed*; And contrariwise, that Others, that are of a *Jovial Nature*, do dispose the *Company to be Merry* and *Cheerful*. And again, that some are *Lucky* to be *kept Company* with, and *Employed*; And Others *Unlucky*. Certainly, it is agreeable to *Reason*, that there are, at the least, some *Light Reflections* from *Spirit* to *Spirit*, when *Men* are in *Presence* one with another, as well as from *Body* to *Body*.

942. It hath been observed, that *Old Men*, who have loved *Young company*, and been Conversant continually with them, have been of *Long Life*; Their *Spirits* (as it seemeth,) being recreated by such *company*. Such were the *Ancient Sophists*, and *Rhetoricians*, which ever had *young Auditors* and *Disciples*; as *Gorgias*, *Protagoras*, *Isocrates*, &c. who lived till they were an hundred years old. And so likewise did many of the *Grammarians*, and *School-Masters*; such as was *Orbilius*, &c.

943. *Audacity* and *confidence* doth, in civil business, so great Effects, as a *Man* may (reasonably) doubt, that besides the very *Daring*, and *Earnestness*, and *Persisting*, and *Importunity*, there should be some *Secret binding*, and *Stooping* of other *Mens Spirits* to such *Persons*.

944. The *Affections* (no doubt) do make the *spirits* more *powerful*, and *Active*; and especially those *Affections*, which draw the *spirits* into the *Eyes*: which, are two, *Love* and *Envy*, which is called *Oculus Malus*. As for *Love*, the *Platonists* (some of them) go so far, as to hold, that the *Spirit* of the *Lover* doth pass into the *Spirits*, of the *Person Loved*, which causeth the desire of return into the *Body*, whence it was *Emitted*, whereupon followeth that *appetite of contact* and *conjunction* which is in *Lovers*. And this is observed likewise, that the *Aspects* that procure *Love*, are not *Gazings*, but *Sudden Glances*, and *Dartings* of the *Eye*. As for *Envy*, that emitteth some *Maligne* and *Poysonous Spirit*, which taketh hold of the *Spirit* of another; and is likewise of greatest Force, when the *cast* of the *Eye* is *Oblick*. It hath been noted also, that it is most dangerous, when an *envious eye* is cast upon *Persons* in *Glory*, and *Triumph*, and *Joy*. The *reason* whereof is, for that, at such times, the *Spirits* come forth most into the *Outward parts*, and so meet the *Percussion* of the *Envious Eye*, more at *Hand*: And therefore it hath been noted, that after great *Triumph*, *Men* have been ill disposed, for some Dayes following. We see the opinion of *Fascination* is Ancient, for both *Effects* of Procuring *Love*; and *sickness* caused by *Envy*: and *Fascination* is ever by the *Eye*. But yet if there be any such *Infection* from *Spirit* to *Spirit*, there is no doubt, but that it worketh by *Presence*, and not by the *Eye* alone, yet most forcibly by the *Eye*.

945. *Fear* and *Shame*, are likewise *Infective*; for we see that the *starting* of one, will make another ready to *Start*: And when one *man* is out of *countenance* in a *company*, others do likewise *Blush* in his behalf.

Now we will speak of the *Force* of *Imagination* upon other *Bodies*; and of the *means* to *exalt* and *strengthen* it. *Imagination*, in this place, I understand to be, the *representation* of an *Individual thought*. *Imagination* is of three kinds: the first *Joyned* with *Belief* of that which is to *come*: the Second *joyned* with *Memory* of that which is *Past*: And the third is of *Things Present*, or as if they were *Present*; For I comprehend in this *Imagination*

Feigned

feigned, and at *Pleasure*; As if one should *Imagine* such a *Man* to be in the *Vestments* of a *Pope*, or to have *Wings*. I single out, for this time, that which is with *Faith*, or *Belief* of that which is to *come*. The *Inquisition* of this *Subject*, in our way, (which is by *induction*,) is wonderful hard, for the *Things* that are reported, are full of *Fables*; and *new Experiments* can hardly be made, but with extream caution. for the reason which we will hereafter declare.

The *Power* of *Imagination* is in three kinds; The first upon the *Body* of the *Imaginant*, including likewise the *Child* in the *Mothers Womb*; the second is, the Power of it upon *Dead Bodies*; as *Plants*, *Wood*, *Stone*, *Metal*, &c. The third is, the Power of it, upon the *Spirits* of *Men*, and *Living Creatures*. And with this last we will only meddle.

The *Problem* therefore is, whether a *Man constantly* and *strongly beleiving*, that such a *Thing* shall be; (As that such an *one* will *Love him* or that such an *one* will *Grant him* his *request*, or that such an *one* shall *recover* a *sickness*, or the like) it doth help any thing to the *Effecting* of the *Thing* it selfe. And here again we must warily distinguish; For it is not meant, (as hath been partly said before) that it should help by *Making* a *Man* more *Stout*, or more *Industrius*: (In which kind a *Constant belief* doth much) but meerly by a *secret operation*, or *binding*, or *changing* the *spirit* of *another*: And in this it is hard, (as we began to say) to make any *new Experiment* for I cannot *command* my self to *beleive* what *I* will, and so no *Tryal* can be made. Nay it is worse, for whatsoever a *Man Imagineth doubtingly*, or with *fear*, must needs do hurt, if *Imagination* have any Power at all; for a *Man* representeth that oftner, that he feareth, than the contrary.

The Help therefore is, for a *Man* to work by *another*, in whom he may Create *Belief*, and not by *himself*, until *himself* have found by *Experience* that *Imagination* doth prevail; for then *Experience* worketh in *himself belief*, if the *belief*, that such a *Thing* shall be, be joyned with a *belief*, that his *Imagination* may procure it.

946. For example; I related one time to a *man*, that was curious and vain enough in these things, *that I saw a kind of* Jugler *that had a* Pair *of* Cards, *and would tell a* Man *what* Card *he thought*. This pretended learned man told me it was a mistaking in me. *For* (*said he*) *it was not the* knowledge *of the* mans thought, (*for that is proper to* God) *but it was the* inforcing *of a* thought *upon him*, *and* binding *his* Imagination *by a* stronger, *that he could* think no other *Card* And thereupon he asked me a *Question*, or two which I thought he did but cunningly, knowing before what used to be the *feats* of the *Jugler*. *Sir*, (*said he*) *do you remember whether he told the* Card, *the* Man *thought*, himself, *or bade* another *to tell it*. I answered (as was true) *That he bade another tell it*. Whereunto he said; *so I thought: for* (*said he*) *himself could not have put on so strong an* Imagination, *but by telling the other the* Card, (*who beleived that the* Jugler *was some strange* Man *and could do strange* things) *that other* Man *caught a* strong Imagination. I harkened unto him, thinking for a vanity he spoke prettily. Then he asked me another *question*: saith he, *do you remember, whether he bad the* Man *think the* Card *first*, *and afterwards told the other* man *in his Ear*, *what he should think*, *or else that he did whisper first in the* Mans *ear*, *that should tell the* card, *telling that such a* man *should think such a* card, *& after bade the* man *think a* card? I told him, as was true: *that he did first whisper the* Man *in the ear that such a* man *should think such a* card: upon this the *Learned man* did much exult, & please himself saying, *do you may see that my* opinion *is right: for if the* man *had thought first*, *his thought had bin fixed*; *but the other Imagining first*, *bound his thought*: which though it did somwhat sink with me, yet I made

made it lighter than I thought, and said, *I thought it was* confederacy *between the* Jugler, *and the two* Servants; though (indeed) I had no reason so to think for they were both my *Fathers* servants, and he had never plaid in the House before. The *Jugler* also did cause a *Garter* to be held up, and took upon him to know that such an *one* should point in such a *place* of the *Garter*, as it should be near so many *Inches* to the *longer end*, and so many to the *shorter*; and still he did it by *first telling* the *Imaginer*, and after *bidding* the *Actor think*.

Having told this *Relation*, not for the weight thereof, but because it doth handsomly open the *Nature* of the *Question*, I return to that I said, That *Experiments* of *Imagination* must be practised by others, and not by a *Mans* self. For there be three *means* to fortifie *Belief*; the first is *Experience*, the second is *Reason*, and the third is *Authority*. And that of these which is far the most *potent*, is *Authority*: For *Belief* upon *Reason* or *Experience* will stagger.

947. For *Authority*, it is of two kinds: *Belief* in an *Art*, and *Belief* in a *Man*. And for things of *Belief* in an *Art*, a Man may exercise them by *himself*; but for *Belief* in a *Man*, it must be by another. Therefore if a *Man* believe in *Astrology*, and find a *figure* prosperous; or believe in *Natural Magick*, and that a *Ring* with such a *Stone*, or such a *piece* of a *Living Creature* carried, will do good, it may help his *Imagination*; but the *Belief* in a *Man* is far the more *active*. But howsoever all *Authority* must be out of a *Mans self*, turned (as was said) either upon an *Art*, or upon a Man; and where *Authority* is from one *Man* to another, there the second must be *Ignorant*, and not *learned*, or *full* of *thoughts*: And such are (for the most part) all *Witches* and *superstitious persons*, whose *Beliefs*, tied to their *Teachers* and *Traditions*, are no whit controlled either by *Reason* or *Experience*: And upon the same reason, in *Magick* they use (for the most part) *Boys* and *Young People*, whose *Spirits* easiliest take *Belief* and *Imagination*.

Now to fortifie *Imagination*, there be three ways: The *Authority* whence the *Belief* is derived; *Means* to *quicken* and *corroborate* the *Imagination*; and *Means* to *repeat* it and *refresh* it.

948. For the *Authority* we have already spoken. As for the second, namely, the *Means* to *quicken* and *corroborate* the *Imagination*, we see what hath been used in *Magick*; (if there be in those practices any thing that is purely *Natural*) as *Vestments*, *Characters*, *Words*, *Seals*, some parts of *Plants*, or *Living Creatures*, *Stones*, *choice* of the *Hours*, *Gestures* and *Motions*; also *Incenses* and *Odors*, *choise* of Society, which encreaseth *Imagination*, *Diets*, and *Preparations* for some time before. And for *Words*, there have been ever used, either *barbarous Words* of no sense, lest they should disturb the *Imagination*; or *Words* of *similitude*, that may second and feed the *Imagination*: And this was ever as well in *Heathen Charms*, as in *Charms* of later times. There are used also *Scripture Words*, for that the *Belief* that *Religious Texts* and *Words* have power, may strengthen the *Imagination*. And for the same reason *Hebrew words* (which among us is counted the *holy Tongue*, and the *words* more *mystical*) are often used.

949. For the *refreshing* of the *Imagination* (which was the third *Means* of *Exalting* it) we see the practices of *Magick*; as in *Images* of *Wax*, and the like, that should melt by little and little, or some other *things buried* in *Muck*, that should putrifie by little and little, or the like: For so oft as the *Imaginant* doth think of those things, so oft doth he represent to his *Imagination*, the *effect* of that he desireth.

950. If there be any *power* in *Imagination*, it is leſs credible that it ſhould be ſo *incorporeal* and *immateriate* a *Virtue*, as to work at great *diſtances*, or through all *Mediums*, or upon all *Bodies*; but that the *diſtance* muſt be competent; the *Medium* not adverſe, and the *Body* apt and proportionate. Therefore if there be any operation upon *Bodies* in abſence by Nature, it is like to be conveyed from *Man* to *Man*, as *Fame* is: As if a *Witch* by *Imagination* ſhould hurt any a far off, it cannot be naturally, but by working upon the *Spirit* of ſome that cometh to the *Witch*, and from that *party* upon the *Imagination* of *another*, and ſo upon *another* till it come to one that hath reſort to the *party intended*; and ſo by *him*, to the *party intended himſelf*. And although they ſpeak, that it ſufficeth to take a *Point*, or a *peice* of the *Garment*, or the *Name* of the *party*, or the like; yet there is leſs credit to be given to thoſe things, except it be by *working* of evil *ſpirits*.

The *Experiments* which may certainly demonſtrate the *power* of *Imagination* upon other *Bodies*, are few or none; for the *Experiments* of *Witchcraft* are no clear proofs, for that they may be by a tacite *operation* of *malign Spirits*; we ſhall therefore be forced in this *Inquiry*, to reſort to new *Experiments*, wherein we can give onely *Directions* of *Tryals*, and not any *Poſitive Experiments*. And if any *man* think that we ought to have ſtaid till we had made *Experiment* of ſome of them our ſelves, (as we do commonly in other *Titles*) the truth is, that theſe *Effects* of *Imagination* upon other *Bodies*, have ſo little credit with us, as we ſhall try them at leiſure: But in the mean time we will lead others the way.

951. When you work by the *Imagination* of *another*, it is neceſſary that he, by whom you work, have a *precedent opinion* of you, that you can do ſtrange things, or that you are a *Man* of *Art*, as they call it; for elſe the ſimple *affirmation* to another, that this or that ſhall be, can work but a weak *impreſſion* in his *Imagination*.

952. It were good, becauſe you cannot diſcern fully of the *ſtrength* of *Imagination* in one *Man*, more then another, that you did uſe the *Imagination* of more then *one*, that ſo you may light upon a *ſtrange one*. As if a *Phyſitian* ſhould tell three or four of his *Patients ſervants* that their *Maſter* ſhall ſurely recover.

953. The *Imagination of one* that you ſhall uſe (ſuch is the variety of *Mens minds*) cannot be always alike *conſtant* and *ſtrong*; and if the ſucceſs follow not ſpeedily, it will faint and loſe *ſtrength*. To remedy this, you muſt pretend to him whoſe *Imagination* you uſe ſeveral *degrees* of *Means* by which to *operate*: As to preſcribe him, that every three days, if he find not the ſucceſs apparent, he do uſe another *Root*, or *part* of a *Beaſt*, or *Ring*, &c. as being of more *force*; and if that fail, another; and if that, another, till ſeven times. Alſo you muſt preſcribe a good large time for the *effect* you promiſe; as if you ſhould tell a *ſervant* of a *ſick man*, that his *Maſter* ſhall recover, but it will be fourteen days ere he findeth it apparently, &c. All this to entertain the *Imagination*, that it waver leſs.

954. It is certain, that *potions* or *things* taken into the *Body*, *Incenſes* and *Perfumes* taken at the *Noſtrils*, and *oyntments* of ſome *parts* do (naturally) work upon the *Imagination* of him that taketh them. And therefore it muſt needs greatly *cooperate* with the *Imagination* of him whom you uſe, if you preſcribe him, before he do uſe the *Receit* for the Work which he deſireth, that he do take ſuch a *Pill*, or a *ſpoonful* of *Liquor*, or burn ſuch an *Inſence*, or *anoint* his *Temples*, or the *Soles* of his Feet, with ſuch an *Oyntment* or *Oyl*: And you muſt chuſe for the *Compoſition* of ſuch *Pill*, *Perfume*, or

Oynt-

Ointment, such *Ingredients* as do make the *Spirits* a little more *grosse* or *muddy*, whereby the *Imagination* will fix the better.

The *Body passive*, and to be *wrought upon*, (I mean not of the *Imaginant*) is better wrought upon (as hath ben partly touched) at some *times* then at others; As if you should prescribe a *Servant* about a *sick person*, (whom you have possessed that his *Master* shall recover) when his *Master* is fast asleep, to use such a Root, or such a *Root*. For *Imagination* is like to work better upon *sleeping men*, then *men awake*; as we shall shew when we handle *Dreams*. 955.

We find in the *Art of Memory*, that *Images visible* work better then other *conceits*: As if you would remember the word *Philosophy*, you shall more surely do it by *imagining* that such a *Man* (for *Men* are best *places*) is reading upon *Aristotles Physicks*, then if you should imagine him to say, *Ile go study Philosophy*. And therefore this *observation* would be translated to the *subject* we now speak of; for the more lustrous the *Imagination* is, it filleth and fixeth the better. And therefore I conceive, that you shall in that *Experiment* (whereof we spake before) of *binding* of *thoughts*, less fail, if you tell one that such an one shall name *one* of *twenty men*, then if it were *one* of *twenty Cards*. The *Experiment* of *binding* of *thoughts* would be diversified and tried to the full: And you are to note, whether it hit for the most part, though not always. 956.

It is good to consider upon what *things Imagination* hath most force: And the *rule* (as I conceive) is, that it hath most *force* upon *things* that have the *lightest* and *easiest motions*; and therefore above all upon the *Spirits* of *Men*, and in them upon such *affections* as move *lightest*: As upon *procuring* of *Love*, *binding of lust*, which is ever with *Imagination* upon *Men* in *fear*, or *Men* in *irresolution*, and the like: Whatsoever is of this kind would be throughly enquired. *Tryals* likewise would be made upon *Plants*, and that diligently: As if you should tell a *man* that such a *Tree* would die this year, and will him at these and these times to go unto it, to see how it thriveth. As for *inanimate things*, it is true, that the *Motion* of *Shuffling* of *Cards*, or *casting* of *Dice*, are very *light motions*; and there is a *Folly* very usual, That *Gamesters* imagine, that some that stand by them, bring them ill luck. There would be a Trial also made, of holding a *Ring* by a *thred* in a *Glass*, and telling him that holdeth it before, that it shall strike so many times against the *side* of the *Glass*, and no more; or of holding a *Key* between two *mens Fingers* without a *Charm*; and to tell those that hold it, that at such a *Name* it shall go off their *fingers*. For these two are extream light *motions*. And howsoever, I have no *opinion* of these things yet so much I conceive to be true, That *strong Imagination* hath more force, upon *things living*, or that have been *living*, then *things* meerly *inanimate*; and more force likewise upon *light* and *subtil motions*, then upon *motions vehement* or *Ponderous*. 957.

It is an usual *Observation*, That if the *Body* of one *murthered* be brought before the *Murtherer*, the *wounds* will bleed afresh. Some do affirm, That the *dead Body*, upon the presence of the *Murtherer* hath opened the *Eyes*; and that there have been such like *motions* as well where the *party murthered* hath been *strangled* or *drowned*, as where they have been *killed* by *wounds*. It may be that this participateth of a *Miracle*, by *Gods* just judgement, who usually brings *murthers* to light. But if it be *Natural*, it must be referred to *Imagination*. 958.

The *tying* of the *point* upon the day of *Marriage* to make *Men* impotent 959.

tent towards their *Wives*, which (as we have formerly touched) is so frequent in *Zant* and *Gascony*, if it be *Natural*, must be referred to the *Imagination* of *him* that *tieth* the *Point*. I conceive it to have the less affinity with *Witchcraft*, because not peculiar persons onely, (such as *Witches* are) but any *Body* may do it.

960. Experiment in Consort, touching the *Secret Virtue of Sympathy and Antipathy.*

There be many *things* that work upon the *Spirits of Men* by *Secret Sympathy* and *Antipathy*. The *vertues* of *Precious Stones* worn, have been anciently and generally received, and curiously assigned to work several *effects*. So much is true, that *Stones* have in them fine *Spirits*, as appeareth by their *splendor*: And therefore they may work by *consent* upon the *Spirits* of *Men*, to comfort and exhilarate them. Those that are the best for that *effect*, are the *Diamond*, the *Emerald*, the *Jacinth Oriental*, and the *Gold stone*, which is the *yellow Topaz*. As for their particular *Proprieties*, there is no credit to be given to them. But it is manifest, that *Light* above all things, excelleth in *comforting* the *Spirits* of *Men*: and it is very probable, that *Light varied* doth the same *effect* with more *Novelty*. And this is one of the *causes* why *Precious Stones* comfort. And therefore it were good to have *Tinctured Lanthorns*, or *Tinctured Skreens* of *Glass coloured* into *Green*, *Blue*, *Carnation*, *Crimson*, *Purple*, *&c.* and to use them with *Candles* in the *night*. So likewise to have round *Glasses*, not onely of *Glass coloured through*, but with *Colours* laid between *Crystals*, with *handles* to hold in ones hand. *Prismes* are also comfortable things. They have of *Paris work*, *Looking Glasses*, broidered with broad *Borders* of small *Crystal*, and great counterfeit *Precious Stones* of all *Colours*, that are most glorious and pleasant to behold, especially in the *Night*. The *Pictures* of *Indian Feathers* are likewise comfortable and pleasant to behold. So also fair and clear *Pools* do greatly comfort the *Eyes Spirits*; especially when the *Sun* is not *glaring* but *overcast*, or when the Moon shineth.

961. There be divers sorts of *Bracelets* fit to *comfort* the *Spirits*; and they be of three *Intentions*; *Refrigerant*, *Corroborant*, and *Aperient*. For *Refrigerant* I wish them to be of *Pearl*, or of *Coral*, as is used. And it hath been noted that *Coral*, if the *party* that weareth it be ill disposed, will wax *pale*; which I believe to be true, because otherwise *distempers* of *heat* will make *Coral* lose colour. I commend also *Beads* or little *Plates* of *Lapis Lazuli*, and *Beads* of *Nitre*, either alone, or with some *Cordinal mixture*.

962. For *Corroboration* and *Comfortation*, take such *Bodies* as are of *astringent quality* without *manifest cold*. I commend *Bead-Amber*, which is full of *Astriction*, but yet is *unctuous*, and not *cold*, and is conceived to *impregnate*, those that wear such *Beads*. I commend also *Beads* of *Harts-Horn* and *Ivory*, which are of the like nature; also *Orenge Beads*, also *Beads* of *Lignum Aloes*, *macerated* first in *Rose-water* and *dried*.

963. For *opening*, I commend *Beads*, or *peices* of the *Roots* of *Carduus Benedictus*; also of the *Roots* of *Peony* the Male, and of *Orras*, and of *Calamus Aromaticus*, and of *Rew*.

964. The Cramp (no doubt) cometh of *contraction* of *Sinews*; which is manifest in that it cometh either by *cold* or *dryness*, as after *Consumptions* and *long Agues*; for *Cold* and *Driness* do (both of them,) *contract* and *corrugate*. We see also, that *chafing* a little above the *place* in pain, easeth the *Cramp*; which is wrought by the *Delitation* of the *contracted Sinews* by *heat*. There are in use for the prevention of the *Cramp*, two things: The one, *Rings* of *Sea-horse Teeth* worn upon the *Fingers*; the other, *Bands* of

of *Green Periwinkle* (the *Herb*) tied about the *Calf* of the *Leg*, or the *Thigh*, &c. where the *Cramp* useth to come. I do find this the more strange, because neither of these have any *Relaxing Virtue*, but rather the contrary. I judge therefore that their *working* is rather upon the *Spirits* within the *Nerves* to make them strive less, then upon the *Bodily substance* of the *Nerves*.

965. I would have *tryal* made of two other *kinds of Bracelets* from *comforting* the *Hearts* and *Spirits*. The one of the *Trochisch of Vipers* made into little *pieces of Beads*; for since they do great good inwards (especially for *Pestilent Agues*) it is like they will be effectual outwards, where they may be applied in greater *quantity*. There would be *Trochisches* likewise made of *Snakes*, whose *flesh dried* is thought to have a very *opening* and *Cordial Virtue*. The other is of *Beads* made of the *Scarlet Powder*, which they call *Kerms*, which is the principal *Ingredient* in their *Cordial Confection Alkermes*. The *Beads* would be made up with *Amber Greece*, and some *Pomander*.

966. It hath been long received, and confirmed by divers *tryals*, that the Root of the *Male Piony* dried, tied to the *Neck*, doth help the *Falling-sickness* and likewise the *Incubus*, which we call the *Mare*. The *cause* of both these *Diseases*, and especially of the *Epilepsie* from the *Stomach*, is the *grossness* of the *Vapors* which rise and enter into the *Cells* of the *Brain*: And therefore the *working* is by *extream* and *subtil Attenuation*, which that *Simple* hath. I judge the like to be in *Castoreum*, *Musk*, *Rew-seed*, *Agnus Castus Seed*, &c.

967. There is a *Stone* which they call the *Blood-Stone*, which worn, is thought to be good for them that *bleed* at the *Nose*; which (no doubt) is by *astriction* and *cooling* of the *Spirits*. *Quære*, if the *Stone* taken out of the *Toads Head*, be not of the like virtue, for the *Toad* loveth *Shade* and coolness.

968. *Light* may be taken from the *Experiment* of the *Horse-tooth Ring*, and the *Garland of Periwinckle*, how that those things which asswage the *strife* of the *Spirits* do help diseases, contrary to the *Intention* desired; for in the *curing* of the *Cramp*, the *Intention* is to relax the *Sinews*; but the *contraction* of the *Spirits*, that they strive less, is the best help: So to procure ease *Travail of Women*, the Intention is to bring down the *Child*; but the best help is, to stay the *coming down* too *Fast*; whereunto they say the *Toad-stone* likewise helpeth. So in *Pestilent Fevers*, the *Intention* is to expel the *Infection* by *Sweat* and *Evaporation*; but the best *means* to do it, is by *Nitre Diascordium* and other *cool things*, which do for a time arrest the *Expulsion*, till *Nature* can do it more quietly. For as as one saith prettily, *In the quenching of the flame of a Pestilent Ague, Nature is like People that come to quench the Fire of an House; which are so busie, as one of them letteth another.* Surely it is an excellent *Axiome*, and manifold *use*, that whatsoever appeaseth the *contention of Spirits* furthereth their *action*.

969. The *Writers of Natural Magick* commend the wearing of the *spoil* of a *Snake*, for *Preserving of Health*. I doubt it is but a *conceit*; for that the Snake is thought to renew her *Youth* by casting her *spoil*. They might as well take the *Beak* of an *Eagle*, or a piece of a *Harts-horn*, because those renew.

970. It hath been anciently *received*, (for *Pericles* the *Athenian* used it) and it is yet in use, to wear little *Bladders of Quick-silver*, or *Tablets* of *Arsenick*, as *preservatives* against the *Plague*: Not, as they conceive, for any *comfort* they yield to the *Spirits*; but for that being *poysons* themselves, they draw the *venome* to them from the *Spirit*.

971. *Vide the Experiments* 95, 96, and 97, touching the *several Sympathies* and *Antipathies* for *Medicinal use*.

972. It is said, that the *Guts* or *Skin* of a *Wolf*, being applied to the *Belly*, do cure the *Cholick*. It is true, that the *Wolf* is a *Beast* of great *Edacity*, and *Digestion*; and so it may be the *parts* of him comfort the *Bowels*.

973. We see *Scare-crows* are set up to keep *Birds* from *Corn* and *Fruit*. It is reported by some, that the *Head* of a *Wolf*, whole, dried and hanged up in a *Dove house*, will scare away *Vermin*, such as are *Weasils*, *Polecats*, and the like. It may be the *Head* of a *Dog* will do as much; for those *Vermin* with us, know *Dogs* better than *Wolves*.

974. The *Brains* of some *Creatures*, (when their *Heads* are rosted) taken in *Wine*, are said to strengthen the *Memory*; as the *Brains* of *Hares*, *Brains* of *Hens*, *Brains* of *Deers*, &c. And it seemeth to be incident to the *Brains* of those *Creatures* that are fearful.

975. The *Oyntment* that *Witches* use, is reported to be made of the *Fat* of *Children* digged out of their *Graves*; of the *Juyces of Smallage*, *Wolf-bane*, *Cinquefoil*, mingled with the *Meal* of *Fine Wheat*. But, I suppose, that the *Soporiferous Medicines* are likest to do it; which are *Henbane*, *Hemblock*, *Mandrake*, *Moon shade*, *Tobacco*, *Opium*, *Saffron*, *Poplar-leaves*, &c.

976. It is reported by some, that the *affections* of *Beasts* when they are in strength, do add some *virtue* unto *Inanimate things*: As that the *Skin* of a *Sheep* devoured by a *Wolf* moveth *itching*; that a *stone* bitten by a *Dog* in anger, being thrown at him, drunk in *Powder* provoketh *Choler*.

977. It hath been observed, that the *diet of Women* with *Child*, doth work much upon the *Infant*. As if the *Mother* eat *Quinces* much, and *Coriander-seed* (the *nature* of both which, is to repress and stay *vapors* that ascend to the *Brain*) it will make the *Child* ingenious: And one the contrary side, if the *Mother* eat (much) *Onions* or *Beans*, or such *vaporous food*, or drink *Wine* or *strong Drink* immoderately, or *Fast* much, or be given to much musing, (all which send or draw vapors to the *Head*) it endangereth the *Child* to become *Lunatick*, or of *imperfect memory*: And I make the same judgment of *Tobacco* often taken by the *Mother*.

978. The *Writers* of *Natural Magick* report, that the *Heart* of an *Ape* worn near the *Heart*, comforteth the *Heart*, and increaseth *audacity*. It is true, that the *Ape* is a merry and bold *Beast*. And that the same *Heart* likewise of an *Ape* applied to the *Neck* or *Head*, helpeth the *Wit*, and is good for the *Falling sickness*. The *Ape* also is a witty *Beast*, and hath a *dry Brain*; which may be some *cause of attenuation of Vapors* in the *Head*. Yet it is said to move *Dreams* also. It may be the *Heart* of a *Man* would do more, but that it is more against *Mens* minds to use it; except it be in such as wear the *Reliques of Saints*.

979. The *Flesh* of a *Hedghog* dressed and eaten, is said to be a great *drier*. It is true, that the *Juice* of a *Hedgehog*, must needs be *Harsh* and *Dry*, because it putteth forth so many *Prickles*: For *Plants* also that are full of *Prickles*, are generally dry; as *Briars*, *Thorns*, *Barberries*. And therefore the *Ashes* of

980. a *Hedghog* are said to be a great *Desiccative* of *Fistula's*.

Mummy hath great force in *Stanching* of *blood*; which as it may be ascribed to the *Mixture* of *Balmes*, that are *Glutinous*; so it may also partake of a secret *Propriety*, in that the *blood* draweth *Mans Flesh*. And it is approved, that the *Moss* which groweth upon the *Scull* of a *Dead Man* unburied will stanch *blood* potently. And so do the *dregs* or *Powder of blood* severed from the *Water* and *dried*.

It

It hath been practiſed to make *White Swallows*, by *anointing* of the *Eggs* with *Oyl*. Which *effect* may be produced by the *ſtopping* of the *Pores* of the *Shell*, and making the *Juice* that putteth forth the *Feathers* afterwards more penurious, and it may be, the *anointing* of the *Eggs* will be as effectual as the *anointing* of the *Body*. Of which, *Vide the Experiment* 93. 981.

It is reported, that the *White* of an *Egg*, or *Blood* mingled with *Salt-water*, doth gather the *Saltneſs*, and maketh the *water* ſweeter. This may be by *Adheſion*; as in the *Sixth Experiment* of *Clarification*. It may be alſo, that *Blood*, and the *White* of an *Egg*, (which is the *matter* of a *Living Creature*) have ſome *Sympathy* with *Salt*; for all *Life*, hath a *Sympathy* with *Salt*. We ſee that *Salt* laid to a *cut fingure*, healeth it; ſo, as it ſeemeth, *Salt* draweth *Blood*, as well as *Blood* draweth *Salt*. 982.

It hath been anciently recieved, that the *Sea-Hare* hath an *Antipathy* with the *Lungs*, (if it cometh near the Body) and erodeth them. Whereof the *cauſe* is conceived to be a *quallity* it hath of *heating the Breath* and *Spirits*; as *Cantharides* have upon the *watry parts* of the *Body*, as *Urine* and *Hydropical Water*. And it is a good *rule*, That whatſoever hath an *operation* upon certain *kinds* of *Matters*, that in *Mans Body* worketh moſt upon thoſe *parts* wherein that kind of *matter* aboundeth. 983.

Generally that which is *Dead*, or *Corrupted*, or *Excerned*, hath *antipathy* with the ſame *thing* when it is *alive*, and when it is *ſound*, and with thoſe *parts* which do *excern*: as a *Carcaſs of Man* is moſt *infectuous* and *odious* to *Man*, a *Carrian* of an *Horſe* to an *Horſe*, &c. *Purulent* matter of *Wounds and Ulcers*, *Carbuncles*, *Pox*, *Scabs*, *Leproſie*, *to ſound Fleſh*; and the *Excrement* of every *Species* to that *Creature* that *excerneth* them. But the *Excrements* are leſs pernicious then the *corruptions*. 984.

It is a common *experience*, That *Dogs* know the *Dog-killer*, when as in times of Infection ſome petty *Fellow* is ſent out to kill the *Dogs*; and that though they have never ſeen him before, yet they will all come forth, and bark, and fly at him. 985.

The *Relations* touching the *Force of Imagination*, and the *Secret inſtincts* of *Nature*, are ſo uncertain, as they require a great deal of *Examination* ere we conclude upon them. I would have it firſt throughly inquired, whether there be any ſecret paſſages of *Sympathy* between *Perſons* of *near blood*; as *Parents*, *Children*, *Brothers*, *Siſters*, *Nurſe-children*, *Husbands*, *Wives*, &c. There be many reports in *Hiſtory*, that upon the *death* of *Perſons* of ſuch nearneſs, *Men* have had an inward *feeling* of it. I my ſelf remember, that being in *Paris*, and my *Father* dying in *London*, two or three days before my *Fathers* death, I had a *dream*, which I told to divers *Engliſh Gentlemen*, that my *Fathers Houſe* in the *Country* was *Plaiſtered* all over with *Black Mortar*. There is an opinion abroad, (whether idle, or no I cannot ſay) That loving and kind *Husbands* have a *ſenſe* of their *Wives breeding Child* by ſome *accident* in their own *Body*. 986.

Next to thoſe that are *near* in *blood*, there may be the like *paſſage* and *inſtincts of Nature* between great *Friends* and *Enemies*. And ſometimes the revealing is unto another *perſon*, and not to the *party* himſelf. I remember *Philippus Comineus* (a grave Writer) reporteth, That the *Arch-biſhop* of *Vienna* (a *Reverend Prelat*) ſaid (one day) after *Maſs* to *King Lewis* the Eleventh of *France*, *Sir*, *Your Mortal Enemy is dead*; what time *Duke Charls* of *Burgundy* was ſlain at the *Battel* of *Granſon* againſt the *Switzers*. Some tryal alſo would be made, whether *Pact* or *Agreement* do any thing; as if two *Friends* ſhould agree, That ſuch a *day* in every *Week*, they being in far *diſtant places* ſhould 987.

pray

Pray one for another; or should put on a *Ring* or *Tablet*, one for another's sake; whether if one of them should break their *Vow* and *Promise*, the other should have any *Feeling* of it, in *Absence*.

988. If there be any *Force* in *Imaginations* and *Affections* of *Singular Persons*; It is Probable the *Force* is much more in the *Joynt Imaginations* and *Affections* of *Multitudes*: as if a *Victory* should be won, or lost in *Remote Parts*, whether is there not some *Sense* thereof, in the *People* whom it concerneth; because of the great *Joy*, or *Grief*, that many *Men*, are possessed with at once? *Pius Quintus*, at the very time, when that Memorable *Victory* was won, by the *Christians*, against the *Turks*, at the *Naval Battel* of *Lepanto* being then hearing of *causes* in *Consistory*, brake off suddenly, and said to those about him; *It is now more time, we should give thanks to God, for the great Victory he hath granted us, against the Turks.* It is true, that *Victory* had a *Sympathy* with his *Spirit*; for it was meerly his work, to conclude that *League*. It may be, that *Revelation* was *divine*; but what shall we say then to a number of *examples*, amongst the *Grecians*, and *Romans*? where the *people* being in *Theaters* at *Plays*, have had news of *victories* and *overthrows* some few days, before any *Messenger* could come.

It is true, that that may hold in these things, which is the general *Root* of *Superstition*: namely, that *Men* observe when *things Hit*, and not when they miss: and commit to memory the one, and forget and pass over the other. But touching *Divination*, and the *misgiving* of *minds*, we shall speak more, when we handle in general, the *nature* of *minds*, and *Souls*, and *Spirits*.

989. We have given formerly some *Rules* of *Imagination*; and touching the *fortifying* of the Same. We have set down also some few *instances*, and *directions*, of the *force* of the *Imagination*, upon *Beasts*, *Birds*, &c. upon *plants*, and upon *Inanimate bodies*: wherein you must still observe, that your *tryals* be upon *subtil* and *light motions*, and not the contrary; for you will sooner by *Imagination*, bind a *Bird* from *singing*, than from *eating* or *flying*: and I leave it to every *Man*, to choose *Experiments*, which himself thinketh most commodious; giving now but a few *examples* of every of the three kinds.

990. Use some *Imaginant*, (observing the *Rules* formerly prescribed) for *binding* of a *Bird* from *singing*; and the like of a *dog* from *barking*. Try also the *Imagination* of some, whom you shall accommodate with things to fortifie it in *Cock fights*, to make one *Cock* more hardy, and the other more cowardly. It would be tried also in *flying* of *Hawks*; or in *coursing* of a *Deer* or *Hare*, with *Grey-hounds*; or in *Horse-Races*; and the like *comparative Motions*: for you may sooner by *Imagination* quicken or slack a *Motion*, than raise or cease it; as it is easier to make a *dog* go slower, than to make him stand still that he may not run.

991. In *Plants* also you may try the *force* of *Imagination*; upon the *lighter* sort of *Motions*: as upon the sudden *Fading* or lively *coming up* of *Herbs*; or upon their *bending* one way or other; or upon their *Closing* and *Opening*, &c.

992. For *Inanimate things*, you may try the *force* of *Imagination*, upon staying the *working* of *beer* when the *Barm* is put in; or upon the *coming* of *butter* or *cheese* after the *Charming*, or the *Rennet* be put in.

993. It is an ancient *Tradition* every where alledged, for *example* of *secret proprieties* and *influxes* that the *Torpedo Marina*, if it be touched with a long stick, doth stupifie the *hand* of him that toucheth it. It is one degree of

work-

working at *distance*, to work by the continuance of a fit *Medium*; as *Sound* will be conveyed to the *Ear* by striking upon a *Bow-string*, if the *Horn* of the Bow be held to the *Ear*.

The *Writers* of *Natural Magick* do attribute much to the *Vertues* that come from the *parts* of *Living Creatures*, so as they be taken from them, the *Creatures* remaining still alive; as if the *Creature* still living did infuse some *immateriate Vertue* and *vigor* into the *part severed*. So much may be true, that any *part* taken from a *Living Creature* newly *slain*, may be of greater force, then if it were taken from the like *Creature dying* of it *self*; because it is fuller of *Spirit*. 994.

Tryal would be made of the like *parts* of *Individuals* in *Plants* and *Living Creatures*; as to cut off a *Stock* of a *Tree*, and to lay that which you cut off to *putrefie*, to see whether it will decay the rest of the *Stock*; or if you should cut off part of the *Tail*, or *Leg* of a *Dog*, or a *Cat*, and lay it to *putrefie*, and so see whether it will *fester*, or keep from *healing*, the *part* which remaineth. 995.

It is received, that it helpeth to *continue love*, if one wear a *Ring* or a *Bracelet* of the *Hair* of the *party beloved*. But that may be by the *exciting* of the *Imagination*; and perhaps a *Glove*, or other like *Favor*, may as well do it. 996.

The *Sympathy* of *individuals* that have been *Intire*, or have *Touched*, is of all others, the most *Incredible*: yet according unto our faithful manner of *Examination* of *Nature*, we will make some little mention of it. The *taking away* of *Warts*, by *Rubbing* them with somewhat that afterwards is put to waste and consume, is a common *Experiment*; and I do apprehend it the rather, because of mine own *Experience*. I had from my *Childhood*, a *Wart* upon one of my *Fingers*, afterwards, when I was about sixteen years old, being then at *Paris*, there grew upon both my *Hands* a number of *Warts* (at least on hundred) in a moneths space. The *English Embassadours Lady*, who was a *Woman* far from *Superstition*, told me one day she would help me away with my *Warts*. Whereupon she got a *Piece* of *Lard* with the *Skin* on, and rubbed the *Warts* all over with the *Fat Side*, and amongst the rest that *Wart* which I had had from my *Childhood*; than she nailed the *piece* of *Lard* with the *Fat* towards the *Sun*, upon a *Post* of her *Chamber Window*, which was to the *South*. The success was, that within five weeks space all the *Warts* went quite away, and that *Wart* which I had so long endured for company. But at the rest I did little marvel, because they came in a short time, and might go away in a short time again; but the going away of that which had staid so long doth yet stick with me. They say the like is done by the *rubbing* of *warts* with a green *Elder-stick*, and then *Burying* the *Stick* to *Rot* in *Muck*. It would be tried with *Cornes*, and *Wens*, and such other *Excrescences*: I would have it also tried with some *Parts* of *Living Creatures* that are neerest the *Nature* of *Excrescences*; as the *Combs* of *Cocks*, the *Spurs* of *Cocks*, the *Horns* of *Beasts*, &c. and I would have it tried both ways: both by *rubbing* those *parts* with *Lard* or *Elder* as before, and by *cutting off* some *peice* of those *parts* and laying it to *Consume*, to see whether it will work any effect towards the *Consumption* of that *part* which was once *joyned* with it. 997.

It is constantly received and avouched, that the *anointing* of the *Weapon* that maketh the *Wound*, will heal the *Wound* it self. In this *Experiment*, upon the relation of *men* of *credit*, (though my self, as yet, am not fully inclined to believe it) you shall note the *Points* following. First, the *Ointment* wherewith this is done, is made of divers *Ingredients*; whereof the strange- 998.

strangest and hardest to come by, are the *Moss* upon the *Skull* of a *dead-man unburied*, and the *Fats* of a *Boar*, and a *Bear* killed in the *act* of *generation*. These two last I could easily suspect to be prescribed as a startling hole, that if the *Experiment* proved not, it might be pretended, that the *Beasts* were not killed in the due time; for as for the *Moss*, it is certain there is great quantity of it in *Ireland*, upon *slain Bodies* laid on *heaps unburied*. The other *Ingredients* are the *Blood-stone* in *Powder*, and some other *things*, which seem to have a *virtue* to *stanch blood*, as also the Moss hath. And the *Description* of the *Whole Oyntment* is to be found in the *Chymical Dispensatory of Crollius*. Secondly, The same *Kind* of *Oyntment* applied to the *Hurt* it self, worketh not the *effect*, but onely applied to the *Weapon*. Thirdly, (which I like well) they do not observe the *Confecting* of the *Oyntment* under any certain *Constellation*; which commonly is the excuse of *Magical Medicines* when they fail, that they were not made under a fit *figure of Heaven*. Fourthly, it may be applied to the *Weapon*, though the *party hurt* be at great *distance*. Fifthly, it seemeth the *Imagination* of the party to be *cured* is not needful to concur, for it may be done without the knowledge of the *party Wounded*: And thus much hath been tried, that the *Oyntment* (for *Experiments* sake) hath been wiped off the *Weapon*, without the knowlege of the *party hurt*, and presently the *party hurt* hath been in great *rage of pain*, till the *Weapon* was *reanointed*. Sixthly, it is affirmed, That if you cannot get the *Weapon*, yet if you put an *Instrument* of *Iron* or *Wood*, resembling the *Weapon* into the *Wound*, whereby it bleedeth, the *anointing* of that *Instrument* will serve and work the *effect*. This I doubt should be a device to keep this strange *form* of *Cure* in request and use, because many times you cannot come by the *Weapon* it self. Seventhly, the *Wound* must be at first *washed clean* with *White-wine*, or the *parties* one *Water*, and then bound up close in *fine Linnen*, and no more *dressing* renewed till it be *whole*. Eighthly, the *Sword* it self must be *wrapped* up *close* as far as the *Oyntment* goeth, that it taketh no *wind*. Ninthly, the *Oyntment*, if you *wipe* it off from the *Sword* and keep it, will *serve again*, and rather *increase* in *vertue* then *diminish*. Tenthly, it will *cure* in far *shorter time* then *Oyntments of Wounds* commonly do. Lastly, it will *cure* a *Beast* as well as a *Man*; which I like best of all the rest, because it subjecteth the *matter* to an *easie tryal*.

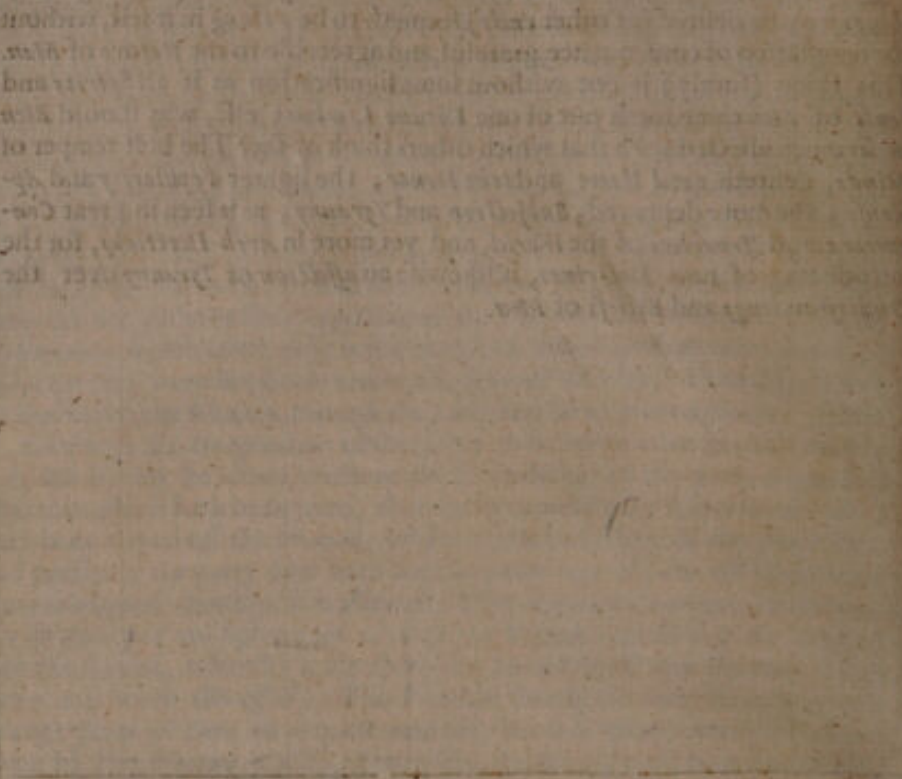
999. Experiment Solitary, touching *Secret Proprieties*.

I Would have Men know, that though I reprehend the *easie passing over* of the *causes* of *things*, by ascribing them to *secret* and *hidden virtues* and *proprieties* (for this hath arrested and laid asleep all true *Inquiry* and *Indications*;) yet I do not understand, but that in the *practical part* of *Knowledge* much will be left to *Experience* and *Probation*, whereunto *Indigestion* cannot so fully reach; and this not onely in *Species* but in *Individuo*. So in *Physick*, if you will cure the *Jaundies*, it is not enough to say, that the *Medicine* must not be cooling, for that will hinder the *opening* which the *disease* requireth; that it must not be *Hot*, for that will exasperate *Choler*; that it must go to the *Gall*, for there is the *obstruction* which causeth the *disease*, &c. But you must receive from *Experience*, that *Powder* of *Chamæpytis*, or the like, drunk in *Beer*, is good for the *Jaundies*. So again a wise *Physitian* doth not continue still the same *Medicine* to a *Patient*, but he will vary, if the first *Medicine* do not apparently succeed; for of those *Remedies* that are good for the *Jaundies*, *Stone*, *Agues*, &c. that will do good in one *Body*, which will not do good in another, according to the correspondence the *Medicine* hath to the *Individual Body*.

The

1000. Experiment Solitary, touching the *General Sympathy of Mens Spirits*.

THe *delight* which *Men* have in *Popularity*, *Fame*, *Honor*, *Submission* and *Subjection* of other *Mens Minds*, *Wills*, or *Affections* (although these *things* may be desired for other *ends*) seemeth to be a *thing* in it self, without contemplation of consequence, grateful, and agreeable to the *Nature* of *Man*. This thing (surely) is not without some signification, as if all *Spirits* and *Souls* of *Men* came forth out of one *Divine Limbus*; else, why should *Men* be so much affected with that which others think or say? The best temper of *Minds*, desireth *good Name* and *true Honor*; the lighter *Popularity* and *Applause*; the more depraved, *Subjection* and *Tyranny*; as is seen in great *Conquerors* and *Troublers* of the *World*, and yet more in *Arch-Hereticks*, for the introducing of new *Doctrines*, is likewise an *affection* of *Tyranny* over the *Understandings* and *Beliefs* of *Men*.



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THE NOVUM ORGANVM

OF

Sir FRANCIS BACON,

BARON of *VERULAM*,

Viſcount *St. Albans.*

EPITOMIZ'D:

For a clearer underſtanding of his

NATURAL HISTORY.

Tranſlated and taken out of the Latine
by *M. D.* B. D.

LONDON,
Printed for *Thomas Lee* at the *Turks*-head
in *Fleetſtreet.* 1676.

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THE

PREFACE

TO THE

READER.

I Need not recommend to your perusal this useful Treatise, seeing that it proceeds from such a Genius, whose most trivial conceptions have obtained the esteem of his Age, not inferiour in Learning to any of the former. He was a person of a sound judgement, sharp wit, vast comprehension, and of extraordinary abilities both natural and acquir'd. But I need not run over the praises of a person so well known amongst us to oblige my Reader to a kind reception, and favourable interpretation of this obscure, but useful Book: For the things therein contained are so excellent in themselves, and so well designed, that we may be inclinable of our own accord to embrace and peruse them.

The Authors purpose, as you may perceive, is to censure the limitations of Sciences to the bounds prescribed to us, by the shallow pates of some of former Ages, to discover the mistakes of our understandings, to point at the sources from whence they proceed, to rectifie the common errours of men, backed by ill grounded Axioms, to direct us to a right interpretation of Nature's Mysteries, and oblige us to settle our judgements, upon better and sounder principles than ordinary; his purpose is to open to us a Gate to a greater Proficiency and improvement in all kind of Learning, to pull down the Wals of Partition, and remove the Non plus ultra, that we might sail to those Indies full of Gold and Jewels. I mean the Sciences not yet discovered to our World, and fetch from thence all the Rarities, the Knowledges, and Inventions, that might pleasure and benefit our humane life. For that purpose he adviseth us not to take things and notions too much upon Trust, but to ground our belief upon Practice, and well ordered experience. He layes down several Principles, which may seem strange and new; but if they be rightly examined, we shall find them naturally proceeding from the nature of things. I confess the most excellent conceptions are wrapped up in obscure terms, and in such new contrived expressions, that King James at the first perusal judged this Novum Organum to be past all Mans understanding. But we may consider,

ſider, that a new Method, and new Things and Principles deſerve new expreſſions, and that our learned Author ſpeaks not to the Vulgar, but unto the Learned, unto whom he diſcovers other Lands never found out before, and adviſeth them to adventure, to ſeek and to proceed on without minding the diſcouragements and prohibitions of our Predeceſſors in Learning.

This Treatiſe therefore was looked upon as a ſeaſonable Addition to his Natural History, *but becauſe the whole would have made it too voluminous, I have been deſired to gather out ſuch Obſervations and Directions as might be anſwerable to that ſubject. I muſt needs confeſs, after a ſerious peruſal, I did ſcarce know what was to be ſet aſide; for all the things things therein contained, are ſo material and ſeaſonable, that I have wondred, that our Engliſh Curioſi have not had the deſire to ſtudy and underſtand the directions that are there given to undeceive their miſtaken Judgements. In ſuch a Caſe, that this* Novum Organum *might be the better intelligible, a meer interpretation is not ſufficient, in regard of the Authors difficult and new found expreſſions, a Comment would be required, which if it were well and judiciouſly compoſed according to the Authors true meaning and intent, I am perſwaded every one would be of my Judgement, that it is the beſt and moſt uſeful Treatiſe of our Dayes for the purpoſe that is deſigned. I am perſwaded that it might be of a ſingular uſe to ſuch Vertuoſi amongſt us, as are not perfectly acquainted with the Latine Tongue, and yet imploy their Time and Studies in the improvement of their abilities, and finding out inventions uſeful to the Life of Man, for it would ſupply them with ſuch principles as their leaſure and contrivance might wonderfully improve in new diſcoveries.*

I was ſorry that my Pen was limited to ſo few ſheets, and that I had not the liberty to make the whole Organum *appear in our Language. For brevity ſake therefore I have in ſome places ſhortened the Authors expreſſions. However this will be ſufficient to give a taſte of the whole, which ſuch as underſtand the Language of the Learned may peruſe at their leaſure,* Vale.

M. D.

Part of the
Novum Organum,
OR,
APHORISMS
OF THE
Interpretation of NATURE and KINGDOME of *MAN.*

Taken out of the First Book.

MAN, Natures Minister and Interpreter, acts and understands only so much of the ordering of Nature, as he hath observed by the assistance of Experience and Reason: more he neither doth, nor can apprehend.

Neither the Hand alone, nor an Understanding left to it self, can do much. Things are performed by instruments and helps, which the Understanding needs as much as the Hand. Now as Mechanick Instruments assist and govern the Hands motion, likewise the instruments of the Understanding prompt and advise it.

Humane Knowledge and Power are co-incident in the same, or happen to be alike, because ignorance of the Cause renders the Effect unintelligible: for Nature is not overcome without submission, and that, which in Contemplation stands instead of the Cause, in Operation serves as a Rule.

As to Operation, Man can do no more but only apply or remove natural Bodies. The rest Nature willingly compleats.

The Mechanick, the Mathematician, the Physitian, the Chymist, and the Magician are variously concerned in natural Operations, but as it happens at present their attempts are but slight, and their successes inconsiderable.

It were an extravagancy, and a plain contradiction to expect the accomplishment of those things, which were never yet done unless by means never yet attempted.

Even those Operations which are found out are rather to be ascribed to Chance and Experience than to Sciences; for the Sciences, which are now professed amongst us, are nothing else, but an adorning and a setting forth of things formerly invented, not the modes of Invention or the designments of new Operation.

The Cause and Origine almost of all the Mischiefs, that happen in Sciences, is this alone, that we too much admire and set up the strength and power of our understanding, and we neglect the true helps and aids thereof.

Natures subtilty far exceeds the subtilty of our Sense, or that of our Understanding; so that the delicate meditations of Mankind, their speculations and inventions are but foolish things, if they were narrowly searched into.

As Siences commonly so called are unprofitable for the invention of Operations, so the Logick now in use is not conducible to the finding out of true Sciences.

The Logick, which we now use tends to the establishment and confirmation of Errours, which are founded in vulgar notions rather than to a serious enquiry after Truth, therefore it is more hurtful than profitable.

A Syllogisme is not used amongst the principles of Sciences, and in medial axioms it is imployed in vain, for it falls much short of Natures subtility. It hath therefore a command over assent, not over the things themselves.

A Syllogisme consists of Propositions, Propositions of Words, Words interpret Notions, therefore if Notions, the basis of Things be confus'd, and rashly abstracted from things, nothing will be firm that is built upon them, therefore our only assurance is in a right induction.

There is no soundness in Logical and Physical Notions, neither substance, nor quality, action, passion, nor being it self, are proper Notions, much less heavy, light, thick, thin, moist, dry, generation, corruption to attract, to expel element, matter, form, &c. All these are phantastical and ill designed.

The Notions of the lower Species, as a man, a dog, a dove, and the immediate apprehensions of our senses; namely, hot, cold, white, black, don't much deceive us, and yet nevertheless by the fluidity of matter and mixture of things they are sometimes confounded. All other Notions, which men have hitherto used are aberrations, and are neither duely nor truely abstracted, and raised from the very things themselves.

The things that are already invented in Sciences, are such as most commonly depend on vulgar Notions. If any will search into the more inward, and remote mysteries of Nature, he must make use of Notions and Axioms, abstracted from things in a more certain and solid manner, that the working of the Understanding may be better and surer.

There are and may be two ways of searching and finding out truth: one from Sense and perticulars leads to the most general Axioms, and out of those Principles and their unquestionable Authority judges and finds out middle Axioms. This way is much in use. The other raiseth Axioms from Sense, and perticulars by a continual and gradual ascent it proceeds at last to generals. This is a true way but not yet attempted.

The Understanding left to it self goes the former way, observing a Logical method; for the mind delights to leap to generals, that it might acquiesce there, and after a little stay it loaths Experience. But these

evils

evils are now at length augmented by Logick for the pomp of disputations.

An Understanding left to it self, accompanied with sober, patient, and grave Wit, if not hindred by former precepts, essays the other way, which is right but not successful; because when the Understanding is not directed and assisted, is but weak, and unable to overcome the obscurity of things.

Either way derives its beginning from sense and perticulars, and acquiesces in things most general. But yet they differ very much, for the one does lightly run over experience and perticulars; the other converses in them in a right and methodical manner. Again the one layes down at first, certain abstract and un profitable generals. The other rises by degrees to these things, which indeed are more known to Nature.

It can never be that Axioms framed by arguing, for finding out new Operations, should be of any value, because the subtilty of Nature doth far surprise the acuteness of disputation. But Axioms rightly abstracted in order from perticulars, do easily discover and shew forth other new perticulars, and therefore by that means Sciences became active.

The Axioms now in use sprang from small and slender experience, and a few common perticulars, they are for the most part made and enlarged according to their measure, so that it is no wonder, if they lead not to new perticulars. Now if by chance any instance not observed or known before, offer it self, the Axiome is salved by some friviolous distinction; whereas it is more proper, that the Axiom it self should be mended.

That humane reason, which we use in Natures assistance, we are wont to call anticipations of Nature, because it is rash and hasty. But that reason, which is rightly extracted out of things, we call interpretation of Nature.

Anticipations are strong enough to gain consent, seeing that if all men were equally and conformably made, they would agree well enough among themselves. To speak plainly, no right judgement can be made of our way, nor of those things which are found out agreeable unto it by anticipations, I mean by the reason now in use: because we cannot desire any one to stand to the judgement of that thing which is it self called in question.

It is no easie matter to deliver, or explain those things which we have produc'd; because things new in themselves are to be understood by the Analogy they have with old ones.

Borgias tells us of the French Expedition into *Italy*, that they came with chalk in their hands to mark out their Inns, and not with arms to break through them. Our design is the same, that our doctrines might be admitted by well disposed and capacious Souls, for there is no need of confutations, where we disagree in the very principles, notions, and forms of demonstration.

Their reason, who held *non-comprehension*, and our way do in some sort agree in the beginning, but they vastely differ and are opposite in the end, for they absolutely affirm, that nothing can be be known, but we say not much can be known in Nature, in that way as it is now handled. They by their assertion destroy the authority of Sense and Understanding, we study and give remedies to help them.

Idols, mistakes, and mis-apprehensions, which now possesse, and are deeply rooted in Mans Understanding, so besiege the minds of Men that

Truth can hardly get admission, but if it should they would hinder and disturb the restoration of Sciences, unless Men being fore warned would arm themselves against them, as much as they could.

There are four sorts of Idols or false Images, which besiege Mens minds: we, for distinction sake, have called them first *Idola Tribus.* 2. *Idola Specus.* 3. *Idola Fori.* 4. *Idola Theatri.*

The raising Notions and Axioms by true induction is doubtless a proper remedy to drive away and remove these Idols, yet their indication is of great use, for the doctrine of Idols conduces to the interpretation of Nature; even as the doctrine of Sophistical arguments doth to vulgar Logick.

Idola Tribus are founded in humane Nature it self, and in every Family and Stock of Mankind. For humane sense is falsely affirm'd to be the measure of things. On the contrary, all the conceptions both of sense and reason are taken from the analogy of Man, not the analogy of the Universe. Humane Understanding is like an unequal looking-glass to the rayes of things, which mixing its own Nature with the Nature of things, doth wrest and infect it.

Idola Specus are the mis-apprehensions of every individual Man. For every one hath besides the mistakes of humane Nature in general, a den or individual cave, where the light of Nature is obscured and corrupted. This happens either through every Mans singularity, or through education and conversation among others, or by reading of Books and the authorities of them who are honoured and admired by every one, or through the different impressions which occur in a prepossessed and predispos'd, or in a calm and equal mind, or the like: so that the Spirit of man, as it is placed or qualified in every Man, is a various, a troubled, and a fortuitous thing; wherefore *Heraclitus* said well, that men sought after Sciences in lesser worlds, and not in the great and common World.

There are also Idols or mis-apprehensions arising from the mutual contracts, and also ciations of Men, which by reason of humane commerce and society we call *Idola Fori*: For Men are associated by speech, but words are impos'd according to the vulgar capacity; therefore a vitious and an improper imposition of words doth wonderfully mislead and clog the Understanding. Neither the definitions and explications, wherewith learned men are wont to defend and vindicate themselves in some things, do mend the matter for words, do plainly force the Understanding and disturb all things, they lead men into many idle controversies and foolish inventions.

Lastly there are Idols or misapprehensions, which are entered into Mens minds from divers opinions of the Philosophers, as also from the perverse Laws of demonstrations: these we call *Idola Theatri.* Because all the kinds of Philosophy, which have been invented and received we look upon as so many Fables produced and acted to make fictitious and scenical Worlds. Neither speak we of those amongst us, or only of the ancient Philosophers and Sects; seeing many the like Fables may be compos'd and made, because the causes of the different errours are for the most part common; neither do we understand this only of universal Philosophy, but also of many Principles and Axioms of Sciences which have prevailed by tradition, credulity and neglect. But of all these kinds of Idols we must speak more largely and distinctly, that so the humane intellect may take more heed.

Humane Understanding is inclinable of it self to suppose a greater order and equality in things than it finds. And whereas many things in Nature are monodical and altogether unlike, yet it appropriates to them parallels, correspondencies, and relatives, which are not from hence, are derived those Figments.

In Cœlestial Bodies all things are moved by perfect Circles. In the mean time they reject Spiral and Serpentine lines, retaining yet the names: From hence it is, that the Element of Fire is introduced to make a quaternion with the other three, which are within the reach of our senses. To the Elements also, as they call them, fancy ascribes to them a double proportion of excess in their mutual rarefaction, and such like dreames are invented. Nor is this vanity predominant in opinions only, but also in simple notions

The Humane Understanding attracts all other things to give its suffrage and consent unto those things which once please it, either because they are received and believed, or because they delight. And though a greater strength and number of contrary instances occur, yet it doth either not observe, or contemn them, or remove, or reject them by a distinction not without great and dangerous prejudice, by which an inviolable authority remains in those former conceptions. Therefore he gave a right answer, who, when a list of the Names of such as had paid there their vows for escaping the danger of Shipwrack, was shewn to him hung up in a Temple, and when he was questioned whether he did not acknowledge the Deity of the gods? He in answer demanded what was become of their pictures who had perished after that they had paid their Vows? There is almost the same reason for all Superstition, as in Astrological dreams, presages, &c. Men delight in such vanities, they mind the events when they come to pass, but when they fail, which is very often, they neglect and pass them by. But this evil more subtilly invades Philosophy and Sciences, wherein that which once takes, infects and corrupts the rest, though more firm and better. But in case this delight and vanity were wanting, yet it is a proper and perpetual error in Humane Understanding, to be rather moved and stirred up by affirmatives than by negatives, although in truth it ought to be indifferent to both: Yet on the other hand the strength of a negative Instance is greater in constituting every Axiom.

Humane Understanding is for the most part moved with those things, which suddenly and at once effect and reach the mind, and wherewith the fancy is wont to be filled and puffed up. As for the rest it supposes and fancies to have them in a kind of inperceptible manner, even like those few things that possess the mind. But as to that quick running over remote and heterogeneous instances, whereby Axioms are tried as it were by fire, the Understanding is altogether slow and unable, unless severe Laws and violent commands be imposed upon it.

Humane Understanding cannot rest, but still desires more and more, though all in vain. Therefore it is not to be imagined that Heaven should hear any extream or extime parts; for it may be alwayes necessarily urged, that there is something further. Again it cannot be conceived how Eternity hath run along until now, because there is a common distinction usually admitted, that it is infinite *a parte ante & a parte post*, which can in no wise be proved, for then it would follow that one infinite is greater than another, and that an infinite consumeth and tends to a finite. The like nicety occurs through the weakness of our imagination concer-

ning lines alwayes divisible, but this mental infinity more dangerously interposes in the invention of causes : For whereas Universals chiefly ought to be in a positive nature, as they are found out, being not really causable, yet the Humane Understanding being unable to rest, still desires things more known, but whiles it tends to further things it falls back to nearer ones, *viz.* Final causes, which indeed arise rather from Humane Nature, than the nature of the Universe. Out of this Fountain Philosophy is strangely corrupted. But he is equally an unskilful and a slight Philosopher, who seeks out a cause in primary universals, as he who desires it not in subordinate and subaltern things.

Humane Understanding is not an *Ignis fatuus* a meer light, but it receives an impression from the Will and the Affections, which produces the reason why it desires Sciences, for what a Man had rather have true, that he resolves to believe. Therefore he rejects difficult things, through impatiency of inquiry; sober things, because they confine the hope; the high Mystery of Nature, because of our natural Superstition; the light of experience, because of an arrogancy and pride, least the mind should seem to converse in vile and transitory affairs, he rejects Paradoxes being too much over-ruled by the mistakes of the vulgar. Lastly affection qualifies and infects the Soul many wayes which cannot be conceived.

But the greatest hinderance of the Humane Understanding, and its most dangerous errors proceed from the dulness, unsufficiency, and deceptions of the senses : those things which make impressions on the senses are of a greater weight than others of a higher nature, that do not affect them : Therefore contemplation most commonly ends with the sight, insomuch that there is little or no observation made of invisible things. Therefore the actings of the Spirits shut up in sensible bodies are hid from us. And all subtil transformation, that happens in the parts of the grosser things, which we commonly stile alteration, but is in Truth a subtil metaschematism escapes also our knowledge. Nevertheless, if these two that we have named be not found out, there can be no great matter performed in the works of nature.

Again the nature of common air, and of all Bodies which in thinness surpass the air, they being many in number are almost unknown, for sense in it self is a weak and an erroneous thing, nor do the Organs conduce much to enlarge or sharpen the senses, but the truest interpretation of Nature is made by instances, and by fit and proper experiments, when sense judges of the experiment, the experiment of Nature, and of the thing it self.

The Humane intellect is by its own Nature carried on to abstracts, and those things which are unstable it fancies to be constant.

But it is better to dissect Nature than abstract her, which was done by *Democritus*'s School. By that means he searched further than the rest into Nature. For that purpose we must rather examine matter, its schemes and transformations, its pure acts and the Law of action and motion. Forms are but the invention of mens brains, unless you will call the Laws of the act forms.

Of this kind are those false imaginations, which we call *Idola Tribus*, they proceed, either from the equality of the substance of the humane Spirits or the prepossessions, coarctations, and turbulent motions thereof, or from the inspirations of the passions, or disagreement of the senses, or the manner of impression.

Idola

Idola Specus proceed from the proper nature of every individual mind or body, as also from education, custome or other casualties, which kind though various and manifold, yet more especially we propound those which require most caution, and have greatest power to defile the Understanding, and render it impure; contemplations of Nature and most simple Bodies only disturb and impair the Understanding, but contemplation of Nature and of Bodies compound, and in their configuration astonish and dissolve the intellect. This is most evident in the School of *Hencippus* and *Democritus* compared with other Philosophy, for it so much considers the particles of things, that it almost neglects their frames: and others so amazedly behold them, that they cannot arrive to Natures simplicity. These contemplations therefore are to be altered and interchangeably assumed, that the Understanding at the same time, may be made penetrating and capable, and those inconveniencies we speak of be avoided with the false notions proceeding from them.

Let therefore your speculative prudence be so disposed in expelling and removing the *Idola Specus*, which proceed either from the predominancy, or excess of composition and division, or from our affection to the times, or from large and small Objects. In general let every one, who studies the nature of things, chiefly suspect that which captivates his Understanding, and so much the greater heed is to be taken in these opinions, that the Understanding may be kept equal and pure.

But *Idola Fori* are the most troublesome of all, which, by a confederacy of words and names, have insinuated themselves into the Understanding. For men believe that their Reason governs words, but so it happens that words retort and reflect their power upon the Understanding. This hath made Philosophy and Sciences Sophistical and unactive. Now words are for the most part accommodated to vulgar capacities, and by lines most apparent to common appprehensions they divide things. But when a sharper intellect, or more diligent observation would transfer those lines, that they might be more agreeable to Nature; words make a noise: from hence it comes to pass, that the great and solemn disputations of learned men, often end in controversies concerning words and names, with which, according to the custome and prudence of Mathematicians 'twere a wiser way to begin, and to reduce them into order by definitions. And yet definitions in natural and material beings cannot remedy this evil because they also consist of words, and words beget words, so that it is necessary to have recourse to perticular instances, and their ranks and orders, as we shall presently shew, when we come to the manner and reason of constituting notions and Axioms.

Mis-apprehensions forced by words upon the Understanding are of two sorts. 1. The names of things which are not: for as there are things which through inadvertency wanting a name, so are there names without things, through a Phantastical supposition. 2. Or the names of things which are but confused, ill determined, rashly, and unequally abstracted from things. Of the first sort are Fortune, the *Primum Mobile*, the Planetary Orbs, the Element of Fire, and such like fictions arising from vain and false speculations. This kind is easier cast out, because it is exterminable by a continued abnegation and antiquation of such speculations. But the other sort is perplex'd and deeply rooted, proceeding from an ill and unskilful abstraction. For example sake, take any word, *Humidum* if you please, and let us see how its various significations agree, and we shall

ſhall find this word *Humidum* to be nothing elſe but a confuſed note of divers actions enduring no conſtancy or reduction; for it ſignifies that which eaſily circumfunds it ſelf about another body, and is in it ſelf indeterminable and inconſiſtent, that which eaſily gives place on all ſides, and eaſily divides and diſſipates, and as eaſily collects, and reunites it ſelf, that which eaſily flowes and moves, eaſily adheres to another body and moiſtens it, that which is eaſily reduced into a liquid, or melts, having been before conſiſtent or ſolid: Therefore if you conſider the predication and impoſition of this word taken in one ſenſe the Flame is moiſt, in another ſenſe the Air is not moiſt. In one ſenſe again ſmall duſt is moiſt, in another glaſs is ſo. Whence it is evident, that this notion was only raſhly abſtracted from waters and common liquors without any due verification.

In words alſo there are certain degrees of pravity and error, leſs vitious are the names of ſome ſubſtances, eſpecially the loweſt Species well deduced, for the notion of Chalk and Clay is good, the notion of Earth bad, more vitious are the actions of Generation, Corruption, Alteration: The moſt vitious qualities, except the immediate objects of ſenſe, are heavy, light, rare, denſe, *&c.* And yet even among theſe it cannot be helped but ſome notions will be better than others, accordingly as more copious matter ſupplies Humane ſenſe.

The other miſtakes named *Idola Theatri*, are not innate, nor ſecretly wrought in the Underſtanding, but by fabulous ſpeculations, and the perverſe Laws of demonſtrations plainly infuſed and received. But in theſe to undertake or endeavour a confutation is not agreeable to what we have ſpoken. For ſeeing that we neither agree in our principles nor demonſtrations all diſputation it taken away. But this is good luck for the Ancients, that they may preſerve their reputation, for nothing is detracted from them, ſeeing the way is ſo queſtionable. Becauſe a lame Man, as they ſay, in the way, out goes a Racer out of the way, for tis evident the ſtronger and nimbler he is, the greater is his aberration, whiles he is out of the way.

But ſuch is our manner of inventing Sciences, that we attribute not much to the ſharpneſs and ſtrength of wit, and yet we almoſt equalize them, for even as the deſcribing of a right line or perfect Circle much depends on the ſteadineſs and exerciſe of the hand, if it be done meerly by the hand; but if a rule or compaſſes be uſed, there is little or no ſuch dependancy upon the hand: So fares it exactly with our Reaſon. Although there be no particular uſe of confutations, yet we muſt ſay ſomething of the Sects and Kinds of theſe Theories, and afterwards of their outward ſigns, becauſe they are in a bad condition, and laſtly of the cauſes of ſo much unhappineſs, and ſo long and general a conſent in error, that Truth may have an eaſier acceſs, and the Humane Underſtanding may be more throughly purged, and rid of theſe miſtakes.

Idola Theatri or theoretical miſtakes are many, and may be more, and in time to come will be, for unleſs mens wits had been employed about Religion and Divinity during many Ages, and alſo about civil Governments, eſpecially Monarchies, they had deteſted ſuch novelties in contemplations. So that Men addicted unto them, ran the hazard of their fortunes, not only deprived of a reward, but alſo expoſed to contempt and envy. Doubtleſs many more Sects of Philoſophy, and Theories like to thoſe, which once in great varieties flouriſhed amongſt the Grecians, had

had been introduced : for as upon the etherial *Phænomena's* more figures of Heaven may be formed, likewiſe many more various opinions may be as eaſily founded and eſtabliſhed upon the *Phenomena*'s of Philoſophy : Now the Fables of this Theater are like thoſe that are acted on the poetical Stage, whence it comes to paſs, that Scenical and feigned narrations are more quaint and elegant than thoſe taken out of true hiſtory, and better pleaſe the Readers.

In general either much out of little, or little out of much is aſſumed into Philoſophical matter, ſo that on all ſides, Philoſophy is founded on the too narrow baſis of experience, and Natural Hiſtory, and determines out of fewer things than it ought; for the rational ſort of Philoſophers ſnatch from experience ſeveral vulgar things, and they to neither certainly found out, nor diligently examined or tried, the reſt they place in meditation, and the exerciſe of wit.

There is another ſort of Philoſophers, who have beſtowed a great deal of pains in few experiments, and from thence have preſumed to draw and frame a Philoſophy ſtrangely wreſting all other things thereunto.

There is alſo a third ſort of them, who intermingle divinity, and traditions of Faith and Adoration amongſt whom the vanity of ſome has inclined them to ſeek and derive Sciences from Spirits and Demons. Therefore the ſtock of Errours and falſe Philoſophy is threefold, namely Sophiſtical, Emperical, and Superſtitious.

Of the firſt kind *Ariſtotle* is an evident Example. By his Logick he corrupted natural Philoſophy made the world conſiſt of Categories attributed to the humane Soul, a moſt noble ſubſtance, a genus made up of ſecondary notions, tranſacted the buſineſs of denſe and rare, whereby bodies undergo greater or leſſer dimenſions or ſpaces by the cold diſtinction of act and power. He aſſerted only one proper motion to be in all bodies, and if they had any other, that he ſaid was from another; many more things he affirmed according to his fancy, which he impoſed upon Nature, being every where more ſolicitous how he might explain himſelf in anſwers, and make any thing poſitive in words, than of the internal truth of things. This plainly appears if you compare his Philoſophy with others famous amongſt the Grecians, for the *Homoiomera* of *Anaxagoras*, the Atoms of *Leucippus*, and *Democritus*, the Heaven and Earth of *Parmenides*, the diſcord and concord of *Empedocles*, *Heraclitus*'s reſolution of Bodies into the adiaphorous nature of Fire, and the replication of them to denſity, have ſomething of natural Philoſophy in them, and a reliſh of nature and experience : whereas *Ariſtotles* Phyſicks are nothing but logical notions, which under a more ſpecious name, not nominal but more real he retracts in his Metaphyſicks, nor let not that move any one, that in his Books of Animals, in his Problems and other Treatiſes he frequently uſeth Experiments. For he firſt decreed them, neither did he rightly conſult experience in eſtabliſhing his Determinations and Axioms, but after he had determined them according to his pleaſure, he made experience a ſlave to his fancies : And upon this account he is more to be blamed than his modern Followers, I mean a Sect of Scholaſtical Philoſophers, who have altogether forſaken experiments.

But the Emperical kind of Philoſophy brings forth more deformed and monſtruous opinions than the Sophiſtical or rational, becauſe it is not founded in the light of common notions, which though ſlender and ſuperficial is notwithſtanding in ſome meaſure univerſal and conducive to

many things, but in a few narrow and obscure experiments. And therefore to those who daily converse in such experiments, and have thereby corrupted their fancy, this Philosophy seems probable and certain, but to others incredible and vain. A notable example whereof we find in the Chymists and their opinions, but now scarcely any where else, unless in *Gilberts* Philosophy. However we must by no means omit a caution concerning this Philosophy, because we inwardly foresee and presage that if men awakened by our precepts, shall at last betake themselves to experience, bidding adieu to Sophistical doctrines, they will sustain some damage, through a præmature and inconsiderate haste of the understanding, by soaring too soon to generals and principles, which evil we ought to prevent.

But the corruption of Philosophy through superstition and intermixed Divinity extends it self further, and works much mischief, both to Philosophy in general and particular. For the humane understanding is no less obnoxious to the impressions of Fancy, than to the impressions of vulgar notions. For the contentious and Fallacious kind of Philosophy ensnares the Understanding, but the other kind being phantastical, swoln and Poetical doth rather flatter it. For there is in Man a certain ambition of the Understanding as well as in the Will, especially in sublime and elevated Wits. Of this kind you have an example amongst the Grecians, especially in *Pythagoras*, but joyned with gross superstition, but more dangerously and subtilly in *Plato*, and his School. This kind of evil is found in the parts of other Philosophers; by the introduction of abstract Formes, final Causes, first Causes, and frequent omitting the medial, and the like. Wherefore take great heed to this matter, for it is the worst of evils to deifie errors, and to adore vain things may be well accounted the plague of the Understanding.

Some modern Men guilty of much levity, have so indulged this vanity, that they have essayed to found natural Philosophy in the first Chapter of *Genesis*, the Book of *Job*, and other places of Holy Writ, seeking the living among the dead. Now this vanity is so much the more to be check'd and restrained, because by unadvised mixture of divine and humane things, not only a phantastical Philosophy is produced, but also an Heretical Religion. Therefore it is safe to give unto Faith with a sober mind, the things that are Faiths.

Hitherto our Excellent Author hath spoken of the bad authority of Philosophy, founded in vulgar notions, a few Experiments, or in Superstition: he examines next the depraved matter of Contemplation especially in natural Philosophy.

He proceeds next to discover to us by what means demonstrations lead us into errors and mistakes, and concludes that experience is the best demonstration, if it be founded upon mature Experiments. He discourses afterwards of the several sorts of Philosophers among the Greeks, and takes notice of their imperfections, of their ignorance in ancient History, and in Cosmography, so that they could not be acquainted with so many experiments, as the Learned of our dayes.

Afterwards he discourseth of the causes of Errors, and of their long continuance in credit in the World, that none might wonder how it comes to pass that some in these last Ages, find so many mistakes in the Learning and Wit admired in former Ages.

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The first Cause of the small proficiency in Sciences, he saith, is the streights of time, and their ignorance of former Times: for their Observation had not scope enough, nor sufficient assistance from true History, to gather right and judicious Experiments.

In the second place another Cause of great moment certainly offers it self; namely that in those times, when the wits of men and Learning flourished most or but indifferently, Natural Philosophy had the least share in humane contemplations: nevertheless this ought to be accounted the great Mother of Sciences: for all Arts and Sciences, pluck'd away from this Root, may perhaps be polished and accommodated to use, but they will never grow. Now it is evident, that since the Christian Faith was embrac'd and encreas'd the most part of the rarest Wits applied themselves to Divinity. To this end large rewards were propounded, and all manner of helps plentifully afforded. This study of Divinity took up the third part or period of time amongst us Europeans, and the more because about that time Learning began to flourish, controversies touching Religion did wonderfully increase: but in the preceding Age, during the second period among the Romans, the chiefest meditations and studies of Philosophers were imployed and spent in Moral Philosophy, which was then the Heathens Divinity. Moreover the greatest Wits in those dayes for the most part applied themselves to Civil affairs, by reason of the Roman Empires greatness, which required the labours of many men. But that Age wherein Natural Philosophy seem'd chiefly to flourish among the Grecians was a parcel of time of small continuance, for even in ancienter times, those Seven, called Wisemen, all except *Thales*, applied themselves to Moral Philosophy and Politicks. And in after times, when *Isocrates* had brought down Philosophy from Heaven upon Earth, Moral Philosophy prevailed further still, and diverted mens thoughts from physiological speculations.

That very period of time also, wherein Physick Enquiries flourished was corrupted and spoiled with contradictions, and new determinations. Wherefore Natural Philosophy in every one of those periods, being greatly neglected or hindred, 'tis no wonder men profited so little in it, seeing they altogether minded other things.

Add moreover, that those who studied Natural Philosophy, especially in these modern times, did not wholly addict themselves thereunto, unless perhaps you may alledge the example of some Monk in his Cell, or Nobleman in his Country House. So at length it was made but a passage and draw-bridge to other things.

This, this famous Mother of Sciences, was basely thrust down into servile offices, and made a drudge to wait upon Medicine, or the Mathematicks; and again to wash the immature wits of young men, and give them a superficial mixture, that they might afterwards be the better qualified to receive of another. In the mean while let no man expect a great progress in Sciences, especially in the practical part, unless natural Philosophy be produced to particular Sciences, and those again reduced to Natural Philosophy: for hence it comes to pass, that Astronomy, Opticks, Musick, many Mechanichal Arts, Physick it self, and what is more wonderful, even Moral Philosophy, Politicks, and Logick, have for the most part no considerable depth, but languish in the surface and variety of things, because when once these particular Sciences are divided, they are no longer nourished by Natural Philosophy, which out of the Fountains

and true contemplations of motions, rayes, sounds; texture and figuration of Bodies, affections, and intellectual apprehensions, communicates new strength and augmentation to them. And therefore 'tis no wonder, that Sciences grow not since they are separated from their roots. Another great and powerful cause, why Sciences are so little advanced, is this, that race cannot rightly be run, where the Goal is not rightly placed and fixed. Now the true and legitimate mark of Sciences is to enrich Mans life with new inventions and forces. But the greater number of men know nothing of this, because they are mercenary and professory, unless it happens that some Artist of a sharper wit, and ambitious of Glory, studies some new inventions, which commonly tends to his own undoing. Therefore most Men are so far from propounding to themselves the advancement of Arts and Sciences, that even out of those things that they have, they seek no more than what may be converted into professory use, gain, reputation, or the like advantages. And if any one amongst the multitude seeks knowledge ingeniously and for it self, yet you will find he doth this rather to obtain variety of contemplations and precepts, than for the rigid and severe inquiry of Truth. Again suppose another more severely enquires after Truth, yet even he propounds to himself such conditions of Truth as may satisfie his mind and understanding in reference to the causes of things known long ago, not those which may give fresh pledges of operations or new light to Axioms, The end therefore of Sciences being not yet rightly defined, or well assigned by any body, no wonder if Error and mistakes attend those things which are subordinate thereunto.

The Noble Author condemns next the erroneous wayes which conduct to Sciences; namely obscure Traditions, giddy Arguments, the windings of Chance or unclean Experience; and wonders that none yet have recommended sense, and well ordered Experience, which he supposes to be partly caused by a great mistake. That the Majesty of Humane Understanding is impaired with long conversing in Experiments and particular things, subject to sence, and determined to matter; especially seeing these things are laborious in the inquiry, ignoble in the meditation, harsh in discourse, illiberal in the practice, infinite in number, and full of subtilty.

Again the reverence of Antiquity, and the authority and consent of those who have been accounted great men in Philosophy, has detained and inchanted men from making any progress in Sciences.

As for Antiquity the opinion which men entertain of it, is idle and incongruous to the word it self, for the old age, and great age of the world are terms equivolent to antiquity, and ought to be attributed to our times, not to the youthful age of the world, that wherein the Ancients lived.

For that Age in respect of ours was greater and ancienter, in respect of the World it self, lesser and younger: and therefore in like manner, as we expect a greater knowledge in Humane Affairs, a more mature and a riper judgement from an Old Man than from a Young Man, by reason of his Experience, and the variety and plenty of things which he hath seen, heard, observed, and understood, so also far greater matters may rationally be expected from our Age, than from the ancient times, if it would but know its strength, and were willing to try and mind things, because we live in the Worlds old Age, and are stored with infinite experiments, and advanced in our noble Observations. *The discoveries of other Lands unknown*

unknown to former Ages are no small helps to our experience. Besides it is a great weakness to attribute so much to ancient Authors, for Truth is the Daughter of Time not of Authority, and the ancientest times are the youngest in respect of the World. The other cause of mens mistakes is their admiring the operations which can shew grey hairs, and a too great esteem of liberal Arts and Learning already found out, which is an act of simplicity and childishness. But the greatest damage hath happened to Sciences through pusilanimity; and the smalness of those tasks, which humane Industry hath proposed to it self, and yet, what is worst of all, that pusilanimity is accompanied with Arrogance and disdain.

Moreover Natural Philosophy in all Ages hath had a troublesome and harsh Enemy; namely Superstition, and a blind immoderate zeal of Religion.

Lastly the way to all Reformed Philosophy hath been blocked up by the unskilfulness of some Divines, who were afraid least a deeper enquiry should dive into Nature beyond the bounds of Sobriety, traduce and falsly wrest those things, which are spoken of Divine Mysteries in the sacred Writings, against Searchers of divine Secrets: Others cunningly conceive, if the means be unknown, which they think greatly concerns Religion, all things may more easily be referred to the deity. Others from their example fear least motions and mutations in Philosophy should terminate in Religion.

Again all things in the manners and institutions of Schools, Universities, Colledges, and the like places destimated for learned Men, and getting Learning, are found to be against the advancement of Sciences, &c.

But the greatest Obstacle in the progress of Sciences, and new undertakings thereof is discerned in the dispairing of men, and a supposed impossibility; for even wise and grave men are wont to diffide in these things, pondering with themselves the obscurity of Nature, shortness of Life, deception of the Sences, weakness of judgement, difficulty of Experiments, and the like, &c.

We must take our beginnings from God, in what we are about, for the excellent nature of Good therein it manifestly from God, who is the Author of Good, and Father of Lights.

The Foundations of Experience, for we must descend to them, have hitherto been either none at all or very weak; neither hath a sufficient System of particulars been any wayes as yet found outand congested, either in number, kind, or certainty, able to inform the understanding.

In the plenty of Mechanical Experiments, there is discovered a great want of such as assist or tend to the information of the understanding, &c.

Not onely a greater plenty of Experiments is to be sought, and procured, differing in kind from what ever was yet done, But also another method, order and process are to be introduc'd, for the continuing and promoting of Experience. For wandring Experience, guided by it self, is a meer cheat; and doth rather amaze men than inform them. But when Experience proceeds regularly, orderly, and soberly, there may be some better hope of Sciences.

Seeing there is such a great number, and as it were an Army of particulars, but so scattered and diffused, that they disgregate and confound the understanding, we can expect no good from the skirmishes, light motions, and transcursions of the understanding, unless by fit, well disposed, and

and exact Tables, there be an inſtruction, and co-ordination of thoſe things which appertain to the ſubject of our enquiry: and the mind be applyed to the preparatory and digeſted helps of theſe Tables.

But when this plenty of particulars is rightly and orderly placed before our eyes we muſt not preſently paſs to the Inquiſition, and Invention of new particulars or operations, or if we do we muſt not reſt in them, &c.

We muſt not permit the Underſtanding to leap or fly from particulars to remote and general Axioms, ſuch as are called the principles of Arts and Things, or by their conſtant verity to prove or diſcuſs medial Axioms.

But then Men may hope well of Sciences, when by a true Scale, and continual not intermitted degrees, we aſcend from particulars to leſſer Axioms, then to medial, for ſome are higher than others; and laſtly to univerſals; for the loweſt Axioms differ not much from naked Experience, but the ſupreſſive and more general which occur, are rational and abſtracted, and have no ſolidity. The medial therefore are thoſe true ſolid and lively Axioms, wherein mens fortunes and eſtates are placed, and above thoſe alſo are thoſe more general, if not abſtracted, but truely limited by theſe medial or middle Axioms.

Therefore the humane underſtanding needs not feathers but lead and weights to hinder its leaping and flying. But this is not yet done, when it is we may have better hope of Sciences.

Now in conſtituting an Axiom another form of induction contrary to what was formerly, or is now uſed, is found out, and that not onely to prove or invent Principles, as they call them, but alſo leſſer and medial Axioms, ye all. For that induction, which proceeds by ſimple enumeration, is a childiſh thing, and concludes precariouſly, being expoſed to the danger of a contradictory inſtance. And yet moſt commonly it gives judgement from fewer inſtances than it ought, or from thoſe onely which are at hand. But that induction which would induce to the invention and demonſtration of Arts and Sciences, muſt ſeparate Nature by due rejections and ſeparations, and, after ſufficient negatives, conclude upon affirmatives, which thing is not yet done, nor ſo much as attempted, unleſs by *Plato* only, who indeed, to examine definitions and Ideas, doth in ſome meaſure uſe this form of Induction. But for the good and lawful inſtitution of ſuch an induction or demonſtration, many things are to be uſed, which never yet entered into any mortal mans heart, ſo that greater pains is to be taken herein than was ever yet ſpent in a Syllogiſm. Now the help of this induction is not onely to be uſed in finding out Axioms, but alſo in terminating motions, for certainly in this induction our greateſt hope is placed.

Far more and better things, yea and in ſhorter time, are to be expected from the reaſon, induſtry, direction, and intention of men, than from chance the inſtinct of Animals, which hitherto have given the beginning to Inventions.

This alſo may be brought as an encouragement, that ſome things which are found out, are of that kind, that before their production it could not eaſily come into mans mind to imagine any thing of them, for every body deſpiſed them as impoſſible, *as the uſe of Guns the invention of Silk, the Seamans needle*, &c.

Therefore we hope there are in Natures boſome many ſecrets of excellent uſe, which have no alliance nor paralelliſm, with the things already

invented

invented, but are placed out of Fancies Road, not as yet found out; which doubtleſs after many revolutions of Ages ſhall at laſt come forth, even as thoſe former did. But by the way we now declare, they may ſpeedily and ſuddenly be both anticipated and repreſented.

We muſt not omit another thing, which may raiſe up our hope. Let men reckon the infinite expence of Wit, time, and money, which they are at in things and ſtudies of far leſſer uſe and value, the leaſt part whereof, were it converted to ſound and ſolid things, would conquer all difficulty.

Had we a man among us, who would *de facto* anſwer Nature's Queries, the Invention of all Cauſes and Sciences would be the ſtudy but of a few years.

Some without doubt, when they have read over our Hiſtory and Tables of Invention, may object that ſomething is leſs certain, or altogether, falſe in our experiments, and therefore perhaps will think with himſelf, that our inventions are founded on falſe foundations, and dubious principles. But this is nothing, for ſuch things muſt needs happen at firſt, for it is all one as though in writing or printing ſome one Letter or other ſhould be miſplaced, which does not uſually hinder the Reader, for ſuch errors are eaſily corrected by the ſence, &c.

Many things alſo will occur in our Hiſtory and Experience, firſt ſlight and common, then baſe and mechanical, laſtly too curious, meerly ſpeculative, and of no uſe, which kind of things may divert and alienate the ſtudies of men.

Now for thoſe things which ſeem common, let men conſider, that they themſelves are wont to do no leſs than refer and accommodate the cauſes of rare things to theſe which are frequently done, but of things daily happening they enquire not the cauſes, but take them for granted.

And therefore they inquire not into the cauſes of weight, cœleſtial rotation, heat, cold, light, hard, ſoft, ſlender, denſe, liquid, conciſtent or ſolid, animate and inanimate, ſimilar diſſimilar, nor laſtly Organical, but diſpute and judge of other things, which happen not ſo frequently and familiarly by theſe as being evident, manifeſt, and received. But we, who know well enough, that no judgement can be made of rare and notable things, much leſs new things be brought to light without the cauſes of vulgar things, and the cauſes of cauſes rightly examined and found out are forced neceſſarily to receive the moſt vulgar things into our Hiſtory: Furthermore we perceive nothing has hindred Philoſophy more, than becauſe things familiar and frequently happening do not ſtay and detain the contemplation of men, but are entertained by the by, and their cauſes not inquired into, ſo that information of unknown matters is not oftner required than attention in known things.

Now as touching the vileneſs and diſhoneſty of things, they are no leſs to be entertained in Natural Hiſtory than the richeſt and moſt precious things, nor is Natural Hiſtory thereby polluted, for the Sun does equally viſit Pallaces and Sinks, and yet is not defiled. Again we do not build or dedicate a Capitol or Pyramid to the Pride of men, but we found an holy Temple for the worlds pattern in humane Underſtanding.

Therefore we follow our Copy for whatſoever is worthy of eſſence is worthy of Science, which is the image of Science, but vile things ſubſiſt as well as coſtly ones. Moreover, as out of ſome putrid matters, as muſk and civet, ſometimes the beſt odours come, even ſo from low and ſordid inſtances

inſtances ſometimes excellent light and information flowes.

Before all things we have and muſt ſpeak firſt of this thing, *viz.* That we now at firſt ſetting out, and for a time, ſeek only lociferous not fructiferous Experiments, according to the examples of Divine Creation, which only produced Light on the firſt day, and beſtowed a whole day upon it; not intermingling with it, in that day, any material Work. If any one therefore think theſe things are of no uſe, it is all one as if he ſhould think Light uſeleſs, becauſe it is indeed no ſolid nor material being; for we may truely affirm, that the light of ſimple Natures being well examined and defined, is like Light which affords paſſage to all the ſecret Rooms of Operations, drawing after it all the companies and troops of Operations, and potentially comprizing the Fountains of moſt noble Axioms; yet in it ſelf it is not of ſo great uſe: Thus the Elements of Letters of themſelves and ſeparately ſignifie nothing, neither are of any uſe, but yet are like the firſt matter in the compoſition, and preparation of every word. Thus the ſeeds of things ſtrong in power are as to uſe, except in their increaſe of no value, and the ſcattered beams of Light unleſs they unite together, become unbeneficial to men.

Some alſo will doubt rather than Object, whether we ſpeak only of Natural Philoſophy, or elſe of other Sciences; namely, Logick, Ethicks and Politicks to be perfected according to our way. But we ſurely underſtand what we have ſaid of all this, and as vulgar Logick, which rules things by ſyllogiſm, belongs not onely to natural, but to all Sciences. So ours, which proceeds by induction, compriſeth all things; for we make an Hiſtory and inventory Tables, as well of Anger, Fear, Modeſty, &c. as of Politick Examples, and ſo of the mental motions of memory, compoſition and diviſion, judgement and the reſt, no leſs than of heat and cold, or light and vegetation, &c. But as our method of interpretation after Hiſtory is prepared and ordered, doth not only behold mental motions and diſcourſes, as common Logick, but alſo the nature of things. So we govern the Underſtanding, that it may apply it ſelf in a perfect and apt manner to the nature of things.

But that ought by no means to be doubted, whether we deſire to deſtroy and demoliſh the Philoſophy, Arts, and Sciences which we uſe, for we on the contrary willingly allow their uſe, cultivation, and honour; nor do we any wayes hinder, but that thoſe which have been in credit, may nouriſh diſputations, adorn Orations, be uſed in profeſſory employments, Laſtly, like currant money, be received among men by conſent. But how truely we profeſs this very thing, which we mention concerning our affection and good will towards allowed Sciences, our publick Writings, eſpecially our Books of the *Advancement of Learning* declare and atteſt.

It remains that we now ſpeak ſomewhat concerning the excellency of the End. Had we before treated of theſe things, our expectations probably had better ſucceeded, but now we are in hopes, that all prejudices being removed, theſe matters may perhaps be of more weight.

For though we had perfected and compleated all things, nor had called others to ſhare in our labours, yet ſhould we have refrained theſe words leſt we might be thought to proclaim our own merits, but ſeeing the induſtry of others is to be ſharpened, and their minds to be ſtirred up and inflamed, 'tis fit we put men in remembrance of ſome things.

Firſt then the Introduction of noble Inventions ſeems to carry the greateſt

teſt ſway amongſt humane actions, as former ages alſo have judged; for they gave divine honor to the Inventors of things, but to thoſe who were meritorious in civil affairs, as the founders of Cities and Empires, Lawgivers, Deliverers of their Countreys from temporal evil, Deſtroyers of Tyranny &c. they only decreed heroick honor. *Inventions alſo, are the new creations, they are man's Glory, they cauſe him to be a God* to the reſt of mankind. *New inventions are of a wonderful conſequence as the Art of Printing, Gun-powder, and the Sea mens compaſs.* Theſe three have changed the Face and State of affairs in the whole World. Firſt, in Learning. Secondly, in Warfare. Thirdly, in Navigation.

There are three ſorts of ambition, the firſt deſires to enlarge man's own power over Countries and People, this is common and ignoble, the Second, endeavours to enlarge other mens, as our Prince's Dominions, this hath more dignity, but no leſs deſire.

But if any one endeavours to reſtore and inlarge the power and dominion of mankind, over the univerſity of things, doubtleſs this ambition is founder, and nobler than the other two: Now mans dominion over things conſiſts onely in Arts and Sciences, for nature is not truſted, but by obedience.

It is now high time that we propound this art it ſelf of interpretating nature, wherein though we ſuppoſe we have given moſt true and profitable precepts, yet we do not attribute unto it any abſolute neceſſity or perfection, as though nothing could be done without it. For we are of opinion if men had by them a juſt Hiſtory of Nature and Experience, and would diligently ſtudy it, and could command themſelves in two things; firſt in putting away received opinions and notions. Secondly, in forbearing a while generals and ſubgenerals, they would by the proper and genuine ſtrength of the underſtanding, without any art, light upon our form of interpretation; for interpretation is the true and natural work of the mind, all obſtacles being firſt removed: But certainly our preſents will make all things more ready and ſure.

Nevertheleſs we do not affirm that nothing can be added unto them. On the contrary we, who conſider the mind not only in its own faculty, but as it is united with things ought to determine, that the art of invention may grow and increaſe with things invented.

Part of the

Novum Organum,

OR,

APHORISMS

OF THE

Interpretation of NATURE and KINGDOME of *MAN.*

Taken out of the Second Book.

1. IT is the buſineſs and intent of humane power to produce and ſuperinduce a new nature, and new things upon a body given to it; but it is the buſineſs and purpoſe of humane ſcience, to find out the true form of this body, or the right difference, or the eſſence of nature, called *natura naturans*, or the Fountain of emanation: theſe words we uſe, becauſe they expreſs the thing, and diſcover it beſt. Now to theſe works of the firſt rank there be two of a ſecond and inferior ſort, that are ſubordinate. To the firſt, the transformation of concrete bodies from one to another within poſſible limits. To the ſecond, invention in all generation and motion of a Secret proceeding continued from an apparant efficient and viſſible matter to a new form; as alſo the invention of an hidden ſchiſm of reſting bodies not in motion.

Although the ways leading to the power and humane ſcience, be nearly allied and almoſt the ſame, nevertheleſs it is the ſafeſt, becauſe of that old and pernicious cuſtome, of ſpending time in abſtracts to begin and raiſe ſciences from their very foundations, which look upon the active part in order, that it might conſume and determine the active part, therefore we muſt ſee to ſome nature to be ſuperinduced upon another body, what precept or direction any ſhould require for that purpoſe, and that in an eaſie and plain expreſſion.

For example, ſuppoſe any ſhould deſire to cover over Silver with the yellow colour of Gold, or give unto it an increaſe of weight, with a regard to the Laws of matter, or to make an obſcure ſtone become tranſparant, or glaſs gluttinous, or to cauſe a body not vegetable to grow; we muſt ſee in ſuch a caſe what direction or deduction may chiefly be deſired, firſt a perſon would doubtleſs wiſh for ſomething of a like Experiment to be ſhewn unto him, which might not fail in the operation, nor deceive in the undertaking. Secondly, he would deſire ſome directions which might not bind him, and force him to certain mediums, and parti-

cular ways of acting, for it may be, that he may be unable to purchase, and procure unto himself such mediums, therefore if there be any other mediums and other methods of acting, besides that direction of producing such a nature, it may perhaps be of such things, as are in the power of the Worker; yet notwithstanding he may be excluded from the tryal of such things by the narrowness of the Rule, so as that he shall meet with no benefit. Thirdly, he may desire, that something may be shewn unto him, which may not be altogether so difficult, as the operation that is in question, but that comes nearer to the practise.

Therefore it is requisite, that every true and perfect Rule of working be certain, free, and well designing, or in order to action; therefore this is the same as the invention of a true form, for the form of any nature is such, that when it is supposed the nature it self must needs follow, therefore it is always present, wherever that nature is, it be speaks it in general and constitutes it. Such is the form of a thing that when it is taken away the nature of the thing is removed.

Therefore it is always absent from it, when that nature is absent, and is in it alone. Lastly, a true form is such, that it deduceth the nature of a thing out of the Fountain of being, which is common to many, and more known than the nature, as they speak, than the form. Therefore the Rule of knowing a true and perfect Axiom is this, *that another nature might be found out which might be convertible with the nature given, and yet be the limitation of a more known nature, like as of a true genus.* These two Rules, the one active, the other speculative, are the same in effect, and what is most useful in operation is most true in speculation.

But the Rule or Axioms of transforming bodies are two fold. The first consider'd a body, as a troop or conjugation of simple natures, as in Gold these things do meet, that it is yellow, weighty, and of such weight that it may be beaten thin and drawn into wire, of such a bigness that it is not volatile, and that it loseth nothing by fire, that it is to be run in such a manner, that it is to be separated and loosned by such means, and the like of the other natures or properties of Gold.

Therefore such an Axiom deduceth the thing from the forms of the simple natures or properties, for he that knows how to bring new forms and methods of yellow, of weight, of fluidity, *&c.* he will see and take care of their gradnations and means, that all these be conjoined in one body from whence transformation into Gold may be expected. Therefore this manner of marking belongs to the primary action, for there is the same method required in bringing forth one simple nature, as many; onely man meets with more difficulty in working, when he is to joyn together many natures, which meet not of themselves unless by the ordinary and usual ways of nature; nevertheless we may affirm that the method of working, which considers the simple natures, though in a concrete body, proceeds from those things, which in nature are constant, eternal, and universal, and open a wide door to mans ability, which as affairs are now manag'd our humane understanding can scarce comprehend or represent.

But the Second kind of Axioms, which depends from the invention of a secret proceeding, acts not by simple natures, but by concrete bodies, as they are found in natures ordinary course; for example, suppose an Inquisition is made from what beginnings, how, and in what manner Gold, or any other Metal, or Stone is generated from its first matter and deform substance until it comes to a perfect mineral, likewise in what manner Herbs grow,

form

form their first concretion of the sap in the earth, or from the seed until it riseth up to be a plant with all the succession of motion, and the divers, and continued endeavours of nature. Likewise of the ordinary generation of animals from their conception to their birth, in like manner of all other bodies.

But this inquisition relates not onely to the generation of bodies, but also to other motions and workings of nature; for example, suppose an inquisition be made into the universal series, and continued manner of nourishment, from the first reception of the Food, until it turns into the substance of the body; likewise of the voluntary motion in animals, from the first impression of the fancy, and repeated endeavours of the spirits, to the movings and turnings of the Arters, or of the outward motion of the tongue, and lips, and other instruments to the giving of articulate voices; for these things relate to concrete or collegious bodies, and in operations they are lookt upon as particular and special custom of nature, not as fundamental, and common Laws, which constitute forms. But we must needs confess, that this method seems to be the most expedite, the most likely and hopeful, and more than the other primary.

But likewise the operative part, which answers this speculative, doth enlarge & encourage, working from those things, which are commonly found in nature, to certain things near at hand, or from those things to other very remote: but the highest and radical operations upon nature depend somewhat upon the primary Axioms. Moreover, when man hath not the liberty of acting, but onely of knowing and beholding, as in cælestial bodies, which are not within mans reach he cannot change nor alter them. Nevertheless the inquisition of the fact it self, or of the truth of the thing, as well as the knowledge of causes and agreements, relates to the primary and universal Axioms of simple natures, as the nature of voluntary relation, or the attractive vertue of the load stone, and many others; which are more common than the Cælestial: neither can any body hope to terminate the question, whether in the daily motion, the earth doth in truth come round, or the Heavens unless he understands first the nature of voluntary rotation.

The hidden proceeding, which we have mentioned, is otherwise, so that our humane understanding, as it is now wrapt up in blindness, cannot easily search into it; neither do we understand certain measures, signs, or degrees of proceeding visible in bodies, but that continued proceeding, which for the most part is not subject to our senses.

For example, In all generation and transformation of bodies, we must inquire what is last, and what flies away, what remains, what is added, what dilates it self, what is drawn to it, what is united, what is separated, what is continued, what is cut off, what means, what hinders, what commands, and what yields, and many other things.

Again, neither are we to enquire after these things in generation and transformation of bodies, but in all other alterations and motions we are likewise to enquire, what proceeds, and what succeeds, what is most fierce, and what is most remiss, what gives the motion, what commands, and the like.

All these things are unknown to, and never handled by the Sciences, which are composed by the grossest and the unablest wits. Seeing every natural action is transacted by the least beginnings, or by such as are so small, that they are not to be perceived by our senses, no body can hope

to rule or turn nature, unleſs he can comprehend and take nôtice of them in a due manner. Out of the two kinds of Axioms, which are already mentioned, Philoſophy and Sciences are to be divided, (the common received words which approach the neareſt to the diſcovery the of things, being applied to our meaning) namely that the inquiſition of forms, which in reaſon according to their own Laws are eternal and unmovable, conſtitutes the Metaphyſicks; but the inquiſition of the efficient, of the matter, of the ſecret proceeding, and hidden ſchiſmatiſm, all which things regard the common and ordinary courſe of nature, not the foundamental and eternal Laws, ſhould couſtitute the Phyſicks. Now to theſe are ſubordinate two practical Sciences, to Phyſick the Mechanick is ſubordinate, and to the Metaphyſicks, the better ſort of Magick, in regard of its large ways and greater command in nature.

Now that we have thus deſcribed our doctrine we muſt proceed to the precepts in a right and orderly manner; therefore the diſcovery of the interpretation of Nature contains chiefly two parts. The firſt tends to the drawing out and raiſing Axioms from experience; the ſecond teacheth how to take and derive Experiments from new Axioms. The firſt part is divided in a threefold manner into three miniſtrations; into that which relates to ſenſe, into that which relates to the memory, and to that which relates to the mind or underſtanding.

Firſt we muſt have a Natural and Experimental Hiſtory; ſufficient and good, which is the foundation of the thing: It muſt not be feigned or contrived onely, but we muſt find what Nature doth, or bears.

But the Natural and Experimental Hiſtory is ſo various and ſcattered that it confouuds and diſturbs the underſtanding; unleſs it be limited and placed in a right order; therefore we muſt form ſome tables and ranks of inſtances in ſuch a manner and order, that the underſtanding may work upon them.

Which, when it is done, the underſtanding left to it ſelf, and moving of it ſelf, is not ſufficient, but unable, for the working of Axioms, unleſs it be ruled and aſſiſted; therefore in the third place a lawful and true induction is to be brought in, which is the Key of the Interpretation; we muſt begin at the End and proceed back-wards to the reſt.

An inquiſition of forms proceeds in this manner, firſt, upon nature given, we muſt bring to the underſtanding all the inſtances of notes, that agree in the ſame Nature, though by different matters; Therefore ſuch a collection is to be Hiſtorical, without any haſty contemplation or greater ſubtilty than ordinary, for example in the inquiſition of the form of Hot.

Convenient Inſtances in the Nature of Hot.

1. THe Sun beams chiefly in Summer; and at Noon.
2. The Sun beams beaten back and preſſed together; ſpecially between Mountains, Walls, and through Burning-glaſſes.
3. All fiery Meteors.
4. Fiery Thunderbolts.
5. The burſting forth of flames out of the Caves of Mountains, &c.
6. All Flame.
7. All ſolid bodies of fires
8. Hot and Natural Baths.

9. All liquids heated or boiling.

10. Vapors and hot ſmoak, and the air it ſelf, which receives a ſtrong and furious heat, when it is ſhut up, as in all places of reflection.

11. Some kind of ſtorms, by the conſtitution of the air, when there is no reſpect to the time of the year.

12. The air ſhut up in ſubterraneous Caves, chiefly in winter.

13. All hair and ſhag, as wooll, the ſkins of beaſts, feathers, have ſomething of heat.

14. All bodies, as well ſolid as liquid, as well thick as thin, as the air, may be heated for a time.

15. Sparks of fire out of Iron or ſteel, when they are ſtruck out.

16. All bodies rubb'd together as a ſtone, wood, cloth, *&c.* So that the axle-trees, and wheels of Carts ſometimes are enflamed.

And the cuſtome amongſt the Weſtern Indians is to make fire by rubbing.

17. All green Herbs, and moiſt, ſhut up cloſe together, as Roſes, Peaſe in a baſket, and Hay, if it he laid up wet will often take fire.

18. Lime watered.

19. Iron when it is firſt diſſolved by ſtrong-waters, in glaſs without any aſſiſtance of fire, and likewiſe Pewter, *&c.* which is not ſo hot.

20. All animals chiefly in their inwards, though the heat in inſects, becauſe of the ſmalneſs of their bodies cannot be perceived by our feeling.

21. Horſe-dung and the new excrements of ſuch like creatures.

22. Strong oil of Sulphur and Vitriol perfo rms the office of heat in burning linning.

23. The oyl of wilde Majoram, and the like, doth the office of heat in burning bones and teeth.

24. The ſtrong ſpirit of wine well rectified performs the office of heat, ſo that if the white of an Egg be caſt into it, it will thicken and whiten almoſt in the ſame manner, as when it is boiled, and cloth being caſt into it will burn, and be brown as a toaſted piece of bread.

25. All ſweet ſents, and hot herbs, as dragon-wort, creſſes, *&c.* Although the hand feels not their heat, neither when they are entire, nor when reduced to aſhes, but when they are chewed a little, they heat the tongue, and the pallet, as if they did burn.

26. Strong vinegar, and all things acide or ſharp, are hot in a member, where there is no * *Epidermis*, as in the eye and tongue, and in a wounded part, or where the ſkin is taken off, they cauſe pain like to that of heat.

* *Or skin to cover ſuch as covers the body.*

27. Alſo extroardinary cold ſeems to be burning.

28. Garlick.

This Liſt we are want to name the Table Eſſence and Preſence.

Secondly, we muſt examine with our underſtanding the inſtances which are deprived of * nature given.

* *Natura data.*

The Inſtances at hand which have not the nature of heat.

THe beams of the Moon, of the Stars, and of the Comets ſeem not to be hot to our feeling, for we may obſerve that the greateſt froſts are

are in the full Moon, but the fixed and bigger Stars, when the Sun goes under them, or draws near them, they are thought to be heated by the heat of the Sun, as when the Sun is in *Leo*, or in the Dog Days.

The Sun beams, in the middle region of the air, are not hot: The reason is, because that region is not near enough to the body of the Sun, from whence the beams burst forth, nor to the earth that reflects them back; therefore this is plain, upon the tops of mountains, which are not the highest, snow abides upon them alwayes. But on the contrary, some have taken notice, that on the top of the Pick of *Tenerif*, and on the top of the Mountains of *Peru*, there is no snow to be seen, but upon the sides of these hills snow remains; therefore the air on the top of those Mountains is not cold, but subtil and sharp, so that in the mountains of *Peru* it pricks and offends the eyes with its sharpness, and the stomack, so that it makes men inclinable to vomit. The Ancients have taken notice, that, on the top of mount *Olympus*, the air is so subtil, that such as climb up to the top, must carry with them spunges dipt in water and vinegar, and often put them to their mouths and noses, because the air is there so subtil, that it sufficeth not for respiration. They say also that there is there so great a calm, free from all rain, storms, snow, and winds, that some who sacrificed there, upon *Jupiters* altar, having made with their fingers an impression in the Ashes upon the Altar, the next year the same Letters and impression were to be seen without the least alteration. And such as venture up to the top of the Pick of *Tenerif* go by night and not by day, they are called upon a little after the rising of the Sun by their guides to hasten down again, because of the danger, as it seems, caused by the subtilty of the air, for fear that it should stiffle the spirits.

The reflection of the Sun beams near the northern pole are very weak and inefficacious in matter of heat.

Let this Experiment be tried, take a Looking Glass made contrary to the burning-glasses, and put it between your hand, and the Sun beams, and take notice whether it don't diminish the heat of the Sun, as the burning-glass increaseth it.

Try this other Experiment, whether by the best and strongest burning-glasses it is not possible to gather together the beams of the Moon in one point, and cause thereby a small degree of warmth.

Try also a burning-glass upon any thing that is hot, but not luminous or shining, as upon hot urine, or hot stone, which is not fiery or upon boiling water or the like, and see whether it increaseth not the heat, as at the rayes of the Sun.

Try also a burning glass before the flame of the fire.

The Comets have not always the same effects in encreasing the heat of the year, though some have observed that grievous droughts have succeeded them. Bright beams, and columns, and * *Chasmata*, and such like meteors appear more frequently in the winter than in the Summer, and especially in great frosts, when the air is very dry. Thunder and Lightnings seldom happen in Winter, but in the time of great heats. But falling Stars are thought to consist for the most part of a thin substance, bright and kindled, near a kin to the strongest fire.

* *Gaping of the firmament.*

There are some Lightnings that yield light but don't burn, such happen alwayes without thunder.

The breaking out, and eruptions of flames are to be seen in cold regions as well as in hot, as in *Islandia*, *Greenland*, as the trees which grow in cold

Countreys

Countreys are more combuſtible, more full of Pitch, and Roſom, than others that grow in hot Regions.

All flame is hot, more or leſs; Nevertheleſs, they ſay, that *Ignis fatuus*, which lights ſometimes againſt a wall, hath but little heat: it may be like the flame of the ſpirit of wine, which is mild and ſoft; but that flame is yet milder, which ſome credible and diſcreet Hiſtorians affirm to have been ſeen about the hair and heads of Boys and Girls, which did not ſo much as ſinge the hair, but did ſoftly wave above them.

Every thing that is fiery, when it turns into a fiery red, when it ſhould not yield any flame, it is always hot.

Of hot Baths, which happen by the ſcituation and nature of the Sun, there hath not been ſufficient inquiry.

All boiling liquors in their own nature are cold, for there is no liquor to be toucht, which is ſo naturally, which remains always hot; heat therefore is given to it for a time, as an acquired nature or quality; ſo that the things themſelves, which are in their operations moſt hot, as the ſpirit of Wine, ſome chymical Oiles, and the Oyl of Vitriol, and of Sulphur, and the like, which at the firſt touching are cold, but ſoon after they burn.

There is a doubt whether the warmth of wool, of ſkins, and of feathers, and the like, proceed not from ſome ſmall inherent heat, as it riſeth from animals, or whether it proceeds not from a fatneſs and Oylineſs, which is agreeable to warmth, or whether it comes not from the incluſion and fraction of the Air.

There is nothing Tangible, or yielding ſpirit, but is apt to take fire: yet many things differ in this, that ſome receive heat ſooner, as Air, Oyl, and water; others not ſo quickly, as Stone, and Metals.

There can be no ſparks ſtruck out of Stone, or Steel, or out of any other hard ſubſtance, unleſs ſome minute parts of the ſubſtance of the Stone or Metal be alſo ſtruck out.

There is no Tangible Body to be found, but becomes warm by rubbing; therefore the Ancients did fancy, that the heavenly Globes had no other warmth or vertue to cauſe heat, but that which was derived to them from the attrition of the air, when they were rowled about in their ſwift and furious courſe.

Some Herbs and Vegetables, when they are green and moiſt, ſeem to have in them ſome ſecret heat; but that heat is ſo ſmall, that it is not to be perceived by feeling when they are ſingle, but when they are heaped together, and ſhut up, that their ſpirits cannot eſcape out into the air, but encourge one another, then the heat appears, and ſometimes a flame in convenient matter.

New lime becomes hot when it is ſprinkled with water, either becauſe of the union of heat, which before was diſperſed, or by the irritation and exaſperation of the ſpirits of water and of fire; for there is a kind of conflict and antiperiſtaſis. How the heat is cauſed will eaſily appear, if inſtead of Water, Oyl be caſt into it, for Oyl, as well as Water, Unites the Spirits ſhut up, but it will not Irritate or anger them.

All dung of Animals, when it is old, hath the power of heating, as we may ſee in the fatting of ground.

Aromatick ſubſtances, and Herbs ſharp at the taſte, are much hotter when they are taken inwardly; we may try upon what other ſubſtances they diſcover any hot vertue. The Seamen tell us, that when heaps and

lumps of Spices or Aromatick substances, are long shut up close, and then opened, there is some danger for such as stir them, or take them out first; for the fumes that arise from them are apt to inflame the spirits, and to give feavers. Likewise an Experiment may be tried, whether their dust will not be able to dry Bacon, and other flesh hung over it, as over the smoak of a fire.

There is an accrimony or penetration in cold things, as Vinegar, and Oyl, of Vitriol, as well as in hot, as in the Oyl of wilde Marjoram, and the like; therefore they cause a like pain in animals, and in inanimate substances they dissolve, and confirm the parts. In animals there is no pain but is accompanied with a certain sense of heat.

Cold and hot have many effects common to them both, tho produced in a different manner; for snow seems to burn the hands of children, and cold preserves flesh from putrefaction, as well as fire, and heat draws together some substances to a lesser bulk as well as cold.

A Table of degrees, or of such things as are comparatively hot.

WE must first speak of those things, which seem not to the feeling to be hot, and yet are so potentially afterwards: we shall descend to mention such things as are actually, or at the feeling hot; and to examine their strength and degrees of heat.

1. Amongst the solid and Tangible bodies, there is none found, which is hot naturally or Originally, neither Stone, nor Metal, nor Sulphur, nor any Mineral, nor Wood, nor Water, nor the Carcase of any animal; but in baths there is hot water by accident, either by subterraneous flames, as fire; such as is in *Etna*, and many other mountains, or by the conflict of bodies, as heat is produced in the dissolution of Iron and Pewter. Therefore our feeling cannot be sensible of any degree of heat in inanimate substances, but they differ in their degrees of cold, for Wood is not so cold as Metals.

2. But touching things that have heat potentially in them, and that are ready to kindle, there are many inanimate substances of that nature, as Sulphure, Naptha, Salt-peter, *&c.*

3. Those things which before were inflamed, as the Horse dung, by an animal heat, or lime, ashes, and soot; by the fire they yet retain certain relicks of their former heat. Therefore there are certain distillations, and separations of bodies, effected by the heat of Horse dung; and the heat is raised in lime by Water, as we have already said.

4. Amongst the Vegetables there is no plant, nor part of a plant, as the droppings, or sap, which seems to our feeling to be hot.

5. There is no part of dead animals nor any thing separated from them, which appears hot, nor the Horse-dung it self, unless it be shut up, and buried close. But nevertheless all dung seems to have heat potentially in it, as may appear by the improvement of the ground. Likewise the Corpses of dead animals have the same secret heat potentially; therefore in Church-yards, where they are daily buried, the ground hath by that means acquired a secret heat, which soon consumes a Carcase newly buried, and sooner than other earth.

6. Whatsoever fatness the ground, as all sorts of dung, Chalk, Sea-sand, Salt, and the like have a secret disposition and tendency to heat.

7. All Putrefaction hath some beginnings of a little heat, though not to that degree as to be perceived by feeling

8. The

8. The first degree of heat of those things, which are to be felt. To be hot by feeling is the heat of animals, that have a great Latitude of degrees, for the lowest degree, as in insects, is not to be perceived by touching. The highest degree scarce attains to the degree of heat of the sun beams in the hottest Regions and Times: Nevertheless it is reported of *Constantine* and of several others, that they were naturally so hot, and their constitution so dry, that in several violent feavers their bodies did burn so much, that when any did but touch them with the hand it would seem to burn a while after.

9. All animals do encrease their heat by motions and exercise, by Wine, good Chear, and Venery, and in burning Feavers, and pain.

10. All animals in the intervals of Feavers are ceased with Cold and shivering at first, but a little after they burn the more.

11. We may further inquire and compare the heat of several animals, as of Fishes, four Footed Beasts, Serpents, Birds, and according to their several species, as in a Lyon, in a Kite, or a Man; for, according to the common opinion, Fishes are inwardly less hot, Birds most, especially, Pigeons, Hawks and Austriches.

12. Let us inquire further of the heat compared in the same animal with the several parts and members, for Milk, Blood, Seed, Eys, are of a moderate degree of warmth, and less hot then the exterior flesh of animals, when it moves and is stirred about, but what degree of heat is in the brain, stomack, heart, and other parts, was never yet found out.

13. All animals, during the Winter and in Cold storms, are outwardly cold, but inwardly they are thought to be hotter than in summer.

14. The Cœlestial heat, in the hottest Regions, times of the Year, and Day, is not so hot as burning Wood, Straw, or Linnen, neither doth it burn but through a glass.

15. The Astrologers inform us, that some Stars are hotter than other, Amongst the Planets, next to *Sol*, *Mars* is the hotest, afterwards *Jupiter*, then *Venus*, but *Luna* is thought to be Cold, and *Saturn* colder: Amongst the fixed Stars *Sirius* is the hottest, then *cor Leonis* or *Regulus*, afterwards the Dog Star, *&c.*

16. The Sun warms most when he is neareſt to our *Zenith*, over our Heads; the same we may think of the other Planets, according to their degree of heat, for example, *Jupiter* is hotter when he is under *Cancer* or *Leo*, than when he is under *Capricornius* or *Aquarius*.

17. The Cœlestial heat is increased three several ways, Namely, when the Globe is over our heads, when it draw near by propinquity, and by a conjunction or association of several Stars.

18. There are several degrees of heat in flames, and fires in strength and weakness.

19. I Judge that the flame, that bursts forth and proceeds from certain imperfect metals, is very strong and fierce.

20. But the flame of thunder seems to be fiercer than all other flames, for sometimes it hath dissolved Iron it self into drops, which all other flames cannot do.

21. In things set a fire there is also a different degree of heat, we esteem the weakest to be burn'd Linnen, or Tinder, touch Wood or Match; after them the weakest fire is that of a burnt coal, and laths set a fire: But the hottest we think to be Metal inflamed, as Iron and Copper, *&c.*

22. Motion increaſeth heat, as we may perceive by blowing with bellows: for ſome of the harder ſort of Metals are not to be diſſolved, or liquefied by a dead fire, unleſs it be Stirred up by blowing.

23. We Judge that the great fires that happen, when the Wind blows hard, do ſtruggle and ſtrive more againſt the wind than they do yield to it, for the flame in ſuch a caſe flies back with a greater fierceneſs when the Wind yeilds than when it drives it.

By the common fire, eſpecially by the ſubterraneous fires, which are the remoteſt and ſhut up cloſeſt from the rayes of the Sun, you may expel the Cæleſtial Nature from the form of hot.

By the heating of bodies of all ſorts, I mean of Minerals, of Vegetables, and of the exterior parts of Animals, of Water, of Oile, *&c.* In drawing them nearer to the fire or any hot body you may expel all variety, and ſubtil texture of bodies. By Iron or other fiery Metals, which may heat other bodies without miniſhing ought of the weight or ſubſtance, expel the mixture of the ſubſtance of another hot thing.

Here follows ſeveral other directions and precepts moſt uſeful, if well underſtood; but becauſe I am limited I proceed to the other helps of natures interpretation recommended by the worthy Author. Firſt, He placeth prerogatives of inſtances. Secondly, Helps of induction. Thirdly, A rectification of induction, &c. *Amongſt the prerogatives of inſtances the ſolitary inſtances are firſt.* They are ſuch as diſcover the nature, which is inquired after in ſuch ſubjects, which have nothing common with other ſubjects, except that Nature. And again, ſuch as diſcover not the nature inquired for in ſuch ſubjects, which are like in all things with other ſubjects, unleſs it be in the Nature it ſelf; for example, if the Nature of Colour, is inquired into, the ſolitary inſtances are Gems of Chriſtal, which yeild not not only a color in themſelves, but caſt it upon a Wall.

They have nothing common with the fired colours in flowers, coloured Gems, Metals, Wood, *&c.* unleſs it be the Colour; from whence it may eaſily appear, that colour is nothing elſe but a Modification of the Image of light caſt into, and received in the firſt kind, by divers degrees of lightning upon the body; in the Second, by the textures and various ſchematiſms of the body.

The Second are the inſtances called Migrantes, they are ſuch in which the nature inquired for paſſeth to the generation, when before it was not, or contrariwiſe paſſeth to corruption, when it was before theſe inſtances are uſeful for a right underſtanding of the nature of things, and to direct us to practiſe; for example, ſuppoſe the nature of whiteneſs be inquired into, the inſtance putting to generation is whole glaſs, and glaſs beaten to with powder, likewiſe ſimple water, and water ſtirred about into froth, for whole glaſs and water are tranſparent, not white, but glaſs beaten and water turned into froth, are not tranſparant, but white; therefore we muſt inquire what happens from that change or paſſage to glaſs or water; for it is evident that the form of whiteneſs is conveighed in by the contuſion of the glaſs, and the ſtirring of the water, and there ſeems to be nothing added beſides the communition of the patts of glaſs and water, and the mixture of the air.

By theſe inſtances we may underſtand ſuch as paſs, not onely to generation and privation, but ſuch as proceed to Majoration and Minoration; for they tend alſo to diſcover to us the true forms of things.

The

The Third assistances are named offensive, they are such as discover the nature inquired, for nakedly and in it self also, in its rise, and highest degree of power, free from all impediments; for as every body receives the forms of many natures conjoyned, so as that in the concrete one weakness depresseth, breaks, and binds another, by that means every form is obscured: Now there are some subjects to be found in which the nature sought for is above the rest in its full vigor, either by the absence of the impediment, or by the predominancy of its vertue. These Instances do chiefly discover the nature of forms. For example, if you inquire for the nature of weight take quick-silver, which is the heaviest of all other things beside Gold, which is not much heavier: But the instance of quick-silver is more proper to discover the nature of weight, than Gold; because Gold is solid and close, but quick-silver is liquid and full of spirits; nevertheless it is heavier than Diamonds, and the most solid things, from whence we may understand the form of weight, which consists in the abundance of the matter, not in the compactness and closeness of the thing.

The Fourth instances are named clandestine. They shew the nature inquired for in its lowest power, and as it were in the Cradle and beginning, rising and hid under a contrary nature that domineers over it. These instances are of great consequence to find out the forms of things, for example, if we inquire for the nature of solid; the clandestine instances are such as discover a weak, and lowest degree of consistency, a solidity in a fluide substance, as in a buble of water, which is as a thin skin of solidity determined and made of a watery body. By this example, and by snow, froth, and melted Metals, we may understand that liquid and solid, are but ordinary notions, agreeable to the sense, for in truth there is in every body a liquidity which is weaker and more infirm in bodies homogeneous, as water, but stronger in heterogenious, therefore the conjunction to an heterogeneous body unites and joyns together, but the insinuation of the homogeneous dissolves and loosens.

The fifth sort of Instances are named Constitutive. They are such as constitute a species of the nature inquired into, as a lesser form, for as the lawful forms which are convertible with the natures sought for, are hid in secret, & are not easily to be found, the thing it self and the weakness of our intellect requires that the particular forms be not neglected, but be diligently inquired into, for whatsoever unites nature, although in an imperfect manner, it shews a way to find out forms.

For example, if any desires to understand nature of memory, or that which excites or helps memory, the constitutive instances are order and distribution, which evidently help our memory, also places in an artificial memory, *&c.* So that there are six lesser forms of those things which help memory; namely; limitation, a reducement of intellectual matters, to a sensibility an impression into a strong affection, an impression into a pure and disingaged mind, a multitude of helps and a former expectation.

The Sixth are conformable instances or proportioned, for they shew similitudes, agreements, and conjugations of things, not in the lesser forms, as the constitutive instances do, but in a concrete body. They shew and discover a certain agreement between bodies, although they don't much conduce to find out forms, nevertheless they are very benefical to reveal the Fabrick of several parts of the universe, and in its members they make a kind of dissection, and therefore they lead us, as it were, by the hand to high and noble axioms.

For

For example, these are conformable Instances, a looking glass and an eye, the make of the ear, and the places where the Eccho sounds, but of which conformity, besides the observation of resemblance, which is very useful for many things, it is easie to gather and form this Axiom, *viz.* that the organ for the senses, and the bodies, that send back the sounds to the sense, are much alike. Again, the understanding being from hence informed, may easily rise to another Axiom higher and more noble; namely, that there is no difference betwen the Consents, or Sympathies, of Sensible Bodies, and such as are inanimate without sense, unless it be that in the former, there is an animal spirit in the body, fitted to receive and entertain it, but in the latter there is none. Therefore as many consents as there are in inanimate bodies, so many senses there might be in animals, if there were as many holes or perforations in the animate body, for the animal spirit to move and fly to the member rightly disposed, as a right organ, *&c.* Another conformable instance is the root of a plant, and the branches. Every vegetable swells and pushes out its parts round about as well downwards as upwards neither is there any Difference between the roots and branches, but only that the root is shut up in the Earth and the branches, spread in the air and the Sun, for if any one will but take a tender branch that grows, and turn the top towards the ground, though it toucheth not the earth, it will push forth a Root and not a Branch. And on the contrary, if the earth be put upon a plant, and be prest with a stone or other hard substance that might hinder the plant from spreading up, it will bring forth branches in the ground and underneath.

Other conformable instances are the Gum of Trees, and the most part of the gems of Rocks, for either of them are but the exudations and sweatings, the first out of the sap of trees, the Second out of Rocks, from hence proceeds the clearness and splendor of both. Namely from the thin and subtil percolation from hence it is also that the hairs of animals are not so beautiful and of such a lively colour as the plumes of birds, for their sweat is not so fine when it issues out of their skin as when it comes out of a Feathers.

Other conformable instances are the Fins of Fishes, and the Feet of four Footed Beasts, or the Feet and Wings of Birds unto which *Aristotle* adds four Circles in the motion of Serpents. Therefore in this great Fabrick of the World, the motion of living creatures seems to be performed by four Arters or flexions.

Also in terrestrial animals the teeth, and in birds, their bills are alike, from whence it is evident that in all perfect animals there is a certain hard substance that draws to the mouth.

The Seventh are irregular instances, such as discover bodies in their whole, which are extravagant and broken off in Nature, and do not agree with other things of the same gender, but are only like to themselves, therefore stiled *Monodicæ*. They are useful to raise and unite nature, to find out the genders and common natures, to limit them by their true differences. Neither are we to desist from an inquisition until the properties and qualities, which are found in such things as are thought to be miracles in nature, may be reduced, and comprehended under some form or certain Law, that all irregularity and singularity might be found to depend upon some common form.

Such instances are the Sun and Moon amongst the Stars, the Loadstone among the Stones, quick-silver amongst metals, the Elephant, amongst the four footed

Footed Beasts, *&c.* The eighth sort of instances are named *Diviantes*, because they are Natures errors, and Monsters, when Nature declines and goes aside from its ordinary course. The use of these is to rectifie the understanding, to reveal the common Forms; neither in these ought we to desist from the inquisition until we have found out the cause of the deviation. But this cause doth not rise properly to any Form, but onely to the hidden proceeding to a Form, for he that knows the ways of Nature, he shall with more ease observe its deviations. And again, he that understands its Deviations can better discover its ordinary ways and methods.

The Ninth sort of instances are Named *Limitanea*, such as discover the species of bodies, which seem to be composed of two species, or the Rudiments between one species and another: such are Flies between rottenness and a plant, certain Comets between stars and fiery meteors, Flying, Fishes, between Birds, and Fishes, *&c.*

The Tenth are instances of Power, which are the noblest, and the most perfect, as the most excellent in every art; for as this is our business chiefly, that Nature should be obedient and yield to the benefits of men; it is fitting, that the works, which are in the power of men, as so many provinces, be overcome and subdued, should be taken notice of, and reckoned specially such as are most plain and perfect, because from them there is an easier and a nearer way to new inventions, never found out before.

The Eleventh instance are stiled *Comitatus* and *Hostiles*. They are such as discover a concrete body, such in which the nature inquired after, doth always follow it as an individual companion, and on the contrary, in which the Nature required doth always fly from it, & is excluded out of its company as an enemy: for out of such instances propositions may be formed, which may be certain, universal, affirmative, and negative, in which the subject shall be such a body in concrete, & the predicate the nature it self that is sought, for example if you seek for hot the *Instantia comitatus* is the flame, *&c.*

The Twelth are *subjunctive*, *&c.*

The Thirteenth are instances of Union which confound and joyn together Natures, which are esteemed to be heterogeneous, and for such are noted and confirmed by the received divisions.

For example, if the nature required is hot. That division seems to be good and authentick, that there are three kinds of heat; the Cœlestial, the animal, and that of the fire. These heats especially one of them being compared with the other two, are, in essence and species, or by a specifick nature, differing and altogether heterogeneous; for the heat of the Cœlestial Globes, and the animate heat, encourage and help generation; but the heat of the fire corrupts and destroyes. It is therefore an instance of Union. This experiment, is common enough when the branch of a vine is brought into the house, where there is a continual fire, by which the Grapes will ripen a month sooner than those that are in the air: so that fruits may be brought to Maturity when they hang upon the tree by the fire, whereas, this seems to be a work proper only to the Sun. Therefore the understanding is perswaded from hence to inquire, what are the differences which are really between the heat of the Sun and that of the fire; from whence it happens that their operations are so unlike, and they nevertheless partake of the same common nature. The differences are found to be four. First, that the heat of the Sun in respect of the heat of the fire is a degree much milder and more favourable. Secondly, That it is conveyed, to us through the air, which of it self is humide. Thirdly, and chiefly that it is very unequal, sometimes drawing near

near and increasing in strength, anon departing and diminishing, which very much contributes to the generation of bodies. Fourthly, that the Sun works upon a body in a long space of time; but the working of the fire, through mens impatiency, performs the business in a shorter time. If any will be careful to attemper and reduce the heat of the fire to a more moderate and milder degree; which may be done several ways, if he will besprinkle it, and cause it to send forth something of humidity; cheifly if he imitates the Suns inequality. Lastly, if he stayes a little, by this means, he shall imitate or equal, or in some things cause the fires heat to be better than the Suns.

The Fourteenth sort of instances are the Judicial, which is when an inquisition is made, and the understanding is placed in an *Equilibrium*, in an uncertainty where to assign the cause of the Nature inquired for.

For example, suppose any man seeks the cause of the flux and reflux of the sea twice a Day. This motion must needs proceeds from the progress and regress of the waters, in the manner of water troubled up and down in a bason, which when it toucheth the one side of the bason, it leaves the other. Or it must proceed from the rising and falling of the waters in the bottom, as boiling water: now there is a doubt unto which of these causes the ebbing and flowing, or flux and reflux of the sea is to be assigned; which if the first of these be asserted, then it will follow, that when the flux is on this side, the reflux will be at the same time on the other. But *Acosco* with some others have found after a diligent inquiry, that upon the Coast of *Florida*, and upon the Coast of *Spain*, and *Africa*, the ebbing and flowing of the Sea happens at the same moment of time. *This question is further examined in the Original.*

The Fifteenth sort of instances are of divorce, because they discover the separations of those natures which often meet.

The *Sixteenth* are the Instances of the lamp, or of the first information, which assist the sense, for as all interpretation of nature begins by the sense, and from the perception of the sense leads by a right and straight-way to inform the understanding, which are the true notions and axioms; it must needs be, that the more copious and exact the representations of the senses are, so much the better and the happier all things must succeed.

The Seventeenth sort of Instances are stiled of the Gate, because they help the immediate actions of the senses. Amongst the senses, it is certain that the sight is the chief, in regard of information; therefore we must seek assistances to this sight.

The eighteenth are Instances called *Citantes*, which deduce that which is not sensible to be sensible.

The Nineteenth are Named Instances of supplement, because they supply the understanding with a right information when the senses fail, therefore we must Fly to them, when we have no proper instances. This is done in a two fold manner, either by Gradation, or by Analogy. For example, the Medium is not to be found which stop the Load-stone in moving the Iron, neither gold, if we put it between, nor silver, nor stone, nor glass, nor wood, &c. Nevertheless after an exact tryal, there may be a certain medium found, which might dull its vertue more than any thing else comparatively, and in some degree, as that the loadstone should not be able to draw Iron to it felt through gold of such a thickness, &c.

The Twentieth sort are stiled Instances *persecantes*, because they cut nature asunder, &c.

The One and Twenty sort are instances of the Rod, or of *non ultra*.

The Two and Twentieth are called Instances *Curriculi*. They measure nature by the moments of time, as the instances of the Rod measure it by the degrees of space. For all motion and natural action is performed in a time, some quicker, some softer, &c.

The Three and Twentieth sort are instances *Quanti*, &c.

The Four and Twentieth sort are instances of Predominancy,

The 25. sort are called *Innuentes*, because they discover and design the benefits of men.

The Six and Twentieth sort are named *Instantiæ Polychrestas*.

The Seven and Twentieth are the Magick instances. They are such in which the matter or the efficient is but little and slender, if compared with the greatness of the work, or of the effect that follows, in somuch that though they are common, they are looked upon as miracles, &c.

I am forced to cut short, and abbreviate many excellent directions, and to pass over several weighty observations, because I am limited. However this abbreviation may give the Reader a taste of the whole.

FINIS.

NEW ATLANTIS.

A Work unfiniſhed.

Written by the Right Honourable:

FRANCIS
Lord *Verulam*, Viſcount *St. Albans*.

NEW

ATLANTIS

A New York medley.

Written by Mr. Howard.

FRANCIS

Henry Brulan, Viscount St. Albans.

TO THE

READER.

THis *Fable* my Lord deviſed, to the end that he might exhibit therein a *Model*, or *Deſcription* of a *Colledge*, inſtituted for the Interpreting of *Nature*, and the producing of great and marvellous *Works* for the benefit of *Men*, under the Name of *Solomons* Houſe, or, *The Colledge of the Six dayes Works*. And even ſo far his Lordſhip have proceeded as to finiſh that Part. Certainly the Model is more vaſt and high, than can poſſibly be imitated in all things; notwithſtanding moſt things therein are within Mens power to effect. His Lordſhip thought alſo in this preſent Fable to have compoſed a Frame of Laws, or of the beſt State or Mould of a *Commonwealth*; but fore-ſeeing it would be a long VVork, his deſire of collecting the *Natural Hiſtory* diverted him, which he preferred many degrees before it.

This VVork of the *New Atlantis* (as much as concerneth the *Engliſh Editions*) his Lordſhip deſigned for this place, in regard it hath ſo near affinity (in one part of it) with the preceding *Natural Hiſtory*.

W. Rawley.

TO THE

READER.

His Fable my Lord devised, to the end that he might exhibit therein a Model, or Description of a College, instituted for the Interpreting of Nature, and the producing of great and marvellous Works for the benefit of Men, under the Name of Solomon's House, or, The College of the Six dayes Work. And even so that his Lordship have proceeded as to finish that Part. Certainly the Model is more vast and high, than can possibly be imitated in all things; notwithstanding most things therein are within Mens power to effect. His Lordship thought also in this present Fable to have comprised a Frame of Laws, or of the best State or Mould of a Commonwealth; but foreseeing it would be a long Work, his desire of collecting the Natural History diverted him, which he preferred many degrees before it.

This Work of the New Atlantis (as much as concerneth the English Edition) his Lordship designed for this place; in regard it hath so near affinity (in one part of it) with the preceding Natural History.

W. Rawley.

NEW ATLANTIS.

WE sailed from *Peru* (where we had continued by the space of one whole year) for *China* and *Japan* by the South Sea, taking with us Victuals for Twelve Moneths, and had good Winds from the East, though soft and weak, for Five Moneths pace and more; but then the Winds came about, and setled in the West for many days; so as we could make little or no way; and were sometimes in purpose to turn back: But then again, there arose strong and great Winds from the South, with a Point East which carried us up (for all that we could do) towards the North; by which time our Victuals failed us, though we had made good spare of them: So that finding our selves in the midst of the greatest Wilderness of Waters in the World, without Victual, we gave our selves for lost men, and prepared for death. Yet we did lift up our hearts and voyces to God above, *Who sheweth his wonders in the deep*; beseeching him of his mercy, That as in the *beginning* he discovered the *Face of the deep*, and brought forth *dry land*; so he would now discover Land to us, that we might not perish. And it came to pass, that the next day about Evening, we saw within a Kenning before us towards the North, as it were thick Clouds, which did put us in some hope of Land; knowing how that part of the South sea was utterly unknown, and might have Islands or Continents that hitherto were not come to light. Wherefore we bent our course thither, where we saw the appearance of Land all that night; and in the dawning of the next day, we might plainly discern that it was a Land flat to our sight, and full of Boscage which made it shew the more dark; and after an hour and halfs sailing, we entred into a good *Haven*, being the Port of a Fair *City*, not great indeed, but well built, and that gave a pleasant view from the Sea: And we thinking every minute long, till we were on Land, came close to the Shore and offered to land; but straight-ways we saw divers of the people with Bastons in their hands, (as it were) forbidding us to land, yet without any cries or fierceness, but onely as warning us off by signs that they made. Whereupon being not a little discomforted, we were advising with our selves, what we should do. During which time, there made forth to us a small Boat with about eight persons in it, whereof one of them had in his hand a Tipstaff of a Yellow Cane, tipped at both ends with Blew, who came aboard our Ship without any shew of distrust at all: And when he saw one of our number present himself somewhat afore the rest, he drew forth a little Scroul of Parchment (somewhat yellower then our Parchment

and shining like the Leaves of Writing-Tables, but otherwise soft and flexible) and delivered it to our foremost man. In which Scroul were written in ancient *Hebrew*, and in ancient *Greek*, and in good *Latine* of the School, and in *Spanish*, these words, 'Land ye not, none of you, and provide to be 'gone from this Coast within sixteen days, except you have further time 'given you: Mean while, if you want Fresh-water or Victual, or help for 'your Sick, or that your Ship needeth repair, write down your wants and 'you shall have that which belongeth to Mercy. This Scroul was signed with a stamp of *Cherubims Wings*, not spred, but hanging downwards, and by them a *Cross*. This being delivered, the *Officer* returned, and left onely a Servant with us to receive our answer. Consulting hereupon amongst our selves, we were much perplexed. The denial of Landing, and hasty warning us away, troubled us much. On the other side, to find that the people had Languages, and were so full of Humanity, did comfort us not a little, and above all, the Sign of the *Cross* to that Instrument, was to us a great rejoycing, and as it were a certain presage of good. Our answer was in the *Spanish* Tongue, 'That for our Ship it was well, for we had rather 'met with Calms and contrary Winds then any Tempests. For our Sick, 'they were many, and in very ill case; so that if they were not permitted to 'land, they ran in danger of their lives. Our other wants we set down in particular, adding. 'That we had some little store of Merchandize, which 'if it pleased them to deal for, it might supply our wants without being 'chargeable unto them. We offered some reward in Pistolets unto the Servant, and a piece of Crimson Velvet to be presented to the *Officer*; but the Servant took them not, nor would scarce look upon them, and so left us, and went back in another little Boat, which was sent for him.

About three hours after we had dispatched our Answer, there came towards us a person (as it seemed) of place: He had on him a Gown with wide Sleeves of a kind of Water-Chamolet, of an excellent Azure colour, far more glossie then ours; his under apparel was green, and so was his Hat, being in the form of a Turbant, daintily made, and not so huge as the *Turkish* Turbants, and the Locks of his Hair came down below the brims of it: A Reverend Man was he to behold. He came in a Boat, guilt in some part of it, with four persons more onely in that Boat, and was followed by another Boat, wherein were some twenty. When he was come within a flight-shot of our Ship, signs were made to us, that we should send forth some to meet him upon the Water; which we presently did in our Ship-boat, sending the principal Man amongst us save one, and four of our number with him. When we come within six yards of their boat, they called to us to stay, and not to approach further; which we did: And there upon the Man whom I before described, stood up, and with a loud voice in *Spanish*, asked, *Are ye Christians?* we answered, *We were*; fearing the less, because of the *Cross* we had seen in the Subscription. At which answer, the said person lift up his right hand towards Heaven, and drew it softly to his mouth, (which is the gesture they use when they thank *God*) and then said, 'If you will swear (all of you) by the Merits of the *Saviour* that ye are no 'Pirates, nor have shed Blood, Lawfully nor Unlawfully, within forty 'days past, you may have License to come on Land. *We said*, We were 'all ready to take that Oath. Whereupon one of those that were with him, being (as it seemed) a *Notary*, made an Entry of this Act. Which done, another of the attendants of the Great Person, which was with

him

him in the same Boat, after his Lord had spoken a little to him, said aloud, 'My Lord, would have you know, that it is not of Pride or Greatness that 'he cometh not aboard your Ship; but for that in your Answer, you de- 'clare, That you have many sick amongst you, he was warned by the *Con- 'servator of Health* of the *City*, that he should keep a distance. We bowed our selves towards him, and answered, 'We were his humble Servants, 'and accounted for great Honor and singular Humanity towards us, that 'which we already done, but hoped well, that the nature of the sickness 'of our Men was not infectuous. So he returned, and a while after came the *Notary* to us aboard our Ship, holding in his hand a Fruit of that Coun- trey like an Orenge, but of colour between Orenge-tawny and Scarlet, which cast a most excellent Odor: He used it (as it seemeth) for a Preser- vative against Infection. He gave us our Oath, *by the Name of Jesus, and his Merits*; and after told us, that the Next day by six of the clock in the morn- ing we should be sent to, and brought to the *Strangers House* (so he called it) where we should be accommodated of things both for our whole and for our sick. So he left us; and when we offered him some Pistolets, he smiling, said, *He must not be twice paid for one labour*, meaning (as I take it) that he had salary sufficient of the *State* for his service; for (as I after learn- ed) they call an Officer that taketh rewards, *Twice-paid*.

The Next morning early, there came to us the same *Officer* that came to us at first with his Cane, and told us, 'He came to conduct us to the *Stran- 'gers House*, and that he had prevented the hour because we might have the 'whole day before us for our business: for (*said he*) if you will follow my 'advice, there shall first go with me some few of you, and see the place, and 'how it may be made convenient for you, and then you may send for your 'sick and the rest of your number which ye will bring on Land. *We thanked him, and said*, 'That this care which he took of desolate Strangers, *God* 'would reward. And so six of us went on Land with him; and when we were on Land, he went before us, and turned to us, and said, *He was but our Servant, and our Guide*. He led us through three fair Streets, and all the way we went there were gathered some people on both sides, standing in a row, but in so a civil a fashion, as if it had been not to wonder at us, but to welcome us; and divers of them, as we passed by them, put their arms a little aboard, which is their gesture when they bid any welcome. The *Strangers House* is a fair and spacious House, built of Brick, of some- what a blewer colour than our Brick, and with handsome Windows, some of Glass, some of a kind of Cambrick oiled. He brought us first into a fair Parlor above-stairs; and then asked us, What Number of persons 'we were, and how many sick. *We answered*, 'We were in all (sick and 'whole) One and fifty persons, whereof our sick were seventeen. He desired us to have patience a little, and to stay till he came back to us, which was about an hour after; and then he led us to see the Chambers which were provided for us, being in Number Nineteen. They having cast it (as it seemeth) that four of those Chambers, which were better then the rest, might receive four of the principal men of our Company, and lodge them alone by themselves; and the other fifteen Chambers were to lodge us two and two together; the Chambers were handsome and chearful Chambers, and furnished civilly. Then he led us to a long Gal- lery, like a Dorture, where he shewed us all along the one side (for the other side was but Wall and Window) seventeen Cells, very neat ones, having partitions of Cedar-wood. Which Gallery and Cells, being in

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all forty, (many more then we needed) were instituted as an Infirmary for sick persons. And he told us withal, that as any of our sick waxed well, he might be removed from his Cell to a Chamber; for which purpose, there were set forth ten spare Chambers, besides the number we spake of before. This done, he brought us back to the Parlor, and lifting up his Cane a little (as they do when they give any charge or command) said to us, 'Ye are to know, that the Custom of the Land requireth, that after this 'day and to morrow (which we give you for removing your People from 'your Ship) you are to keep within doors for three days: But let it not 'trouble you, nor do not think your selves restrained, but rather left to 'your Rest and Ease. You shall want nothing, and there are six of our 'people appointed to attend you for any business you may have abroad. We gave him thanks with all affection and respect and said, *God surely is manifested in this Land.* We offered him also twenty Pistolets; but he smiled and onely said, *What, twice paid?* and so he left us. Soon after our Dinner was served in, which was right good Vians, both for bread and Meat, better then any *Collegiate* Diet, that I have known in *Europe*. we had also drink of three sorts, all wholesome and good; Wine of the Grape, a Drink of Grain, such as is with us our Ale, but more clear; and a kind of Sider made of a Fruit of that Countrey, a wonderful pleasing and refreshing drink. Besides there were brought in to us great store of those Scarlet Orenges for our sick, which (they said) were an assured remedy for sickness taken at Sea. There was given us also a Box of small gray or whitish Pills, which they wished our sick should take, one of the Pills every night before sleep, which (they said) would hasten their recovery The next day, after that our trouble of carriage and removing of our Men and Goods out of our Ship, was somewhat settled and quiet, I thought good to call our company together, and when they were assembled, said unto them, 'My dear Friends, let us know our selves, and how it standeth 'with us. We are Men cast on Land, as *Jonas* was out of the *Whales* '*Belly*, when we were as buried in the deep, and now we are on Land, 'we are but between Death and Life, for we are beyond both the Old 'World and the New, and whether ever we shall see *Europe*, *God* onely 'knoweth: It is a kind of miracle hath brought us hither, and it must be 'little less that shall bring us hence. Therefore in regard of our deliver-'ance past, and our danger present and to come, let us look up to *God*, 'and every man reform his own ways. Besides, we are come here amongst 'a *Christian people*, ful of Piety and Humanity; let us not bring that con-'fusion of face upon our selves, as to shew our vices or unworthiness be-'fore them. Yet there is more; for they have by commandment (though 'in form of courtesie) cloistered us within these Walls for three days, 'who knoweth whether it be not to take some taste of our manners and 'conditions; and if they find them bad, to banish us straight ways; if 'good, to give us further time? for these men that they have given us for 'attendance, may withal have an eye upon us. Therefore for *Gods* love 'and as we love the weal of our Souls and Bodies, let us so behave our 'selves as we may be at peace with God, and may find grace in the eyes 'of this people. Our Company with one Voice thanked me for my good admonition, and promised me to live soberly and civilly, without giving any the least occasion of offence. So we spent our three days joyfully and without care, in expectation what would be done without when they were expired: During which time, we had every Hour Joy

of

of the amendment of our ſick, who thought themſelves caſt into ſome divine *Pool of Healing*, they mended ſo kindly and ſo faſt.

The morrow after our three dayes were paſt, there came to us a new man that we had not ſeen before, cloathed in blew as the former was, ſave that his Turbant was white with a ſmall red croſs on the top, he had alſo a Tippet of fine linnen. At his coming in he did bend to us a little, and put his arms abroad. We of our parts ſaluted him in a very lowly and ſubmiſſive manner, as looking, that from him we ſhould receive ſentence of Life or Death. He deſired to ſpeak with ſome few of us; whereupon ſix of us onely ſtaid, and the reſt avoided the room. He ſaid, 'I am by Office Go-'vernor of this *Houſe of Strangers*, and by Vocation I am a *Chriſtian Prieſt*; 'and therefore am come to you to offer you my ſervice, both as Strangers, 'and chiefly as *Chriſtians*. Some things I may tell you, which I think you 'will not be unwilling to hear. The State hath given you licenſe to ſtay on 'Land for the ſpace of ſix weeks; and let it not trouble you, if your occa-'ſions ask further time, for the Law in this point is not preciſe; and I do 'not doubt, but my ſelf ſhould be able to obtain for you further time as 'ſhall be convenient. Ye ſhall alſo underſtand, that the *Strangers Houſe* is at 'this time rich and much afore hand, for it hath laid up revenue theſe thir-'ty ſeven years; for ſo long it is ſince any Stranger arrived in this part: And 'therefore take you no care, the State will defray you all the time you ſtay, 'neither ſhall you ſtay on day leſs for that. As for any merchandiſe you 'have brought you ſhall be well uſed, and have your Return, either in Mer-'chandiſe, or in Gold or Silver; for to us it is all one, And if you have 'any other requeſt to make, hide it not, for ye ſhall find we will not make 'your countenance to fall by the anſwer ye ſhall receive. Only this I muſt 'tell you, that none of you muſt go above a *Karan* (*that is with them a mile* '*and an half*) from the Walls of the City without ſpecial leave. We anſwe-red, after we had looked a while upon one another, admiring this gracious and parent like uſage, 'That we could not tell what to ſay, for we wanted 'words to expreſs our thanks, and his noble free offers left us nothing to 'ask. It ſeemed to us, that we had before us a Picture of our *Salvation* in '*Heaven*; for we that were a while ſince in the jaws of Death, were now 'brought into a place where we found nothing but Conſolations. For the 'Commandment laid upon us, we would not fail to obey it, though it 'was impoſſible but our hearts ſhould be inflamed to tread further upon 'this happy and holy Ground. *We added*, 'That our Tongues ſhould firſt 'cleave to the Roofs of our Mouths, ere we ſhould forget either this Re-'verend Perſon, or this whole Nation, in our Prayers. We alſo moſt humbly beſought him to accept of us as his true Servants, by as juſt a right as ever men on Earth were bounden, laying and preſenting both our perſons, and all we had at his feet. He ſaid, *he was a Prieſt and looked for a Prieſts reward, which was our Brotherly love, and the good of our Souls and Bodies.* So he went from us, not without tears of tenderneſs in his eyes; and left us alſo confuſed with joy and kindneſs, ſaying amongſt our ſelves. *That we were come into a Land of Angels, which did appear to us daily, and prevent us with comforts, which we thought not of, much leſs expected.*

The next day about ten of the clock the Governor came to us again, and after ſalutations, ſaid familiarly, *that he was come to viſit us*, and called for a Chair, and ſate him down; and we being ſome ten of us (the reſt were of the meaner ſort, or elſe gone abroad) ſate down with him: And when we were ſo, he began thus, 'We of this Iſland of *Benſalem* (*for ſo they call it in*

their

'*their Language*) have this, That by means of our ſolitary ſituation, and of
'the Laws of ſecrecy, which we have for our Travellers, and our rare ad-
'miſſion of Strangers, we know well moſt part of the Habitable World,
'and are our ſelves unknown. Therefore, becauſe he that knoweth leaſt,
'is fitteſt to ask queſtions, it is more reaſon, for the entertainment of the
'time, that ye ask me queſtions, than that I ask you. *We anſwered*, That
'we humbly thanked him, that he would give us leave ſo to do, and that
'we conceived by the taſte we had already, that there was no worldly thing
'on Earth, more worthy to be known, than the Eſtate of that happy Land.
'But above all (*we ſaid*) ſince that we were met from the ſeveral Ends of
'the World, and hoped aſſuredly, that we ſhould meet one day in the
'Kingdom of Heaven, (for that we were both parts *Chriſtians*) we deſired
'to know (in reſpect that Land was ſo remote, and ſo divided by vaſt and
'unknown Seas, from the Land where our *Saviour* walked on Earth) who
'was the Apoſtle of that Nation, and how it was converted to the Faith.
'*It appeared in his face, that he took great contentment in this our Queſtion. He*
'*ſaid*, Ye knit my Heart to you by asking this Queſtion in the firſt place,
'for it ſheweth that you *firſt ſeek the Kingdome of Heaven*; and I ſhall glad-
'ly and briefly ſatisfie your demand.

'About twenty years after the Aſcenſion of our *Saviour*, it came to paſs,
'that there was ſeen by the people of *Renfuſa* (a City upon the Eaſtern
'Coaſt of our Iſland) within night (the Night was cloudy and calm)
'as it might be, ſome miles in the Sea, a great *Pillar of Light*, not ſharp,
'but in form of a Column or Cylinder, riſing from the Sea a great way up
'towards Heaven, and on the top of it was ſeen a large *Croſs of Light*, more
'bright and reſplendent than the Body of the Pillar: Upon which ſo
'ſtrange a ſpectacle the people of the City gathered apace together upon
'the Sands to wonder, and ſo after put themſelves into a number of ſmall
'Boats to go nearer to this marvellous ſight. But when the Boats were
'come within (about) ſixty yards of the Pillar, they found themſelves all
'bound and could go no further, yet ſo as they might move to go about,
'but might not approach nearer; ſo as the Boats ſtood all as in a Theater,
'beholding this Light as an Heavenly Sign. It ſo fell out, that there was
'in one of the Boats, one of the Wiſe men of the Society of *Solomons Houſe*,
'(which *Houſe* or *Colledge* (my good Brethren) is the very eye of this King-
'dom) who having a while attentively and devoutly viewed and contem-
'plated this Pillar and Croſs, fell down upon his face, and then raiſed him-
'ſelf upon his knees, and lifting up his hands to Heaven made his Prayers
'in this manner.

LOrd God *of Heaven and Earth, thou haſt vouchſafed of thy Grace to thoſe of our* Order, *to know thy Works of Creation, and true Secrets of them, and to diſcern (as far as appertaineth to the Generations of Men) between Divine Miracle, Works of Nature, Works of Art, and Impoſtures and Illuſions of all ſorts. I do here acknowledge and teſtifie before this People, that the Thing*

we

we now see before our eyes is thy Finger, *and a true* Miracle. *And forasmuch as we learn in our Books, that thou never workest Miracles but to a Divine and excellent end, (for the Laws of Nature, are thine own Laws, and thou exceedest them not but upon good cause) we most humbly beseech thee to prosper this great Sign, and to give us the Interpretation, and use of it in mercy, which thou dost in some part secretly promise, by sending it unto us.*

'When he had made his prayer, he presently found the Boat he was 'in moveable and unbound, whereas all the rest remained still fast; and 'taking that for an assurance of leave to approach, he caused the Boat to be 'softly and with silence, rowed toward the *Pillar*; but ere he came near it, 'the *Pillar* and *Cross of Light* brake up, and cast it self abroad, as it were, into 'a Firmament of many Stars, which also vanished soon after, and there was 'nothing left to be seen but a small *Ark* or *Chest of Cedar*, dry, and not wet 'at all with Water, though it swam; and in the fore end of it, which was 'towards him, grew a small green Branch of Palm. And when the Wiseman had taken it with all reverence into his Boat, it opened of it self, and 'there was found in it a *Book* and a *Letter*, both written in fine Parchment, 'and wrapped in Sindons of Linnen. The *Book* contained all the *Canonical* 'Books the *Old* and *New Testament*, according as you have them, (for we 'know well what the *Churches* with you receive;) and the *Apocalypse* it self, 'and some other *Books* of the *New Testament*, which were not at that time 'written, were nevertheless in the *Book*. And for the *Letter*, was in these 'words.

I *Bartholomew*, a Servant of the Highest, and Apostle of *JESUS CHRIST*, was warned by an Angel that appeared to me in a Vision of Glory, that I should commit this *Ark* to the Flouds of the Sea. Therefore I do testifie and declare unto that People, where *GOD* shall ordain his *Ark* to come to Land, that in the same day is come unto them Salvation, and Peace, and Good will from the *FATHER*, and from the *LORD JESUS*.

'There was also in both these Writings, as well the *Book* as the '*Letter*, wrought a great Miracle, conform to that of the *Apostles* in the 'Original *Gift of Tongues*. For there being at that time in this Land *Hebrews*, '*Persians*, and *Indians*, besides the Natives; every one read upon the *Book* 'and

'and *Letter*, as if they had been written in his own Language. And thus 'was this Land saved from Infidelity (as the Remain of the old World 'was from water) by an Ark; through the Apostolical and Miraculous 'Evangelism of St. *Bartholomew*. And here he paused, and a Messenger came and called him forth from us. So this was all that passed in that Conference.

The next day the same Governor came again to us immediately after Dinner, and excused himself, saying, 'That the day before he was called from us 'somewhat abruptly, but now he would make us amends, and spend time 'with us, if we held his Company and Conference agreeable. *We answered*, 'That we held it so agreeable and pleasing to us, as we forgot both dangers 'past and fears to come, for the time we heard him speak, and that we thought 'an hour spent with him, was worth years of our former life. *He bowed himself a little to us, and after we were set again, he said*, 'Well the Questi-'ons are on your part. *One of our number said, after a little pause*. 'That 'there was a matter we were no less desirous to know then fearful to ask, 'lest we might presume too far; but encouraged by his rare Humanity to-'wards us (that could scarce think our selves strangers, being his vowed and 'professed Servants) we would take the hardiness to propound it: humbly 'beseeching him, if he thought it not fit to be answered, that he would par-'don it, though he rejected it. *We said*, We well observed those his Words 'which he formerly spake, That this happy Island where we now stood 'was known to few, and yet knew most of the Nations of the World, 'which we found to be true, considering they had the Languages of '*Europe*, and knew much of our state and business; and yet we in *Europe* '(notwithhanding all the remote Discoveries and Navigations of this last 'Age) never heard any of the least inkling or glimpse of this Island. This 'we found wonderful strange, for that all Nations have interknowledge 'one of another, either by Voyage into Forein Parts, for by strangers 'that come to them: And though the Traveller into a Forein Countrey, 'doth commonly know more by the Eye, then he that staid at home can 'by relation of the Traveller; yet both ways suffice to make a mutual 'knowledge in some degree on both parts: But for this Island, we never 'heard tell of any Ship of theirs that had been seen to arrive upon any 'shore of *Europe*, no nor of either the *East* or *West-Indies*, nor yet of any 'Ship of any other part of the World that had made return for them. And 'yet the marvel rested not in this; for the situation of it (as his Lordship 'said) in the secret Conclave of such a vast Sea might cause it: But then, 'that they should have knowledge of the Languages, Books, Affairs of 'those that lye such a distance from them, it was a thing we could not tell 'what to make of; for that it seemed to us a condition and propriety of 'Divine Powers and Beings, to be hidden and unseen to others, and yet 'to have others open, and as in a light to them. At his Speech the Go-vernor gave a gracious smile, and said, 'That we did well to ask pardon 'for this Question we now asked, for that it imported as if we thought 'this Land, a Land of Magicians, that sent forth spirits of the Air into all 'parts to bring them news, and intelligence of other Countreys. It was answered by us all, in all possible humbleness, but yet with a countenance taking knowledge, that we knew, that he spake it but merrily, 'That we 'were apt enough to think, there was somewhat supernatural in this 'Island, but yet rather as Angelical than Magical. But to let his Lord-'ship know truly what it was that made us tender and doubtful to ask this

'Question,

'Question; it was not any such conceit, but because we remembred he 'had given a touch in his former Speech, that this Land had Laws of Secre- 'cy, touching Strangers *To this he said* 'You remember it aright; and 'therefore in that, I shall say to you, I must reserve some particulars which 'it is not lawful for me to reveal, but there will be enough left to give you 'satisfaction.

'You shall understand (that which perhaps you will scarce think cre- 'dible) that about Three thousand years ago or somewhat more, the Na- 'vigation of the World (especially for remote Voyages) was greater then 'at this day. Do not think with your selves, that I know not how much 'it is increased with you within these sixscore years, I know it well; and 'yet I say, greater then, than now. Whether it was, that the example of 'the *Ark* that saved the remnant of Men from the *Universal Deluge* gave 'men confidence to adventure upon the Waters, or what it was, but such 'is the truth. The *Phœnicians*, and specially the *Tyrians*, had great Fleets; 'so had the *Carthaginians* their Colony, which is yet further West: To- 'ward the East, the shipping of *Egypt*, and of *Palestina* was likewise great; 'China also, and the great *Atlantis* (that you call *America*) which have now 'but Junks and Canoaes, abounded then in tall ships. This Island (as 'appeareth by faithful Registers of those times) had then Fifteen hundred 'strong Ships of great content. Of all this, there is with you sparing memory 'or none, but we have large knowledge thereof.

'At that time this Land was known, and frequented by the Ships and 'Vessels of all the Nations before-named, and (as it cometh to pass) they 'had many times Men of other Countreys that were no Sailers, that came 'with them, as *Persians*, *Caldeans*, *Arabians*; so as almost all Nations of 'might and fame resorted hither, of whom we have some stirps and little 'Tribes with us this day. And for our own Ships, they went sundry, 'Voyages, as well to your *Streights*, which you call the *Pillars of Hercules*, 'as to other parts in the *Atlantick* and *Mediterranean Seas*; as to *Paguin* '(which is the same with *Cambalu*) and *Quinsay* upon the Oriental Seas, as 'far as to the Borders of the East *Tartary*.

'At the same time, and an Age after or more, the Inhabitants of the 'great *Atlantis* did flourish. For though the Narration and Description 'which is made by a great Man with you, that the Descendents of *Neptune* 'planted there, and of the magnificent Temple, Palace, City and Hill, 'and the manifold streams of goodly Navigable Rivers, (which as so many 'Chains invironed the same Site and Temple,) and the several degrees of 'ascent, whereby men did climb up to the same, as if it had been a *Scala* '*Cœli*, be all Poetical and Fabulous; yet so much is true, That the said 'Countrey of *Atlantis*, as well that of *Peru* then called *Coya*, as that of '*Mexico* then named *Tyrambel*, were mighty and proud Kingdoms in 'Arms, Shipping, and Riches; so mighty, as at one time (or at least with- 'in the space of ten years) they both made two great expeditions, they of '*Tyrambel* through the *Atlantick* to the *Mediterranean Seas*, and they of '*Coya* through the South-sea upon this our Island. And for the former of these 'which was into *Europe*, the same Author amongst you (as it seemeth) had 'some relation from the *Egyptian Priest* whom he citeth for assuredly such 'a thing there was. But whether it were the ancient *Athenians* that had 'the glory of the repulse and resistance of those Forces, I can say nothing; 'but certain it is, there never came back either Ship or man from that Voy- 'age. Neither had the other Voyage of those of *Coya*, upon us, had better

'fortune, if they had not met with enemies of greater clemency. For the
'King of this Island (by name *Altabin*) a wise Man, and a great Warrior,
'knowing well both his own strength, and that of his enemies, handled the
'matter so, as he cut off their Land forces from their Ships, and entoiled
'both their Navy and their Camp, with a greater power than theirs, both
'by Sea and Land, and compelled them to render themselves without
'striking stroke; and after they were at his mercy, contenting himself one-
'ly with their Oath, that they should no more bear Arms against him, dis-
'missed them all in safety. But the *Divine revenge* overtook not long
'after those proud interprises; for within less then the space of One hun-
'dred years the *Great Atlantis* was utterly lost and destroyed, not by a great
'Earthquake, as your *Man* saith, (for that whole Tract is little subject to
'Earthquakes) but by a particular Deluge and Inundation, those Countreys
'having at this day far greater Rivers, and far higher Mountains to pour
'down Waters, than any part of the Old World. But it is true, that the
'same Inundation was not deep, not past Forty Foot in most places from
'the ground; so that although it destroyed Man and Beast generally,
'yet some few wilde Inhabitants of the Wood escaped: Birds also were
'saved by flying to the high Trees and Woods. For as for Men, although
'they had Buildings in many places higher then the depth of the Water;
'yet that Inundation, though it were shallow, had a long continuance,
'whereby they of the Vale, that were not drowned, perished for want of
'Food, and other things necessary. So as marvel you not at the thin Po-
'pulation of *America*, nor at the Rudeness and Ignorance of the People: for
'you must account your Inhabitants of *America* as a young People,
'younger a thousand years at the least than the rest of the World, for
'that there was so much time between the Universal Flood, and their par-
'ticular Inundation. For the poor remnant of Humane Seed which re-
'mained in their Mountains peopled the Countrey again slowly, by little
'and little. And being simple and savage people (not like *Noah* and his
'Sons, which was the chief Family of the Earth) they were not able to
'leave Letters, Arts, and Civility to their Posterity. And having likewise
'in their Mountainous Habitations been used (in respect of the extream
'Cold of those *Regions*) to cloath themselves with the skins of Tigers,
'Bears and great Hairy Goats, that they have in those parts; when after
'they came down into the Valley, and found the intolerable Heats which
'are there, and knew no means of lighter Apparel, they were forced to
'begin the custom of going naked, which continueth at this day, onely
'they take great pride and delight in the Feathers of Birds: And this also
'they took from those their Ancestors of the Mountains, who were in-
'vited unto it by the infinite flight of Birds that came up to the High
'Grounds, while the Waters stood below. So you see by this main
'accident of time, we lost our Traffick with the *Americans*, with whom
'of all others, in regard they lay neerest to us, we had most commerce.
'As for the other parts of the World, it is most manifest, that in the
'Ages following (whether it were in respect of Wars, or by a Natural
'revolution of time) Navigation did every where greatly decay, and
'especially far Voyages (the rather by the use of Gallies and such Vessels
'as could hardly brook the Ocean) were altogether left and omitted.
'So then, that part of entercourse which could be from other Nations
'to sail to us, you see how it hath long since ceased, except it were by
'some rare accident, as this of yours. But now of the cessation of that

'other

'other part of entercourſe, which might be by our ſailing to other Nations.
'I muſt yield you ſome other cauſe: for I cannot ſay (if I ſhall ſay truly)
'but our ſhipping for number, ſtrength, Mariners, Pilots, and all things that
'appertain to Navigation, is as great as ever; and therefore why we ſhould
'ſit at home, I ſhall now give you an account by it ſelf, and it will draw
'nearer to give you ſatisfaction to your principal Queſtion.

'There reigned in this Iſland about One thouſand nine hundred years
'ago, a King, whoſe memory of all others we moſt adore, not ſuperſtitiouſly
'but as a Divine Inſtrument, though a Mortal Man; his name was *Solamona*,
'and we eſteem him as the *Law-giver* of our Nation. This *King* had a *large*
'*heart*, inſcrutable for good, and was wholly bent to make his Kingdom and
'People happy: He therefore taking into conſideration how ſufficient and
'ſubſtantive this Land was to maintain it ſelf without any aid (at all) of the
'Forreigner, being Five thouſand ſix hundred miles in circuit, and of rare
'fertility of ſoil in the greateſt part thereof; and finding alſo the ſhipping of
'this Country mought be plentifully ſet on work, both by Fiſhing, and by
'Tranſportations from Port to Port, and likewiſe by ſailing unto ſome ſmall
'Iſlands that are not far from us, and are under the Crown and Laws of this
'*State*; and recalling into his memory the happy and flouriſhing eſtate
'wherein this Land then was, ſo as it might be a thouſand ways altered to
'the worſe, but ſcarce any one way to the better; thought nothing wanted
'to his Noble and Heroical Intentions, but onely (as far as Humane fore-
'ſight might reach) to give perpetuity to that which was in his time ſo hap-
'ply eſtabliſhed; therefore amongſt his other Fundamental Laws of this
Kingdom, he did ordain the Interdicts and Prohibitions which we have
'touching entrance of ſtrangers, which at that time (though it was after the
'calamity of *America*) was frequent, doubting novelties and commixture of
'manners. It is true, the like Law againſt the admiſſion of ſtrangers, with-
'out licence, is an ancient Law in the Kingdom of *China*, and yet continued
'in uſe; but there it is a poor thing, and hath made them a curious, igno-
'rant, fearful, fooliſh Nation. But our *Law-giver* made his Law of another
'temper. For firſt, he hath preſerved all points of humanity, in taking or-
'der and making proviſion for the relief of ſtrangers diſtreſſed, whereof you
'have taſted. *At which Speech (as reaſon was) we all roſe up and bowed our ſelves.*
He went on. 'That *King* alſo ſtill deſiring to joyn Humanity and Policy to-
'gether, and thinking it againſt Humanity to detain Strangers here againſt
'their Wills, and againſt Policy, that they ſhould return and diſcover their
'knowledge of this his State, he took this courſe. He did ordain, that of the
'Strangers that ſhould be permitted to Land, as many (at all times) might
'depart as would, but as many as would ſtay, ſhould have very good con-
'ditions and means to live from the *State*. Wherein he ſaw ſo far, that
'now in ſo many Ages, ſince the Prohibition, we have memory not of one
'Ship that ever returned, and but of thirteen perſons onely at ſeveral times
'that choſe to return in our Bottoms. What thoſe few that returned, may
'have reported abroad, I know not; but you muſt think, whatſoever they
'have ſaid, could be taken where they came, but for a dream. Now for
'our travelling from hence into parts abroad, our *Law giver* thought fit al-
'together to reſtrain it. So is it not in *China*, for the *Chineſes* ſail where they
'will or can; which ſheweth, that their Law of keeping out Strangers, is
'a Law of puſillanimity and fear. But this reſtraint of ours hath one onely
'exception, which is admirable, preſerving the good which cometh by
'communicating with ſtrangers, and avoiding the hurt; and I will now

'open it to you. And here I shall seem a little to digress, but you will by
'and by find it pertinent. Ye shall understand (my dear Friends) that
'amongst the excellent acts of that *King*, one above all hath the preemi-
'nence: It was the erection and institution of an *Order* or *Society* which
'we call *Salomons House*, the noblest Foundation (as we think) that ever
'was upon the Earth, and the Lanthorn of this Kingdom. It is dedicated
'to the study of the *Works* and *Creatures* of *God*. Some think it beareth
'the Founders name a little corrupted, as if it should be *Solamona's House*;
'but the Records write it as it is spoken, so as I take it to be denomi-
'nate of the *King* of the *Hebrews*, which is famous with you and no stranger
'to us, for we have some parts of his Works, which with you are lost,
'namely that *Natural History* which he wrote of all *Plants* from the *Cedar of*
'*Libanus*, to the *Moss that groweth out of the Wall*, and of all things that
'*have Life and Motion*. This maketh me think, that our *King* finding himself
'to Symbolize, in many things with that *King* of the *Hebrews* (which lived ma-
'ny years before him) honoured him with the Title of this foundation, and I
'am the rather induced to be of this opinion, for that I find in ancient record,
'this *Order* or *Society* is sometimes called *Salomons House*, and sometimes the
'*College* of the *six days Works*: whereby I am satisfied, That our excellent
'*King* had learned from the *Hebrews*, that *God* had created the World, and
'all that therein is, within six Days, and therefore he instituting that *House*
'for the finding out of the true Nature of all things (whereby *God* mought
'have the more Glory in the Workmanship of them, and Men the more fruit
'in the use of them) did give it also that second name. But now to come to our
'present purpose. When the *King* had forbidden, to all his people navigation
'into any part that was not under his Crown, he made nevertheless this Ordi-
'nance; That every twelve years there should be set forth out of this *King-*
'*dom* two Ships appointed to several Voyages; that in either of these Ships
'there should be a Mission of three of the *Fellows* or *Brethren* of *Salomons*
'*House* whose errand was onely to give us knowledge of the affairs and
'state of those Countreys, to which they were designed, and especially of the
'Sciences, Arts, Manufactures and Inventions of all the World; and withal
'to bring unto us Books, Instruments, and Patterns in every kind. That
'the Ships after they had landed the *Brethren* should return, and that the
'*Brethren* should stay abroad till the next Mission. The Ships are not other-
'wise fraught than with store of Victuals, and good quantity of Treasure
'to remain with the *Brethren* for the buying of such things, and rewarding
'of such persons as they should think fit. Now for me to tell you how the
'vulgar sort of Marriners are contained from being discovered at Land,
'and how they that must be put on shore for any time colour themselves
'under the names of other Nations, and to what place these Voyages have
'been designed, and what places of *Rendezvous* are appointed for the new
'Missions and the like circumstances of the practick, I may not do it, neither
'is it much to your desire. But thus you see we maintain a Trade, not for
'Gold, Silver, or Jewels, nor for Silks, nor for Spices, nor any other com-
'modity of Matter, but onely for *Gods* first Creature, which was *Light*: to
'have *Light* (I say) of the growth of all parts of the World. And when he
had said this he was silent, & so were we all; for indeed, we were all astonish-
ed to hear so strange things so probably told. And he perceiving, that we
were willing to say somewhat, but had it not ready, in great courtesie took
us off, and descended to ask us questions of our Voyage and Fortunes,
and in the end concluded that we mought do well, to think with ourselves,

what

and in the end concluded, that we might do well to think with our ſelves what time of ſtay we would demand of the State; and bade us not to ſcant our ſelves, for he would procure ſuch time as we deſired. Whereupon we all roſe up and preſented our ſelves to kiſs the ſkirt of his Tippet; but he would not ſuffer us, and ſo took his leave. But when it came once amongſt our people, that the State uſed to offer conditions to ſtrangers that would ſtay, we had work enough to get any of our men to look to our Ship, and to keep them from going preſently to the Governor to crave conditions; but with much ado, we refrained them till we might agree what courſe to take.

We took our ſelves now for Freemen, ſeeing there was no danger of our utter perdition, and lived moſt joyfully, going abroad, and ſeeing what was to be ſeen in the City and places adjacent within our *Tedder*, and obtaining acquaintance with many of the City, not of the meaneſt quality, at whoſe hands we found ſuch humanity, and ſuch a freedome and deſire to take ſtrangers, as it were into their boſome, as was enough to make us forget all that was dear to us in our own Countreys, and continually we met with many things right worthy of obſervation and relation: as indeed, if there be a Mirror in the World, worthy to hold mens eyes, it is that Countrey. One day there were two of our company bidden to a *Feaſt* of the *Family*, as they call it; a moſt natural, pious and reverend cuſtom it is, ſhewing that Nation to be compounded of all goodneſs. This is the manner of it. It is granted to any man that ſhall live to ſee thirty perſons deſcended of his body alive altogether, and all above three years old, to make this *Feaſt*, which is done at the coſt of the State. The *Father* of the *Family*, whom they call the *Tirſan*, two days before the Feaſt taketh to him three of ſuch Friends as he liketh to chuſe, and is aſſiſted alſo by the Governor of the City or place where the Feaſt is celebrated; and all the *Perſons* of the *Family*, of both Sexes are ſummoned to attend him. Theſe two days the *Tirſan* ſitteth in conſultation concerning the good eſtate of the *Family*; there, if there be any Diſcords or Suits between any of the Family, they are compounded and appeaſed; there, if any of the Family be diſtreſſed or decayed, order is taken for their relief and competent means to live; there, if any be ſubject to vice or take ill courſes, they are reproved and cenſured. So likewiſe, direction is given touching Marriages, and the courſes of life which any of them ſhould take, with divers other the like orders and advices. The Governor aſſiſteth to the end, to put in execution by his publick Authority, the Decrees and Orders of the *Tirſan*, if they ſhould be diſobeyed, though that ſeldom needeth, ſuch reverence and obedience they give to the order of Nature. The *Tirſan* doth alſo then ever chuſe one man from amongſt his Sons to live in Houſe with him, who is called ever after the *Son of the Vine*; the reaſon will hereafter appear. On the Feaſt-day the *Father* or *Tirſan* cometh forth after Divine Service into a large Room where the Feaſt is celebrated; which Room hath an Half-pace at the upper end. Againſt the Wall, in the middle of the Half-pace, is a Chair placed for him, with a Table and Carpet before it: Over the Chair is a State made round or oval, and it is of Ivy; an Ivy ſomewhat whiter then ours, like the Leaf of a Silver Aſp, but more ſhining, for it is Green all Winter. And the State is curiouſly wrought with Silver and Silk of divers colours, broy ding or binding in the Ivy; and is ever of the work of ſome of the Daughters of the Family, and veiled

over at the top with a fine Net of Silk and Silver: But the substance of it is true Ivy, whereof, after it is taken down, the Friends of the Family are desirous to have some Leaf or Sprig to keep. The *Tirsan* cometh forth with all his Generation or Lineage, the Males before him, and the Females following him. And if there be a Mother, from whose body the whole Lineage is descended, there is a Traverse placed in a Loft above on the right hand of the Chair, with a Privy-door, and a carved Window of Glass leaded with Gold and Blew, where she sitteth, but is not seen. When the *Tirsan* is come forth, he sitteth down in the Chair, and all the Lineage place themselves against the Wall, both at his back, and upon the return of the Half-pace, in order of their years, without difference of Sex, and stand upon their Feet. When he is set, the room being always full of company, but well kept, and without disorder, after some pause there cometh in from the lower end of the room a *Taratan*, (which is as much as an *Herauld*) and on either side of him two *Tsung Lads*, whereof one carrieth a Scroul of their shining yellow Parchment, and the other a cluster of Grapes of Gold, with a long Foot or Stalk: The *Herauld* and *Children* are clothed with Mantles of *Sea-water-green Sattin*, but the *Heraulds* Mantle is streamed with Gold, and hath a Train. Then the *Herauld*, with three Courtesies, or rather inclinations, cometh up as far as the Half-space, and there first taketh into his hand the Scroul. This Scroul is the *Kings Charter*, containing Gift of Revenue, and many Priviledges, Exemptions, and Points of Honor granted to the *Father* of the *Family*; and it is ever stiled and directed, *To such an one. Our well-beloved Friend and Creditor*, which is a Title proper onely to this case: For they say, the King is Debtor to no Man, but for propagation of his Subjects. The Seal set to the *Kings Charter*, is the Kings Image imbossed or moulded in Gold. And though such *Charters* be expedited of course, and as of right, yet they are varied by discretion, according to the number and dignity of the *Family*. This *Charter the Herauld* readeth aloud and while it is read, the *Father* or *Tirsan* standeth up, supported by two of his Sons, such as he chuseth. Then the *Herauld* mounteth the Half-pace, and delivereth the *Charter* into his hand, and with that there is an acclamation by all that are present in their Language, which is thus much, *Happy are the People of Bensalem*. Then the *Herauld* taketh into his hand from the other Child the Cluster of Grapes, which is of Gold, both the Stalks and the Grapes; but the Grapes are daintily enamelled: And if the Males of the *Family* be the greater number, the Grapes are enamelled Purple, with a little Sun set on the top; if the Females, then they are enamelled into a greenish yellow, with a Crescent on the top. The Grapes are in number as many as there are Descendants of the *Family*. This Golden Cluster the *Herauld* delivereth also to the *Tirsan*, who presently delivereth it over to that Son that he had formerly chosen to be in house with him; who beareth it before his *Father* as an Ensign of Honor when he goeth in publick ever after, and is thereupon called *The Son of the Vine*. After this Ceremony ended, the *Father* or *Tirsan* retireth, and after some time cometh forth again to Dinner, where he sitteth alone under the State as before; and none of his Descendants sit with him; of what degree or dignity soever, except he hap to be of *Salomons House*. He is served onely by his own Children, such as are Male, who perform unto him all service of the Table upon the Knee; and the Women onely stand about him, leaning against the Wall. The Room below the Half-pace hath

hath Tables on the sides for the Guests that are bidden, who are served with great and comely order; and toward the end of Dinner (which in the greatest Feasts with them, lasteth never above an Hour and a Half) there is an *Hymn* sung, varied according to the Invention of him that composed it, (for they have excellent Poesie;) but the subject of it is (always) the praises of *Adam*, and *Noah*, and *Abraham*; whereof the former two peopled the World, and the last was the *Father* of the *Faithful*, concluding ever with a Thanksgiving for the *Nativity* of our *Saviour* in whose Birth the Births of all are onely Blessed. Dinner being done, the *Tirsan* retireth again, and having withdrawn himself alone into a place, where he maketh some private Prayers, he cometh forth the third time to give the Blessing, with all his Descendants, who stand about him as at the first. Then he calleth them forth, by one and by one, by name, as he pleaseth, though seldom the order of age be inverted. The person that is called (the Table being before removed) kneeleth down before the Chair, and the *Father* layeth his hand upon his head, or her head, and giveth the Blessing in these words; *Son of* Bensalem (*or Daughter of* Bensalem) *thy Father saith it, the Man by whom thou hast breath and life speaketh the word: the Blessing of the everlasting Father, the Prince of Peace, and the Holy Dove be upon thee, and make the days of thy Pilgrimage good and many.* This he saith to every of them; and that done, if there be any of his Sons of eminent Merit and Vertue, (so they be not above two) he calleth for them again, and saith, laying his arm over their shoulders, they standing, *Sons, it is well you are born; give God the praise, and persevere to the end.* And withal delivereth to either of them a Jewel, made in the figure of an Ear of Wheat, which they ever after wear in the front of their Turbant or Hat. This done, they fall to Musick and Dances and other Recreations after their manner, for the rest of the day. This is the full order of that *Feast*.

By that time six or seven days were spent, I was faln into straight acquaintance with a *Merchant* of that *City*, whose name was *Joabin*; he was a *Jew*, and *circumcised*: For they have some few stirps of *Jews* yet remaining among them, whom they leave to their own Religion; which they may the better do, because they are of a far differing disposition from the *Jews* in other parts. For whereas they hate the *Name* of CHRIST, and have a secret imbred rancor against the people, among whom they live: These (contrariwise) give unto our SAVIOUR many high Attributes, and Love the *Nation* of *Bensalem* extreamly. Surely this Man, of whom I speak, would ever acknowledge that CHRIST was born of a *Virgin*, and that he was more then a Man; and he would tell how GOD made him Ruler of the *Seraphims* which guard his Throne, and they call him also the *Milken way*, and the *Eliah* of the *Messiah*, and many other high Names; which though they be inferior to his Divine Majesty, yet they are far from the Language of other *Jews*. And for the Countrey of *Bensalem*, this Man would make no end of commending it, being desirous, by Tradition among the *Jews* there, to have it believed, that the people thereof were of the Generations of *Abraham* by another Son, whom they call *Nachoran*; and that *Moses* by a secret *Cabala* ordained the Laws of *Bensalem*, which they now use; and that when the *Messiah* should come and sit in his Throne at *Jerusalem*, the King of *Bensalem* should sit at his Feet, whereas others Kings should keep a great distance. But yet setting aside these Jewish Dreams, the Man was a wise man and learned, and of great Policy, and excellently seen in the Laws and Customs of that Nation.

Nation. Amongſt other diſcourſes, one day I told him, I was much affected with the Relation I had from ſome of the Company of their Cuſtom in holding the *Feaſt* of the *Family*, for that (me thought) I had never heard of a Solemnity wherein Nature did ſo much preſide. And becauſe Propagation of Families proceedeth from the Nuptial Copulation, I deſired to know of him what Laws and Cuſtoms they had concerning Marriage, and whether they kept Marriage well, and whether they were tied to one Wife. For that where Population is ſo much affected, and ſuch as with them it ſeemed to be, there is commonly permiſſion of *Plurality* of *Wives*. To this he ſaid, *You have reaſon for to command that excellent Inſtitution of the* Feaſt *of the* Family; *and indeed we have experience, that thoſe Families that are partakers of the Bleſſings of that Feaſt do flouriſh and proſper ever after in an extraordinary manner. But hear me now, and I will tell you what I know. You ſhall underſtand, that there is not under the Heavens, ſo chaſte a Nation as this of* Benſalem, *nor ſo free from all pollution or foulneſs; it is the Virgin of the World. I remember I have read in one of your* European books *of an holy Hermit amongſt you that deſired to ſee the* Spirit *of* fornication *and there appeared to him a little foul ugly Æthiope: But if he had deſired to ſee the* Spirit *of* Chaſtity *of* Benſalem, *it would have appeared to him in the likeneſs of a fair beautiful* Cherubim; *for there is nothing amongſt Mortal Men more fair and admirable, then the chaſte Minds of this People. Know therefore, that with them there are no Stewes, no diſſolute Houſes, no* Courteſans, *nor any thing of that kind. Nay they wonder (with deteſtation) at you in* Europe, *which permit ſuch things. They ſay you have put Marriage out of office; for Marriage is ordeined a remedy for unlawful concupiſence, and Natural concupiſcence ſeemeth as a ſpur to Marriage:* But *when Men have at hand a remedy more agreeable to their corrupt will, Marriage is almoſt expulſed. And therefore, there are with you ſeen infinite Men that marry not, but chuſe rather a Libertine, and impure ſingle Life, then to be yoked in Marriage; and many that do marry, marry late, when the prime and ſtrength of their years is paſt; and when they do marry; what is Marriage to them, but a very bargain, wherein is ſought Alliance, or* Portion, *or Reputation, with ſome deſire (almoſt indifferent) of iſſue, and not the faithful Nuptial Union of Man and Wife that was firſt inſtituted? Neither is it poſſible, that thoſe that have caſt away ſo baſely ſo much of their ſtrength, ſhould greatly eſteem Children (being of the ſame matter) as chaſt Men do. So likewiſe during Marriage is the caſe much amended, as it ought to be, if thoſe things were tolerated onely for neceſſity? No, but there remains ſtill as a very affront to Marriage; the haunting of thoſe diſſolute places, or reſort to Courteſans, are no more puniſh in Married men, then in* Batchelors: *And the depraved cuſtome of change, and the delight in meretricious embracements, (where Sin is turned into Art) maketh Marriage a dull thing and a kind of Impoſition or Tax. They hear you defend theſe things as done to avoid greater evils, as Advowtries, Deflouring of Virgins, Unnatural Luſt, and the like:* But *they ſay this is a prepoſterous Wiſdom: and they call it* Lots *offer, who to ſave his Gueſts from abuſing offered his Daughters:* Nay, *they ſay further, that there is little gained in this, for that the ſame Vices and Appetites do ſtill remain and abound, Unlawfulful Luſt being like a Furnace, that if you ſtop the Flames altogether*

'gether, it will quench; but if you give it any vent, it will rage. As for 'Masculine Love, they have no touch of it, and yet there are not so faithful and inviolate Friendships in the World again as are there; and to 'speak generally (as I said before) I have not read of any such Chastity in 'any People as theirs. And their usual saying is, that whosoever is unchaste, 'cannot reverence himself. *And they say*, That the reverence of a Mans self 'is, next religion, the chiefest Bridle of all Vices. And when he had said 'this, the good *Jew* paused a little. Whereupon, I far more willing to hear 'him speak on, than to speak my self; yet thinking it decent, that upon his 'pause of Speech I should not be altogether silent, said only this; That I 'would say to him, as the *Widow* of *Sarepta* said to *Elias*, That he was 'come to bring to memory our sins; and that I confess the *Righteousness* of '*Bensalem* was greater than the *Righteousness* of *Europe*. *At which Speech* he '*bowed his Head, and went on this manner.* 'They have also many wise and 'excellent Laws touching *Marriage*; they allow no *Polygamy*; they have 'ordained that none do intermarry or contract until a month be past from 'their first interview. *Marriage* without consent of Parents, they do not 'make void, but they mulct it in the Inheritors; for the Children of such '*Marriages* are not admitted to inherit above the third part of their Parents 'inheritance. I have read in a *Book* of one of your *Men*, of a *Feigned* '*common-wealth*, where the married couple are permitted before they 'contract to see one another naked. This they dislike, for they think it a 'Scorn to give a refusal after so familiar knowledge; but because of many 'hidden defects in Men and Womens Bodies, they have a more civil way 'for they have near every Town, a couple of *Pools* (which they call '*Adam* and *Eves* Pools) where it is permitted to one of the Friends of the 'Man, and another of the Friends of the Woman, to see them severally, 'both naked.

And as we were thus in Conference, there came one that seemed to be a Messenger, in a rich Huke, that spake with the *Jew*; whereupon he turned to me, and said, *You will pardon me, for I am commanded away in haste*; the next morning he came to me again, joyful, as it seemed, and said there is word come to the Governor of the City, that one of the *Fathers* of *Salomons House* will be here this day seven night; we have seen none of them this dozen years. His coming is in state, but the cause of his coming is secret. I will provide you and your Fellows of a good *standing to see his entry*. I thanked him, and told him, *I was most glad of the news*. The Day being come, he made his entry. He was a *Man* of middle stature and Age, comely of person, and had an aspect as if he pitied men: He was cloathed in a Robe of fine black Cloth, with White Sleeves, and a Cape. His under Garment was of excellent white Linnen down to the Foot, girt with a Girdle of the same; and a Sindon or Tippet of the same about his Neck; he had Gloves that were curious, and set with Stone, and shoes of Peach-coloured Velvet: his Neck was bare to the Shoulders; his Hat was like a Helmet or *Spanish Montera*, and his Locks curled below it decently, they were of colour brown; his Beard was cut round, and of the same colour with his Hair, somewhat lighter. He was carried in a rich Chariot without Wheels, Litter-wise, with two Horses at either end, richly trapped in blew Velvet embroidered, and two Footmen on each side in the like attire. The Chariot was all of Cedar guilt, and adorned with cristal save that the fore-end had Pannells of Saphires set in borders of Gold; And the Hinder-end the like of Emeraulds of the *Peru* colour.

There

There was also a Sun of Gold, radiant upon the top in the midst and on the top before a small *Cherub* of Gold, with Wings displayed. The Chariot was covered with Cloth of Gold tissued upon blew. He had before him fifty attendants, young men all, in white Satten loose Coats to the mid-leg, and Stockings of white Silk, and Shooes of blew Velvet, and Hats of blew Velvet, with fine Plumes of divers Colours, set round like Hat-bands. Next before the Chariot, went two Men, bare headed, in Linnen Garments down to the foot, girt, and Shoes of blew Velvet; who carried, the one a Crosier, the other a Pastoral Staff like a Sheep-hook, neither of them of Metal, but the Crosier of Balm-wood, the Pastoral Staff of Cedar. Horsemen he had none, neither before, nor behind his Chariot, as it seemeth, to avoid all tumult and trouble. Behind his Chariot went all the Officers and Principals of the Companies of the City. He sate alone upon Cushions, of a kind of excellent Plush, blew, and under his Foot curious Carpets of Silk of divers colours, like the *Persian*, but far finer. He held up his bare hand as he went, as blessing the People, but in silence. The Street was wonderfully well kept, so that there was never any Army had their Men stand in better battel-array, then the people stood. The Windows likewise were not crouded but every one stood in them, as if they had been placed. When the show was past, the *Jew* said to me, 'I shall not be able to attend you as I 'would, in regard of some charge the City hath laid upon me for the entertaining of this great Person. *Three days after the* Jew *came to me again, and said*, Ye are happy men, for the *Father* of *Solomons House* taketh knowledge 'of your being here, and commanded me to tell you, that he will admit all 'your company to his presence, and have private conference with one of 'you that ye shall chuse; and for this, hath appointed the next day after to 'morrow. And because he meaneth to give you his Blessing, he hath 'appointed it in the forenoon. We came at our day and hour, and I was chosen by my fellows for the private access. We found him in a fair Chamber richly hanged and carpeted under Foot, without any degrees to the State: He was set upon a low Throne, richly adorned, and a rich Cloth of State over his head of blew Sattin embroidered. He was alone, save that he had two Pages of Honor on either hand one, finely attired in white. His under Garments were the like, that we saw him wear in the Chariot; but instead of his Gown, he had on him a Mantle with a Cape of the same fine Black, fastned about him. When we came in, as we were taught, we bowed low at our first entrance; and when we were come near his Chair, he stood up, holding forth his hand ungloved, and in posture of Blessing; and we every one of us stooped down and kissed the Hem of his Tippet. That done, the rest departed, and I remained. Then he warned the Pages forth of the Room, and caused me to sit down beside him, and spake to me thus in the *Spanish Tongue*.

GOD

'GOD Bless thee, my Son, I will give thee the greatest Jewel I have: for I will impart unto thee, for the love of *God* and Men, a Relation of the true state of *Salomons House*. Son, to make you know the true state of *Solomons House*, I will keep this order. First, I will set forth unto you the *End* of our *Foundation*. Secondly The *Preparations* and *Instruments* we have for our *Works*. Thirdly, The several *Employments* and *Functions* whereto our *Fellows* are assigned: And fourthly, The *Ordinances* and *Rites* which we observe.

'The *End* of our *Foundation*, is the Knowledge of *Causes* and Secret Motions of things, and the enlarging of the Bounds of *Humane Empire*, to the effecting of all things possible

'The *Preparations* and *Instruments*, are these. We have large and deep *Caves* of several deeps; the deepest are sunk six hundred fathom, and some of them are digged and made under great Hills and Mountains: so that if you reckon together the depth of the Hill, and the depth of the *Cave*, they are (some of them) above three miles deep: For we find that the depth of an Hill, and the depth of a *Cave* from the Flat, is the same thing, both remote alike from the Sun and Heavens Beams, and from the open Air. These *Caves* we call the *Lower Region*, and we use them for all *Coagulations*, *Indurations*, *Refrigerations*, and *Conservations* of *Bodies*. We use them likewise for the *Imitation* of *Natural Mines*, and the *Producing* also of new *Artificial Metals*, by *Compositions* and *Materials* which we use and lay there for many years. We use them also sometimes (which may seem strange) for *Curing* of some *Diseases*, and for *prolongation* of *life* in some *Hermits* that chuse to live there, well accommodated of all things necessary, and indeed live very long; by whom also we learn many things.

'We have *Burials* in several *Earths*, where we put divers *Cements* as the *Chineses* do their *Porcellane*; but we have them in greater variety and some of them more fine. We also have great variety of *Composts* and *Soils* for the making of the Earth fruitful.

'We have high *Towers*, the highest about half a Mile in Height, and some of them likewise set upon high *Mountains*, so that the vantage of the Hill with the *Tower*, is in the Highest of them, three Miles at least. And these places we call the *Upper Region*, accounting the Air, between the *High places* and the *Low*, as a *Middle Region*. We use these *Towers* according to their several heights and situations, for *Insolations*, *Refrigeration*, *Conservation*, and for the *view* of divers *Meteors*, as Winds, Rain, Snow, Hail, and some of the Fiery Meteors also. And upon them, in some places, are dwellings of *Hermits*, whom we visit sometimes, and instruct what to observe.

'We have great *Lakes*, both *salt* and *fresh*, whereof we have use for the *Fish* and *Fowl*. We use them also for *Burials* of some *Natural Bodies*; for we find a difference in things buried in *Earth*, or in *Air* below the *Earth*, and things buried in *Water*. We have also *Pools*, of which some do strain *Fresh water* out of *Salt*, and others by Art do turn *Fresh water* into *Salt*. We have also some *Rocks* in the midst of the *Sea*, and some *Bays* upon the *Shore* for some *Works*, wherein is required the *Air* and *Vapor* of the *Sea*. We have likewise *violent streams* and *Cataracts*, which serve us for many *Motions*; and likewise *Engins* for *multiplying* and *enforcing* of *Winds*, to set also on going divers *Motions*.

We

'We have also a number of *Artificial Wells* and *Fountains*, made in imi-
'tation of the *Natural Sources* and *Baths*; as tinctcd upon *Vitriol*, *Sul*
'*phur*, *Steel*, *Brass*, *Lead*, *Nitre*, and other *Minerals*. And again we have
'little *Wells* for *Infusions* of many *things*, where the *Waters* take the vir-
'tue quicker and better then in *Vessels* or *Basins*: And amongst them we have
'a *Water* which we call *Water* of *Paradise*, being by that we do to it, made
'very sovereign for *Health* and *Prolongation* of *Life*.

'We have also great and *spacious Houses*, where we imitate and demon-
'strate *Meteors*; as *Snow*, *Hail*, *Rain*, some *Artificial Rains* of *Bodies*, and
'not of *Water*, *Thunders*, *Lightnings*; also *Generations* of *Bodies* in *Air*, as
'*Frogs*, *Flies*, and divers others.

'We have also certain *Chambers* which we call *Chambers* of *Health*,
'where we qualifie the *Air*, as we think good and proper for the *cure of di-*
'*vers Diseases*, and *preservation* of *Health*.

'We have also fair and large *Baths* of several *mixtures*; for the *cure* of
'*Diseases*, and the *restoring* of *Mans Body* from *Arefaction*, and other, for
'the *confirming* of it in *strength of Sinews*, *Vital Parts*, and the very *Juice*
'and *Substance* of the *Body*.

'We have also large and various *Orchards* and *Gardens*, wherein we
'do not so much respect Beauty, as variety of ground and soyl, proper for
'divers *Trees* and *Herbs*; and some very spacious, where *Trees* and *Berries*
'are set, whereof we make divers kinds of *Drinks*, besides the *Vineyards*.
'In these we practise likewise all conclusions of *Grafting* and *Inoculating*, as
'well of *Wild Trees* as *Fruit trees*, which produceth many effects. And we
'make (by *Art*) in the same *Orchards* and *Gardens*, *Trees* and *Flowers* to
'come earlier or later then their *seasons*, and to come up and bear more
'speedily then by their *natural course* they do. We make them also (by *Art*)
'much greater, their *nature*, and their *Fruit* greater and sweeter, and of
'differing *taste*, *smell*, *colour* and *figure* from their *nature*; and many of them
'we so order, that they become of *Medicinal use*.

'We have also means to make divers *Plants* rise, by *mixtures* of
'*Earths* without *Seeds*, and likewise to make divers new *Plants* differing
'from the Vulgar, and make one *Tree* or *Plant* turn into another.

'We have also *Parks* and *Enclosures* of all sorts of *Beasts* and *Birds*;
'which we use not onely for view or rareness, but likewise for *Dissections*
'and *Tryals*, that thereby we may take light, what may be wrought upon
'the *Body* of *Man*, wherein we find many strange effects; as *continuing*
'*life* in them, though divers *parts*, which you account *vital* be perished
'and taken forth; *Resuscitating* of some that seem *dead* in *appearance*,
'and the like. We try also all *Poysons* and other *Medicines* upon them.
'as well of *Chirurgery* as *Physick*. By *Art* likewise we make them *greater*
'or *taller* then their *kind* is, and contrariwise *dwarf* them, and stay their
'*growth*: We make them more *fruitful* and *Bearing*, then their *Kind*
'is, and contrariwise *Barren* and not *Generative*. Also we make them
'differ in *Colour*, *Shape*, *Activity*, many ways. We find means to make
'*commixtures* and *Copulations* of divers *Kinds*, which have produced ma-
'ny *new Kinds*, and them not *barren* as the general opinion is. We make
'a number of *Kinds of Serpents*, *Worms Flies*, *Fishes*, *of Putrefaction*;
'whereof some are advanced (in effect) to be *perfect Creatures*, like *Beasts*
'or *Birds*, and have *Sexes*, and do *propagate*. Neither do we this by
'*chance*, but we know beforehand of what *matter* and *commixture* what
'*Kind* of those *Creatures* will arise.

'We

'We have also *Particular Pools* where we make *Tryals* upon *Fishes*, 'as we have said before of *Beasts* and *Birds*.

'We have also *Places* for *Breed* and *Generation* of those *Kinds* of '*Worms* and *Flies* which are of *Special use*, such as are with you, your '*Silk-Worms* and *Bees*.

'I will not hold you long with recounting of our *Brew-Houses*, *Bake-* '*Houses*, and *Kitchins*, where are made divers *Drinks*, *Breads*, and *Meats*, 'rare and of special effects. *Wines* we have of *Grapes*, and *Drinks* of 'other *Juice*, of *Fruits*, of *Grains* and of *Roots*; and of *Mixtures* with '*Honey*, *Sugar*, *Manna*, and *Fruits Dried*, and *Decocted*; also of the *Tears* 'or *Woundings* of *Trees*, and of the *Pulp* of *Canes*; and these *Drinks* are 'of several *Ages*, some to the *Age* or last of forty years. We have *Drinks* 'also brewed with several *Herbs*, and *Roots*, and *Spices*; yea, with several '*Fleshes*, and *White-Meats*; whereof some of the *Drinks* are such, as they 'are in effect *Meat* and *Drink* both; so that divers, especially in *Age*, do 'desire to live with them, with little or no *Meat* or *Bread*. And above all we 'strive to have *Drinks* of *Extream thin parts*, to insinuate into the *Body*, 'and yet without all *Biting*, *Sharpness*, or *fretting*; insomuch, as some of 'them put upon the back of your *Hand*, will, with a little stay, pass through 'to the *Palm*, and yet taste *Milde* to the *Mouth*. We have also *Waters* 'which we *Ripen* in that fashion as they become *Nourishing*; so that they 'are indeed excellent *Drink*, and many will use no other. *Breads* we have 'of several *Grains*, *Roots* and *Kernels*, yea, and some of *Flesh* and *Fish* '*Dried*, with divers Kinds of *Leavenings* and *Seasonings*; so that some do 'extreamly move *Appetites*; some do nourish so, as divers to live of them 'without any other *Meat*, who live very long. So for *Meats*, we have some 'of them so *Beaten*, and made *Tender* and *Mortified*, yet without all *Cor-* 'rupting, as a *weak Heat* of the *Stomach* will turn them into good *Chylus*, 'as well as a *Strong Heat* would meat otherwise prepared. We have some '*Meats* also, and *Breads*, and *Drinks*, which taken by men, enable them to '*Fast* long after; and some other, that used, make the very *Flesh* of *Mens* '*Bodies* sensibly more hard and tough, and their *Strength* far greater than 'otherwise it would be.

'We have *Dispensatories* or *Shops* of *Medicines*, wherein you may 'easily think, if we have such *Variety* of *Plants* and *Living Creatures*, more 'then you have in *Europe*, (for we know what you have) the *Simples Drugs*, 'and *Ingredients* of *Medicines*, must likewise be in so much the greater '*Variety*. We have them likewise of diverse *Ages*, and long *Fermenta-* '*tions*. And for their *Preparations*, we have not onely all Manner of ex- 'quisite *Distillations* and *Separations*, and especially by *Gentle Heats*, and '*Percolations* through divers *Strainers*, yea and *Substances*; but also exact '*Forms* of *Composition*, whereby thy incorporate almost as they were '*Natural Simples*.

'We have also divers *Mechanical Arts*, which you have not, and '*Stuffs* made by them; as *Papers*, *Linnen*, *Silks*, *Tissues*, dainty works of '*Feathers* of wonderful lustre, excellent *Dies*, and many others; and *Shops* 'likewise as well for such as are not brought into Vulgar use amongst us, 'as for those that are. For you must know, that of the things before re- 'cited, many are grown into use throughout the Kingdom; but yet, if 'they did flow from our *Invention*, we have of them also for *Patterns* and '*Principals*.

'We have also *Furnaces* of great *Diversities*, and that keep great *Diversity* of *Heats*, *Fierce* and *Quick*, *strong* and *constant*, *Soft* and *Milde*, *Blown*, *Quiet*, *Dry*, *Moist*, and the like. But above all we have *Heats*, in imitation of the *Suns*, and *Heavenly Bodies Heats*, that pass divers *Inequalities*, and (as it were) *Orbs*, *Progresses* and *Returns*, whereby we may produce admirable effects. Besides we have *Heats* of *Dungs*, and of *Bellies* and *Maws* of *Living Creatures*, and of their *Bloods* and *Bodies*; and of *Hays* and *Herbs* laid up moist; of *Lime* unquenched, and such like. *Instruments* also which generate *Heat* only by *Motion*; and further, *Places* for strong *Insolations*; and again, *Places* under the *Earth*, which by *Nature* or *Art* yield *Heat*. These divers *Heats* we use, as the *Nature* of the *Operation* which we intend, requireth.

'We have also *Perspective Houses*, where we make *Demonstration* of all *Lights* and *Radiations*, and of all *Colours*; and out of *Things Uncoloured* and *Transparent*, we can represent unto you all several *Colours*, not in *Rainbows* (as it is in *Gems* and *Prisms*) but of themselves single. We represent also all *Multiplications* of *Light*, which we carry to great *Distance*, and make so *Sharp* as to discern small *Points* and *Lines*; also all *Colorations* of *Light*, all *Delusions* and *Deceits* of the *Sight*, in *Figures*, *Magnitudes*, *Motions*, *Colours*, all *Demonstrations* of *Shadows*. We finde also divers means, yet unknown to you, of *Producing* of *Light* originally from divers *Bodies*. We procure means of seeing *Objects* a far off, as in the *Heaven*, and *Remote Places*; and represent *Things Near* as *afar off*, and *Things a far of* as *Near*, making *Feigned Distances*. We have also *Helps* for the *Sight*, far above *Spectacles* and *Glasses* in use. We have also *Glasses* and *Ateans* to see *Small* and *Minute Bodies* perfectly and distinctly, as the *Shapes* and *Colours* of *Small Flies* and *Worms*, *Grains* and *Flaws* in *Gems*, which cannot otherwise be seen, *Observations in Urine* and *Blood*, not otherwise to be seen. We make *Artificial Rainbows*, *Halo's*, and *Circles* about *Light*. We represent also all manner of *Reflexions*, *Refractions*, and *Multiplication* of *Visual Beams* of *Objects*.

'We have also *Precious Stones* of all kindes, many of them of great beauty, and to you unknown; *Crystals* likewise, and *Glasses* of divers kindes, and amongst them some of *Metals Vitrificated*, and other *Materials*, beside those of which you make *Glass*: also a number of *Fossiles* and *imperfect Minerals*, which you have not; likewise *Loadstones* of prodigious vertue, and other rare *Stones*, both *Natural* and *Artificial*.

'We have also *Sound Houses*, where we practice and demonstrate all *Sounds* and their *Generation*. We have *Harmonies* which you have not, of *Quarter-Sounds*, and lesser *Slides* of *Sounds*; divers *Instruments* of *Musick* likewise to you unknown, some *Sweeter* then any you have, with *Bells* and *Rings* that are dainty and sweet. We represent *Small Sounds* as *Great* and *Deep*, likewise *Great Sounds extenuate* and *Sharp*. We make divers *Tremblings* and *Warblings* of *Sounds*, which in their *Original* are *Entire*. We represent and imitate all *Articulate Sounds* and *Letters*, and the *Voices* and *Notes* of *Beasts* and *Birds*. We have certain *Helps*, which set to the *Ear*, do further the *Hearing* greatly: We have also divers *Strange* and *Artificial Eccho's Reflecting* the *Voice* many times, and as it were *Tossing* it; and some that give back the *Voice Louder* then it came, some *Shriller* and some *Deeper*, yea, some rendring the *Voice Differing* in the *Letters* or *Articulate Sound* from that they receive. We have all means to convey *Sounds* in *Trunks* and *Pipes* in strange *Lines* and *Distances*.

We

'We have also *Perfume-Houses*, wherewith we joyn also *practises* of 'Taste; we *multiply Smells*, which may seem strange; we *imitate Smells*, 'making all *Smells* to breath out of other *mixtures* then those that give them. 'We make divers *imitations* of *Taste* likewise, so that they will deceive any 'Mans Taste. And in this House we contain also a *Confiture House*, where- 'we make all *Sweet-meats*, *dry* and *moist*, and divers pleasant *Wines*, *Milk*, 'Broths, and *Sallets*, far in greater variety then you have.

'We have also *Engine-Houses*, where are prepared *Engines* and *Instru-* 'ments for all sorts of *Motions*. There we imitate and practise to make 'swifter motions then any you have, either out of your *Muskets* or any *En-* 'gine that you have; and to *make* them, and *multiply* them more *easily*, and 'with *small force*, by *wheels* and other *means*; and to make them *stronger* 'and more *violent* then yours are, exceeding your greatest *Cannons*, and 'Basiliskes. We represent also *Ordnance* and *Instruments of War*, and *En-* 'gines of all kinds; and likewise new *mixtures* and *compositions* of *Gun-* 'powder, *Wildefires* burning in *Water* and *unquenchable*; also *Fire-works* 'of all *variety*, both for *pleasure* and *use*. We imitate also *flights of Birds*; 'we have some *degrees of flying* in the *Air*; we have *Ships* and *Boats* for 'going under water, and *brooking* of *Seas*; also *Swiming-girdles* and 'Supporters. We have divers curious *Clocks*, and other like *motions* of 'Return, and some *perpetual motions*. We imitate also *motions of* Living 'creatures, by *Images of Men*, *Beasts*, *Birds*, *Fishes*, and *Serpents*; we have 'also a great number of other various *Motions*, strange for *quality*, *fineness*, 'and *subtilty*.

'We have also a *Mathematical House*, where are represented all *Instru-* 'ments, as well of *Geometry*, as *Astronomy*, exquisitely made.

'We have also *Houses* of *Deceits* of the *Senses*, where we represent 'all manner of *feats of Jugling*, *false Apparitions*, *Impostures*, and *Illusions*, 'and their *Fallacies*. And surely, you will easily believe that we that have 'so many things truly *Natural*, which induce *admiration*, could in a *world* 'of *particulars deceive the Senses*, if we would disguise those *things*, and la- 'bor to make them more *miraculous*: But we do hate all *Impostures* and 'Lies; insomuch, as we have severely forbidden it to all our *Fellows*, under 'pain of Ignominy and Fines, that they do not shew any *natural work* or 'thing, *adorned* or *swelling*, but only *pure* as it is, and without all *affecta-* 'tion of *strangeness*.

'These are (my Son) the riches of *Solomons House*.

'For the several *employments* and *offices* of our *Fellows*; we have twelve 'that sail into *Forreign Countreys* under the *Names* of other *Nations*, '(for our own we conceal) who bring us the *Books*, and *Abstracts*, and *Pa-* 'terns of *Experiments* of all other *Parts*. These we call *Merchants* of 'Light.

'We have three that *Collect* the *Experiments*, which are in all *Books*. 'These we call *Depredators*.

'We have three that *collect* the *Experiments*, of all *Mechanical Arts*, and 'also of *Liberal Sciences*, and also of *Practises* which are not *brought* into 'Arts. These we call *Mystery-men*.

'We have three that try *new Experiments*, such as themselves think good 'These we call *Pioneers* or *Miners*.

'We have three that *draw* the *Experiments* of the *former four* into *Titles* 'and *Tables*, to give the better light for the drawing of *Observations* and 'Axioms out of them. These we call *Compilers*.

'We have three that bend themselves, *looking* into the *Experiments* 'of their *Fellows*, and cast about how to draw out of them *things of use* 'and *practice* for *Mans life* and *knowledge*, as well for *Works*, as for plain 'Demonstration of *Causes*, *means of* Natural *Divinations*, and the easie and 'clear *discovery* of the *Virtues* and *Parts* of *Bodies*. These we call *Dowry-* 'men or *Benefactors*.

'Then after divers *Meetings* and *Consults* of our whole *number*, to con- 'sider of the former *Labors* and *Collections*, we have three that take care 'out of them to *direct new Experiments* of a higher *Light*, more *penetrating* 'into *Nature* than the *former*. These we call *Lamps*.

'We have three others that do *execute* the *Experiment* so *directed*, and 'report them. These we call *Inoculators*.

'Lastly, We have three that raise the former *Discoveries* by *Experiments* 'into greater *Observations*, *Axioms*, and *Aphorisms*. These we call *Inter-* 'preters of Nature.

'We have also, as you must think, *Novices* and *Apprentices*, that the 'succession of the former employed Men do not fail; besides a great 'number of *Servants* and *Attendants*, *Men* and *Women*. And this we do 'also, we have *Consultations* which of the *Inventions and Experiences* 'which we have discovered shall be published, and which not; and take 'all an *Oath* of *Secrecy* for the concealing of those which we think meet to 'keep secret; though some of those we do reveal sometime to the *State*, 'and some not.

'For our *Ordinances* and *Rites*; we have two very *long* and *fair Gal-* 'leries. In one of these we place *Patterns* and *Samples* of all manner of the 'more *rare* and *excellent Inventions*; in the other we place the *Statues* of 'all *principal Inventors*. There we have the *Statue* of your *Columbus*, that 'discovered the *West-Indies*, also the *Inventor* of *Ships*; your *Monk* that 'was the *Inventor of Ordnance*, and of *Gun-powder*; the *Inventor* of 'Musick; the *Inventor* of *Letters*; the *Inventor* of *Printing*; the *Inventor* of 'Observations of *Astronomy*; the *Inventor* of *Works* in *Metal*; the *Inven-* 'tor of *Glass*; the *Inventor* of *Silk* of the *Worm*; the *Inventor* of 'Wine; the *Inventor* of *Corn* and *Bread*; the *Inventor* of *Sugars*: And 'all these by more certain Tradition, than you have. Then we have divers 'Inventors of our *own*, of *excellent Works*, which since you have not seen, 'it were too long to make *Descriptions* of them; and besides in the right 'understanding of those *Descriptions* you might easily err. For upon every 'Invention of value we erect a *Statue* to the *Inventor*, and give him a libe- 'ral and honourable *reward*. These *Statues* are some of *Brass*, some of *Mar-* 'ble and *Touch-stone*, some of *Cedar*, and other special *Woods* gilt and adorn- 'ed, some of *Iron*, some of *Silver*, some of *Gold*.

'We have certain *Hymns* and *Services* which we say daily, of *Laud* and 'Thanks to *God* for his Marvellous *Works*; and *Forms* of *Prayers* imploring 'his *aid* and *blessing*, for the *Illumination* of our *Labors*, and the turning 'them into *good* and *holy uses*.

'Lastly, We have *Circuits* and *Visits* of divers *Principal Cities* of the 'Kingdom, where, as it cometh to pass, we do publish such new *profitable* 'Inventions, as we think good. And we do also declare *Natural Divinati-* 'ons of *Diseases*, *Plagues*, *Swarms of hurtful Creatures*, *Scarcity*, *Tempest*, 'Earth quakes, *great inundations*, *Comets*, *Temperature* of the *Year*, and 'divers other things; and we give *counsel* thereupon, what the *People* shall 'do for the *prevention* and *remedy* of them.

'And

And when he had said this, he stood up: and I, as I had been taught, kneeled down, and he laid his right hand upon my head, and said, *God bless thee, my Son, and God bless this Relation which I have made: I give thee leave to publish it for the good of other Nations, for we here are in Gods Bosome, a Land unknown.* And so he left me, having assigned a value of about Two thousand Ducats for a Bounty to me and my Fellows; for they give great largesses where they come upon all occasions.

The Rest was not Perfected.

Magnalia Naturæ præcipue quoad usus Humanos.

The
- Prolongation of Life.
- Restitution of Youth in some degree.
- Retarding of Age.
- Curing of Diseases, counted Incurable.
- Mitigation of Pain.

More Easie and less loathsome Purgings:

The
- increasing of Strength and Activity.
- increasing of ability, to suffer Torture or Pain.
- altering of Complexions, and Fatness, and Leanness.
- altering of Statures
- altering of Features.
- increasing and exalting of the Intellectual Parts.

Version of Bodies into other Bodies.

Making of new Species.

Transplanting of one Species into another.

Instruments of Destruction, as of War and Poyson.

Exhilaration of the Spirits; and putting them in good disposition

Force of the Imagination, either upon another Body, or upon the Body it self.

Acceleration of
- Time in Maturations.
- Time in Clarifications.
- Putrefaction.
- Decoction.
- Germination.

Making rich Composts for the Earth.

Im-

Impressions of the Air, and raising of Tempests.
Great alteration, as Induration, Emollition, &c.
Turning Crude and Watry Substances into Oyly and Unctuous Substances.
Drawing of new Foods out of Substances not now in use.
Making new Threds for Apparel; and new Stuffs, such as are Paper, Glasse, &c.
Natural Divinations.
Deceptions of the Senses.
Greater Pleasures of the Senses.
Artificial Minerals and Cements.

FINIS.

HISTORY

Natural and Experimental.

OF

LIFE & DEATH:

OR,

Of the Prolongation of Life.

Written in Latine by the Right Honourable

FRANCIS BACON,
BARON of *VERULAM*,
Viſcount St. *Albans*.

LONDON,
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THE HISTORY OF Life and Death.

The PREFACE.

IT is an ancient saying and complaint, That *Life* is short, and *Art* long; wherefore it behoveth us, who make it our chiefest aim to perfect *Arts*, to take upon us the consideration of *Prolonging Mans Life*, *GOD*, the *Author* of all *Truth* and *Life* prospering our Endeavors. For though the *Life* of *Man* be nothing else but a mass, and accumulation of Sins and sorrows, and they that look for an eternal Life set but light by a Temporary: Yet the continuation of Works of Charity ought not to be contemned, even by us *Christians*. Besides, the beloved *Disciple* of our *Lord* survived the other *Disciples*; and many of the Fathers of the Church; especially of the Holy Monks and Hermits, were long-lived: Which shews, that this blessing of long life, so often promised in the Old Law, had less abatement after our *Saviours* dayes, than other Earthly blessings had; but to esteem of this as the chiefest good, we are but too prone. Onely the enquiry is difficult how to attain the same; and so much the rather, because it is corrupted with false opinions and vain reports: For both those things, which the vulgar *Physitians* talk of, *Radical Moisture* and *Natural Heat*, are but meer Fictions; and the immoderate praises

praiſes of *Chymical Medicines*, firſt puff up with vain hopes, and then fail their admirers.

And as for that *Death* which is cauſed by Suffocation, Putrefaction, and ſeveral Diſeaſes, we ſpeak not of it now, for that pertains to an *Hiſtory of Phyſick*; but onely of that *Death* which comes by a total decay of the Body, and the Inconcoction of old Age. Nevertheleſs the laſt act of *Death*, and the very extinguiſhing of *Life* it ſelf, which may ſo many ways be wrought outwardly and inwardly (which notwithſtanding have, as it were, one common Porch before it comes to the point of death) will be pertinent to be inquired of in this Treatiſe; but we reſerve that for the laſt place.

That which may be repaired by degrees, without a total waſte of the firſt ſtock, is potentially eternal, as the *Veſtal Fire*. Therefore when *Phyſicians* and *Philoſophers* ſaw that living Creatures were nouriſhed and their Bodies repaired, but that this did laſt onely for a time, and afterwards came old age, and in the end Diſſolution; they ſought death in ſomewhat which could not properly be repaired, ſuppoſing a *Radical Moiſture* incapable of ſolid reparation, and which, from the firſt infancy, received a ſpurious addition, but no true reparation, whereby it grew daily worſe and worſe, and, in the end, brought the bad to none at all. This conceit of theirs was both ignorant and vain; for all things in living Creatures are in their youth repaired entirely; nay, they are for a time increaſed in quantity, bettered in quality, ſo as the Matter of reparation might be eternal, if the manner of reparation did not fail. But this is the truth of it, There is in the declining of age an unequal reparation; ſome parts are repaired eaſily, others with difficulty and to their loſs; ſo as from that time the Bodies of Men begin to endure the torments of *Mezentius*, *That the Living die in the embraces of the dead*; and the parts eaſily repairable, through their conjunction with the parts hardly repairable, do decay: For the *Spirits*, *Blood*, *Fleſh* and *Fat* are, even after the decline of years, eaſily repaired; but the drier and more porous parts (as the *Membranes*; all the *Tunicles*, the *Sinews*, *Arteries*, *Veins*, *Bones*, *Cartilages*, moſt of the *Bowels*, in a word almoſt all the *Organical Parts*) are hardly repairable, and to their loſs. Now theſe hardly repairable parts, when they come to their office of repairing the other, which are eaſily repairable, finding themſelves deprived of their wanted ability and ſtrength, ceaſe to perform any longer their proper Functions: By which means it comes to paſs that in proceſs of time the whole tends to diſſolution; and even thoſe very parts, which in their own nature are with much eaſe repairable, yet through the decay of the Organs of reparation can no more receive reparation, but decline, and in the end utterly fail. And the cauſe of the termination of Life is this, for that the *Spirits*, like a gentle flame, continually preying upon Bodies, conſpiring with the outward *Air*, which is ever ſucking and drying of them, do, in time, deſtroy the whole Fabrick of the Body, as alſo the particular Engines and Organs thereof and make them unable for the work of Reparation. Theſe are the true ways of *Natural Death*, well and faithfully to be revolved in our minds; for he that knows not the way of *Nature*, how can he ſuccour her, or turn her about.

Therefore the *Inquiſition* ought to be twofold; the one touching the *Conſumption* or *Depredation* of the Body of Man, the other touching the *Reparation* and *Renovation* of the ſame: To the end, that the former may

as

TO THE

READER.

I Am to give Advertiſement, that there came forth of late a *Tranſlation* of this *Book* by an unknown *Perſon*, who though he wiſhed well to the propagating of his *Lord ſhips Works*, yet he was altogether unacquainted with his *Lordſhips* ſtile, and manner of Expreſſions, and ſo publiſhed a *Tranſlation* lame and defective in the whole. VVhereupon I thought fit to recommend the ſame to be tranſlated a new by a more diligent and zealous Pen, which hath ſince travelled in it; and though it ſtill comes ſhort of that lively and incomparable Spirit and expreſſion, which lived and died with the *Author*, yet I dare avouch it to be much more warrantable and agreeable than the former. *It* is true, this *Book* was not intended to have been publiſhed in *Engliſh*; but ſeeing it hath been already made free of that *Language*, whatſoever benefit or delight may redound from it, *I* commend the ſame to the *Courteous* and *Judicious Reader*.

VV. R.

To the present Age and Posterity,
Greeting.

ALthough I had ranked the History of Life and Death as the last amongst my Six Monethly Designations; yet I have thought fit, in respect of the prime use thereof, (in which the least loss of time ought to be esteemed precious) to invert that order, and to send it forth in the second place. For I have hope, and wish, that it may conduce to a common good; and that the Nobler sort of Physicians will advance their thoughts, and not imploy their times wholly in the sordidness of Cures, neither be honoured for Necessity onely, but that they will become Coadjutors and Instruments of the Divine Omnipotence and Clemency in Prolonging and Renewing the Life of Man; especially seeing I prescribe it to be done, by safe, and convenient, and civil wayes, though hitherto unassayed. For though we Christians do continually aspire and pant after the Land of Promise; yet it will be a token of Gods favour towards us in our journyings through this VVorlds Wilderness, to have our Shoes and Garments (I mean those of our frail Bodies) little worn or impaired.

Fr. St. Albans.

THE

as much as is possible, be forbidden and restrained, and the latter comforted. The former of these pertains, especially to the *Spirits* and outward *Air*, by which the Depradation and Waste is committed; the latter to the whole race of *Alimentation* or *Nourishment*, whereby the Renovation or Restitution is made. And as for the former part touching *Consumption*, this hath many things common with *Bodies Inanimate*, or without Life. For such things as the *Native Spirit* (which is in all tangible bodies, whether living or without life) and the Ambient or external Air worketh upon Bodies Inanimate, the same it attempteth upon Animate or Living Bodies; although the *Vital Spirit* superadded, doth partly break and bridle those operations, partly exalt, and advance them wonderfully. For it is most manifest that inanimate Bodies (most of them will indure a long time without any Reparation; but Bodies Animate without Food and Reparation suddenly fall and are extinguished, as the Fire is. So then, our *Inquisition* shall be double. First, we will consider the Body of man as Inanimate, and not repaired by *Nourishment*: Secondly, as *Animate* and repaired by *Nourishment*. Thus having Prefaced these things, we come now to the *Topick* places of *Inquisition*.

THE

THE Particular Topick Places: OR, ARTICLES of INQUISITION TOUCHING LIFE and DEATH.

1. First, Inquire of *Nature Durable*, and *Not Durable*, in Bodies Inanimate, or without Life, as also in Vegetables; but that not in a large or just Treatise, but as in a Brief or Summary only.

2. Also inquire diligently of *Deficcation*, *Arefaction*, and *Consumption* of *Bodies Inanimate*, and of *Vegetables*, and of the ways and Processes by which they are done: And further, of inhibiting and delaying of *Deficcation*, *Arefaction*, and *Consumption*, and of the *Conservation of Bodies*, in their proper state: And again, of the *Intenebration*, *Ebullition*, and *Recovery of Bodies* to their former freshness, after they be once dried and withered.

Neither need the *Inquisition*, touching these things, to be full or exact, seeing they pertain rather to their proper Title of *Nature durable*; seeing also, they are not Principals in this *Inquisition*, but serve only to give light to the *Prolongation* and *Instauration* of *Life* in *Living Creatures*. In which (as was said before) the same things come to pass, but in a particular manner. So from the *Inquisition* touching *Bodies Inanimate* and *Vegetables*, let the *Inquisition* pass on to other *Living Creatures* besides *Man*.

3. Inquire touching the *length* and *shortness of Life* in *Living Creatures*, with the due circumstances which make most for their long or short lives.

4. But because the *Duration of Bodies* is twofold, one in *Identity*, or the self-same substance, the other by a *Renovation*, or *Reparation*; whereof the former hath place only in *Bodies Inanimate*, the latter in *Vegetables*, and *living Creatures*, and is perfected by *Alimentation*, or *Nourishment*: therefore it will be fit to inquire of *Alimentation*, and of the ways and progresses thereof; yet this not exactly, (because it pertains properly to the Titles of *Assimilation* and *Alimentation*) but, as the rest, in progress only.

From the *Inquisition* touching *Living Creatures*, and *Bodies* repaired by *Nourishment*, pass on to the *Inquisition* touching *Man*. And now being come to the principal subject of *Inquisition*, the *Inquisition* ought to be in all points more precise and accurate.

5. Inquire touching the *length* and *shortness of Life* in *Men*, according to the *Ages* of the *World*, the several *Regions*, *Climates*, and *places* of their *Nativity* and *Habitation*.

6. Inquire touching the *length* and *shortness of life* in *Men*, according to their *Races* and *Families*, as if it were a thing hereditary; also according to their *Complexions*, *Constitutions*, and *Habits* of *Body*, their *Statures*, the *manner* and *time* of their growth, and the making and composition of their *Members*.

7. Inquire touching the *length* and *shortness of life* in *Men*, according to the times of their *Nativity*; but so, as you omit for the the present all *Astrological* observations, and the *Figures* of *Heaven*, under which they were born; only insist upon the vulgar and manifest

manifest Observations; as whether they were born in the Seventh, Eighth, Ninth, or Tenth Month; also, whether by Night or by Day, and in what Month of the Year.

8. Inquire touching the *length* and *shortness of life* in *Men*, according to their *Fare*, *Diet*, *Government* of their *Life*, *Exercises*, and the like. For as for the *Air* in which men live and make their abode, we account that proper to be inquired of in the aboveſaid *Article*, touching the places of their Habitation.

9. Inquire touching the *length* and *shortness of life* in *Men*, according to their *Studies*, their several *Courses of Life*, the *Affections* of the *Mind*, and divers *Accidents* befalling them.

10. Inquire apart touching thoſe *Medicines* which are thought to prolong *Life*.

11. Inquire touching the *Signs* and *Prognosticks of long and short life*; not thoſe which betoken *Death* at hand, (for they belong to an *History of Physick*) but thoſe which are ſeen, and may be obſerved even in Health, whether they be Phyſiognomical Signs, or any other.

Hitherto have been propounded *Inquiſitions* touching *length* and *shortneſs of Life*, beſides the *Rules* of *Art*, and in a confuſed manner; now we think to add ſome, which ſhall be more *Art-like*, and tending to practice, under the name of *Intentions*. Thoſe *Intentions* are generally three: As for the particular Diſtributions of them, we will propound them when we come to the *Inquiſition* it ſelf. The three general *Intentions* are, the *Forbidding of Waſte* and *Conſumption*; the *Perfecting of Reparation*, and the *Renewing of Oldneſs*.

12. Inquire touching thoſe things which conſerve and exempt the Body of Man from *Arefaction* and *Conſumption*, at leaſt which put off and protract the inclination thereunto.

13. Inquire touching thoſe things which pertain to the whole proceſs of *Alimentation*, (by which the Body of Man is repaired) that it may be good, and with the beſt improvement.

14. Inquire touching thoſe things which purge out the *Old Matter*, and ſupply with new; as alſo which do intenerate and moiſten thoſe parts which are already dried and hardned.

But becauſe it will be hard to know the ways of Death, unleſs we ſearch out and diſcover the *Seat* or *Houſe*, or rather *Den of Death*, it will be convenient to make Inquiſition of this thing; yet not of every kind of *Death*, but of thoſe *Deaths* which are cauſed by want and indigence of Nouriſhment, not by violence; for they are thoſe *Deaths* only which pertain to a decay of Nature, and meer old Age.

15. Inquire touching the Point of Death, and the Porches of Death leading thereunto from all parts, ſo as that Death be cauſed by a decay of Nature, and not by violence.

16. Laſtly, Becauſe it is behoveful to know the Character and Form of *Old Age*, which will then beſt be done, if you make a *Collection* of all the *Differences*, both in the State and Functions of the Body, betwixt *Youth* and *Old Age*, that by them you may obſerve what it is that produceth ſuch manifold *Effects*; let not this Inquiſition be omitted.

17. Inquire diligently touching the *Differences* in the *State* of the *Body*, and *Faculties* of the *Mind* in *Youth* and *Old Age*; and whether there be any that remain the ſame without alteration or abatement in *Old Age*.

Nature Durable, and not Durable.

The History.

To the firſt Article.

1. METALS are of that long laſting, that Men cannot trace the beginnings of them; and when they do decay, they decay through *Ruſt*, not through perſpiration into Air; yet *Gold* decays neither way.

2. *Quick-ſilver*, though it be an humid and fluid Body, and eaſily made volatile by Fire, yet (as far as we have obſerved) by Age alone, without Fire, it neither waſteth nor gathereth Ruſt.

3. *Stones*, eſpecially the harder ſort of them, and many other Foſſiles, are of long laſting.

ing, and that though they be exposed to the open air; much more if they be buried in the earth. Notwithstanding *Stones* gather a kind of *Nitre*, which is to them instead of *Rust*. *Precious Stones* and *Chrystals* exceed *Metals* in long lasting; but then they grow dimmer and less Orient, if they be very old.

4. It is observed, that *Stones* lying towards the North do sooner decay with age than those that lie toward the South; and that appears manifestly in *Pyramids*, and *Churches*, and other ancient *Buildings*: contrariwise, in *Iron*, that exposed to the South, gathers *Rust* sooner, and that to the North later; as may be seen in the *Iron bars* of windows. And no marvel, seeing in all putrefaction (as *Rust* is) Moisture hastens Dissolutions; in all simple Arefaction, Drines.

5. In *Vegetables*, (we speak of such as are fell'd, not growing) the Stocks or Bodies of harder *Trees*, and the Timber made of them, last divers ages. But then there is difference in the bodies of Trees: some Trees are in a manner spongy, as the *Elder*, in which the pith in the midst is soft, and the outward part harder; but in Timber-trees, as the *Oak*, the inner part (which they call *Heart of Oak*) lasteth longer.

6. The *Leaves*, and *Flowers*, and *Stalks* of *Plants* are but of short lasting, but dissolve into dust, unless they putrefie: the *Roots* are more durable.

7. The *Bones* of living Creatures last long, as we may see it of mens bones in Charnel-houses: *Horns* also last very long; so do *Teeth*, as it is seen in *Ivory*, and the *Sea-horse* Teeth.

8. *Hides* also and *Skins* endure very long, as is evident in old *Parchment-ment books*: *Paper* likewise will last many ages, though not so long as *Parchment*.

9. Such *things* as have *passed the Fire* last long, as *Glass* and *Brick*, likewise *Flesh* and *Fruits* that have *passed the Fire* last longer than *Raw*, and that not onely because the Baking of the Fire forbids putrefaction, but also because the watry humour being drawn forth, the oily humour supports it self the longer.

10. *Water* of all Liquors is sooneſt drunk up by *Air*, contrariwise *Oil* lateſt; which we may see not onely in the *Liquors* themselves, but in the *Liquors* mixt with other Bodies: for *Paper* wet with water, and so getting some degree of transparency, will soon after wax white, and lose the transparency, again the watry vapour exhailing; but oiled *Paper* will keep the transparency long, the *Oil* not being apt to exhale: And therefore they that counterfeit mens hands, will lay the oiled paper upon the writing they mean to counterfeit, and then assay to draw the lines.

Gums all of them last very long; the like do *Wax* and *Honey*.

11. But the *equal* or *unequal* use of things conduceth no less to long lasting or short lasting, than the things themselves; for *Timber*, and *Stones*, and other *Bodies*, standing continually in the *water*, or continually in the *air*, last longer than if they were sometimes wet, sometimes dry: and so *Stones* continue longer, if they be laid towards the same coast of Heaven in the Building that they lay in the Mine. The same is of *Plants* removed, if they be coasted just as they were before.

12.

Observations.

LEt this be laid for a Foundation, *which is most sure, That there is in every Tangible body a* Spirit, *or body* Pneumatical, *enclosed and covered with the Tangible parts; And that from this* Spirit *is the beginning of all Dissolution and Consumption, so as the Antidote against them is the detaining of this* Spirit.

2. *This* Spirit *is detained two ways: either by a* strait Inclosure, *as it were in a Prison: or by a kind of* free *and* voluntary Detention. *Again, this* voluntary stay *is perswaded two ways: either if the* Spirit *it selfe be not too movable or eager to depart, or if the external* Air *importune it not too much to come forth. So then, two sorts of Substances are durable,* Hard Substances, *and* Oily: Hard Substance *binds in the* Spirits *close*; Oily *partly enticeth the* Spirit *to stay, partly is of that nature that it is not importuned by* Air; *for* Air *is consubstantial to* Water *and* Flame *to* Oil. *And touching* Nature Durable *and* not Durable *in* Bodies Inanimate, *thus much.*

The History.

13. HErbs of the *colder sort* die yearly both in Root and Stalk; as *Lettice*, *Purslane*; also *Wheat* and all kind of *Corn*: yet there are some *cold Herbs* which will last

three or four years; as the *Violet*, *Straw-berry*, *Burnet*, *Prim-rose*, and *Sorrel*. But *Borage* and *Bugloss*, which seem so alike when they are alive, differ in their deaths; for *Borage* will last but one year, *Bugloss* will last more.

14. But many *hot Herbs* bear their age and years better; *Hyssop*, *Thyme*, *Savory*, *Pot-marjoram*, *Balm*, *Wormwood*, *Germander*, *Sage*, and the like. *Fennel* dies yearly in the stalk buds again from the root: but *Pulse* and *Sweet-marjoram* can better endure age than winter; for being set in a very warm place and well-fenced, they will live more than one year. It is known that a knot of *Hyssop* twice a year shorn hath continued forty years.

15. *Bushes* and *Shrubs* live threescore years, and some double as much. A *Vine* may attain to threescore years, and continue fruitful in the old age. *Rose-mary* well placed will come also to threescore years; but *white Thorn* and *Ivy* endure above an hundred years. As for the *Bramble*, the age thereof is not certainly known, because bowing the head to the ground it gets new roots, so as you cannot distinguish the old from the new.

15. Amongst great *Trees* the longest livers are the *Oak*, the *Holm*, *Wild ash*, the *Elm*, the *Beech tree*, the *Chest-nut*, the *Plane-tree*, *Ficus Ruminalis*, the *Lote-tree*, the *Wild-Olive*, the *Palm tree*, and the *Mulberry tree*. Of these, some have come to the age of eight hundred years; but the least livers of them do attain to two hundred.

17. But *Trees Odorate*, or that have sweet woods, and *Trees Rozenny*, last longer in their Woods or Timber than those above-said, but they are not so long liv'd; as the *Cypresse-tree*, *Maple*, *Pine*, *Box*, *Juniper*. The *Cedar* being born out by the vastness of his body, lives well-near as long as the former.

18. The *Ash*, fertile and forward in bearing, reacheth to an hundred years and somewhat better; which also the *Birch*, *Maple*, and *Sirvice-tree*, sometimes do: but the *Poplar*, *Lime tree*, *Willow*, and that which they call the *Sycomore*, and *Walnut tree*, live not so long.

19. The *Apple-tree*, *Pear-tree*, *Plum-tree*, *Pomegranate-tree*, *Citron-tree*, *Medlar-tree*, *Black-Cherry-tree*, *Cherry-tree*, may attain to fifty or sixty years; especially if they be cleansed from the Mos wherewith some of them are cloathed.

20. Generally, greatness of body in trees, if other things be equal, hath some congruity with *length* of *life*; so hath *hardness* of *substance*: and trees bearing *Mast* or *Nuts*, are commonly longer livers than trees bearing *Fruit* or *Berries*: likewise trees putting forth their leaves late, and shedding them late again, live longer than those that are early either in leaves or fruit: the like is of *Wild-trees* in comparison of *Orchard trees*. And lastly, in the same kind, trees that bear a *sowre fruit* out live those that bear a *sweet fruit*.

An Observation.

ARistotle *noted well the difference between* Plants *and* living Creatures, *in respect of their* Nourishment *and* Reparation: *Namely, that the* bodies *of* living Creatures *are confined within certain* bounds, *and that after they be come to their full* growth, *they are continued and preserved by* Nourishment, *but they put forth nothing new except* Hair *and* Nails, *which are counted for no better than* Excrements; *so as the* juice *of* living creatures *must of necessity sooner wax old: but in Trees, which put forth yearly new* boughs, *new* shoots, *new* leaves, *and new* fruits, *it comes to pass that all these parts in* Trees *are once a year young and renewed. Now it being so, that whatsoever is fresh and young draws the* Nourishment *more lively and chearfully to it than that which is decayed and old, it happens withall, that the* stock *and* body *of the* tree, *through which the* sap *passeth to the* branches, *is refreshed and cheated with a more bountiful and vigorous* nourishment *in the passage than otherwise it would have been. And this appears manifest (though* Aristotle *noted it not, neither hath he expressed these things so clearly and perspicuously) in* Hedges, Copses, *and* Pollards, *when the* plashing, shedding, *or* lopping *comforteth the old* stem *or* stock, *and maketh it more flourishing and longer liv'd.*

Desiccation,

Deſiccation, Prohibiting of Deſiccation, and In-teneration of that which is deſiccated and dried.

The Hiſtory.

To the ſecond Article.

1. FIre and *ſtrong Heats dry* ſome things, and *melt* others.
Limus ut hic duresçit, & hæc ut Cera liquesçit, Uno eodemque Igne?
How this Clay is hardned, and how this wax is melted, with one and the ſame thing, Fire? It drieth *Earth*, *Stones*, *Wood*, *Cloth*, and *Skins*, and whatſoever is not *liqueſiable*; and it melteth *Metals*, *Wax*, *Gums*, *Butter*, *Tallow*, and the like.

2. Notwithſtanding, even in thoſe things which the *fire* melteth, if it be very vehement and continueth, it doth at laſt dry them. For *metal* in a ſtrong *fire*, (*Gold* onely excepted) the *volatile* part being gone forth, will become leſs ponderous and more brittle; and thoſe *oily* and *fat ſubſtances* in the like *fire* will burn up, and be dried and parched.

3. *Air*, eſpecially *open Air*, doth manifeſtly *dry*, but not *melt*: as *High wayes*, and the upper part of the Earth, moiſtned with ſhowers, are *dried*; *linnenclothes* waſhed, if they be hang'd out in the *Air*, are likewiſe *dried*; *herbs*, and *leaves*, and *flowers*, laid forth in the ſhade, are *dried*. But much more ſuddenly doth the *Air* this, if it be either enlightned with the *Sun beams*, (ſo that they cauſe no putrefaction) or if the *air* be ſtirred, as when the *wind* bloweth, or in *rooms open* on all *ſides*.

4. *Age* moſt of all, but yet ſloweſt of all, *drieth*; as in all bodies, which (if they be not prevented by putrefaction) are *drie* with *Age*. But *age* is nothing of it ſelf, being onely the meaſure of *time*; that which cauſeth the *effect* is the *native Spirit* of bodies, which ſucketh up the moiſture of the body, and then, together with it, flieth forth and the *air ambient*, which multiplieth it ſelf upon the *native ſpirits* and *juices* of the body, and preyeth upon them.

5. *Cold* of all things moſt properly *drieth*: for *drying* is not cauſed but by *contraction*; now *contraction* is the proper work of *cold*. Cut becauſe we *Men* have *heat* in a high degree, namely, that of *Fire*, but *cold* in a very low degree, no other than that of *Winter*, or perhaps of *Ice*, or of *Snow*, or of *Nitre*; therefore the *drying* cauſed by *cold* is but weak, and eaſily reſolved. Notwithſtanding we ſee the *ſurface* of the *earth* to be more *dried* by *Froſt* or by *March-winds*, than by the *Sun*, ſeeing the ſame *wind* both licketh up the *moiſture*, and affecteth with *coldneſs*.

6. *Smoak* is a *drier*; as in *Bacon* and *Neats-tongues*, which are hanged up in the chimneys: and *perfumes* of *Olibanum* or *Lignum Aloes* and the like, dry the *Brain* and cure *Catarrhs*.

7. *Salt*, after ſome reaſonable continuance, *drieth*, not onely on the out ſide, but in the inſide alſo; as in *Fleſh* and *Fiſh* ſalted, which, if they have continued any long time, have a manifeſt hardneſs within.

8. *Hot Gums* applied to the skin, dry and wrinkle it; and ſome *aſtringent waters* alſo do the ſame.

9. *Spirit* of *ſtrong waters* imitateth the *fire* in *drying*: for it will both poteh an Egg put into it, and toaſt Bread.

10. *Powders* dry like *Sponges* by drinking up the moiſture, as it is in *Sand* thrown upon *Lines* new written: alſo *ſmoothneſs* and *politeneſs* of bodies (which ſuffer not the vapour of moiſture to go in by the pores) *dry* by accident, becauſe it expoſeth it to the *Air*; as it is ſeen in *precious Stones*, *Looking-glaſſes*, and *Blades* of *Swords*, upon which if you breath, you ſhall ſee at firſt a little miſt, but ſoon after it vaniſheth like a cloud. And thus much for *Deſiccation* or *Drying*.

11. They uſe at this day in the *Eaſt parts* of *Germany Garners* in *Vaults* under ground, wherein they keep *Wheat* and other *grains*, laying a good quantity of ſtraw both under the *grains* and about them, to ſave them from the dampneſs of the *Vault* by which device they keep their grains 20 or 30 years. And this doth not onely preſerve them from ſuſtineſs, but (that which pertains more to the preſent *inquiſition*) preſerves them alſo in that greenneſs that they are fit and ſerviceable to make *bread*. The ſame is reported to have been in uſe in *Capadocia* and *Thracia*, and ſome parts of *Spain*.

12. The placing of *Garners* on the tops of houſes, with windows towards the Eaſt and North, is very commodious. Some alſo make two *Sollars*, an upper and a lower; and the upper *Sollar* hath an hole in it, through which the grain continually deſcendeth, like *ſand* in an *hour-glaſs*, and after a few dayes they throw it up again with ſhovels, that ſo it may be in continual motion. Now it is to be noted

that this doth not onely prevent the Fustiness, but conserveth the Greeness and slacketh the Desiccation of it. The cause is that which we noted before, That the discharging of the *Watry humour*, which is quickned by the *Motion* and the *Winds*, preserves the *Oily humour* in his being, which otherwise would fly out together with the *Watry humour*. Also in some Mountains, where the *Air* is very pure, *dead Carkases* may be kept for a good while without any great decay.

13. *Fruits* as *Pomegranates*, *Citrons*, *Apples*, *Pears*, and the like; also *Flowers*, as *Roses* and *Lilies* may be kept a long time in Earthen Vessels close stopped: howsoever, they are not free from the injuries of the outward *Air*, which will affect them with his unequal Temper through the sides of the Vessel, as it is manifest in heat and cold. Therefore it will be good to stop the mouths the Vessels carefully, and to bury them within the *Earth*; and it will be as good not to bury them in the *Earth*, but to sink them in the *Water*, so as the place be shady, as in *Wells* or *Cisterns* placed within doors: but those that be sunk in *Water* will do better in Glass vessels than in Earthen.

14. Generally those things which are kept in the *Earth*, or in *Vaults* under *ground*, or in the *bottom* of a *Well*, will preserve their freshness longer than those things that are kept above *ground*.

15. They say it hath been observed, that in *Conservatories* of *Snow* (whether they were in Mountains, in natural Pits, or in Wells made by Art for that purpose) an *Apple*, or *Chest-nut*, or *Nut*, by chance falling in, after many moneths, when the *Snow* hath melted, hath been found in the Snow as fresh and fair as if it had been gathered the day before.

16. Country people keep *Clusters* of *Grapes* in Meal, which though it makes them less pleasant to the taste, yet it preserves their moisture and freshness. Also the harder sort

17. of *Fruits* may be kept long, not onely in *Meal*, but also in *Saw-dust*, and in *heaps* of *Corn*.

18. There is an opinion held, *Bodies* may be preserved fresh in *Liquors* of their own kind, as in their proper *Menstrua*; as, to keep *Grapes* in *Wine*, *Olives* in *Oil*.

Pomegranates and *Quinces* are kept long, being lightly dipped in *Sea water* or *Salt water*, and some after taken out again, and then dried in the open *Air*, so it be in the Shade.

19. Bodies put in *Wine*, *Oil*, or the *Lees* of *Oil*, keep long; much more in *Honey* or *Spirit* of *Wine*; but most of all, as some say, in *Quick-silver*.

20. *Fruits* inclosed in *Wax*, *Pitch*, *Plaister*, *Paste* or any the like Case or Covering, keep green very long.

21. It is manifest that *Flies*, *Spiders*, *Ants* or the like small *creatures*, falling by chance into *Amber*, or the *Gums* of *Trees* and so finding a burial in them, do never after corrupt or rot, although they be soft and tender Bodies.

22. *Grapes* are kept long by being hanged up in *Bunches*: the same is of other *Fruits*. For there is a two-fold Commodity of this thing; the one, that they are kept without *pressing* or *bruising*, which they must needs suffer, if they were laid upon any hard substance; the other, that the *Air* doth encompass them on every side alike.

23. It is observed that *Putrefaction*, no less than *Desiccation* in *Vegetables*, doth not begin in every part alike, but chiefly in that part where, being alive, it did attract nourishment. Therefore some advise to cover the *stalks* of *Apples* or other *Fruits* with *Wax* or Pitch.

24. Great *Wicks* of *Candles* or *Lamps* do sooner consume the *Tallow* or *Oil* than lesser *Wicks*; also *Wicks* of *Cotten* sooner than those of *Rush*, or *Straw*, or small *Twigs*: and in *Staves* of *Torches*, those of *Juniper* or *Firre* sooner than those of *Ash*: likewise *Flame moved* and *fanned* with the *Wind* sooner than that which is *still*: And therefore *Candles* set in a *Lanthorn* will last longer than in the *open Air*. There is a Tradition, that *Lamps* set in *Sepulchres* will last an incredible time.

25. The *Nature* also and *Preparation* of the *Nourishment* conduceth no less to the *lasting* of *Lamps* and *Candles*, than the nature of the *Flame*; for *Wax* will last longer than *Tallow*, and *Tallow* a little wet longer than *Tallow* dry, and *Wax-candles* old made longer than *Wax-candles* new made.

26. *Trees*, if you stir the *Earth* about their *Root every year*, will continue less time; if once in four, or perhaps in ten years, much longer: also *cutting* off the *Suckers* and *young shoots* will make them live the longer: but *Dunging* them, or laying of *Marl* about their Roots, or much *Watring* them, adds to their fertility, but cuts off from their long lasting. And thus much touching the *Prohibiting* of *Desiccation* or *Consumption*.

The

The Intenteration or making tender of that which is dried (which is the chief matter) affords but a small number of *Experiments*. And therefore some few *Experiments* which are found in living Creatures, and also in Man, shall be joyned together. 27.

Bands of Willow, wherewith they use to bind Trees, laid in water, grow more flexible: Likewise they put Boughs of Birch (the ends of them) in Earthen Pots filled with Water, to keep them from withering; and Bowls cleft with driness, steep'd in water, close again. 28.

Boots grown hard and obstinate with age, by greasing them before the Fire with Tallow wax soft, or being only held before the Fire, get some softness. *Bladders* and *Parchments* hardned also, become tender with warm water, mixed with Tallow, or any fat thing; but much the better, if they be a little chafed. 29.

Trees grown very old, that have stood long without any culture, by digging and opening the Earth about the Roots of them, seem to grow young again, and put forth young Branches. 30.

Old Draught-Oxen worn out with labour, being taken from the yoak, and put into fresh Pasture, will get young and tender flesh again: insomuch, that they will eat as fresh and tender as a *Steer*. 31.

A strict Emaciating Diet of *Guiacum*, *Bisket*, and the like, (wherewith they use to cure the *French-Pox*, *Old Catarrhs*, and some kind of *Dropsies*) doth first bring men to great poverty and leanness, by wasting the Juices and Humours of the Body; which after they begin to be repaired again, seem manifestly more vigorous and young. Nay, and I am of opinion, that Emaciating Diseases afterwards well cured, have advanced many in the way of long life. 32.

Observations.

MEn *see clearly, like* Owls, *in the* Night *of their own* Notions; *but in* Experience, *as in the* Day-light, *they wink, and are but half sighted. They speak much of the* Elementary quality *of* Siccity *or* Driness, *and of things* Desiccating, *and of the* Natural Periods *of* Bodies *in which they are corrupted and consumed: But mean while, either in the* beginnings, *or* middle passages, *or* last acts *of* Desiccation *and* Consumption, *they observe nothing that is of moment.* 1.

Desiccation *or* Consumption, *in the process thereof, is finished by three* Actions; *and all these (as was said before) have their Original from the* Native Spirit *of* Bodies. 2.

The first Action *is, the* Attenuation *of the* Moisture *into* Spirit: *the second is, the* issuing forth, *or* flight of the Spirit; *the third is, the* Contraction *of the* grosser parts *of the* Body *immediately after the* Spirit *issued forth. And this last is, that* Desiccation *and* Induration, *which we chiefly handle. The former two consume only.* 3.

Touching Attenuation, *the matter is manifest: For the* Spirit *which is inclosed in every* Tangible Body *forgets not its nature, but whatsoever it meets withal in the Body (in which it is inclosed) that it can digest and master, and turn into it self, that it plainly alters and subdues, and multiplies it self upon it, and begets new* Spirit. *And this evicted by one proof, instead of many; for that those things which are throughly dried are lessened in their* weight, *and become hollow, porous, and resounding from within. Now it is most certain, that the inward* Spirit *of any thing, confers nothing to the* Weight, *but rather lightens it; and therefore it must needs be, that the same* Spirit *hath turned into it the moisture and juyce of the* Body *which weighed before, by which means the* weight *is lessened. And this is the* first Action, *the* Attenuation *of the* Moisture, *and converting it into* Spirit. 4.

The second Action, *which is the* issuing forth, *or* Flight of the Spirit, *is as manifest also. For that* issuing forth, *when it is in throngs, is apparent even to the sense, in* Vapours *to the sight, in* Odours *to the smelling; but if it issueth forth slowly, (as when a thing is decayed by age) then it is not apparent to the sense, but the matter is the same. Again, where composure of the Body is either so streight, or so tenacious, that the* Spirit *can find no pores or passages by which to depart, then, in the striving to get out, it drives before it the grosser parts of the Body, and protrudes them beyond the superficies or surface of the Body; as it is in the rust of* Metals, *and mould of all* fat things. *And this is the* second Action, *the* Issuing forth, *or* Flight of the Spirit. 5.

The third Action *is somewhat more obscure, but full as certain; that is, the* Contraction *of the* grosser parts *after the* Spirit *issued forth. And this appears, first, in that* Bodies *after the* Spirit *issued forth, do manifestly shrink, and fill a less room; as it is in* 6.

the

the Kernels *of* Nuts, *which after they are dried, are too little for the* Shells; *and in* Beams *and* Planchers *of* Houses, *which at first lay close together, but after they are dried give; and likewise in* Bowls, *which through drought grow full of Cranies, the parts of the* Bowl *contracting themselves together, and after* contraction *must needs be empty spaces. Secondly, It appears by the wrinkles of* Bodies *dried; for the endeavour of* contracting *it self is such, that by the contraction it brings the parts nearer together, and so lifts them up; for whatsoever is contracted on the sides, is lifted up in the midst: And this is to be seen in* Papers *and old* Parchments, *and in the* skins *of* living Creatures, *and in the* Coats *of* Cheeses: *all which, with age, gather wrinkles. Thirdly, This* Contraction *shews it self most in those things, which by heat are not only wrinkled, but ruffled and plighted, and, as it were, rouled together; as it is in* Papers, *and* Parchments, *and* Leaves, *brought near the Fire: For* Contraction *by* Age, *which is more slow, commonly causeth wrinkles; but* Contraction *by the* Fire, *which is more speedy, causeth plighting. Now in most things where it comes not to* wrinkling *or* plighting, *there is simple* Contraction, *and* angustiation *or* straightning, *and* induration *or* hardning, *and* deficcation, *as was shewed in the first place. But if the issuing forth of the* Spirit, *and* absumption *or* waste *of the* Moisture *be so great, that there is not left body sufficient to unite and contract it self, then of necessity* Contraction *must cease, and the body become putrid, and nothing else but a little dust cleaving together, which with a light touch is dispersed, and falleth asunder; as it is in* Bodies *that are rotten, and in* Paper burnt, *and* Linnen *made into* Tinder, *and* Carkasses *imbalmed after many* Ages. *And this is the third* Action, *the* Contraction *of the* grosser parts *after the* Spirit *issueth forth.*

7. *It is to be noted, that* Fire *and* Heat *dry only by accident; for their proper work is to attenuate and dilate the* Spirit *and* Moisture; *and then it follows by accident, that the other parts should contract themselves, either for the flying of* Vacuum *alone, or for some other* motion *withal, whereof we now speak not.*

8. *It is certain, that* Putrefaction *taketh its Original from the* Native Spirit, *no less than* Arefaction; *but it goeth on a far different way: For in* Putrefaction, *the* Spirit *is not simply vapoured forth, but being detained in part, works strange garboils; and the grosser parts are not so much locally contracted, as they congregate themselves to parts of the same nature.*

Length and Shortness of Life in Living Creatures.

The History.

To the first Article.

Touching the Length *and* Shortness *of* Life *in* Living Creatures, *the Information which may be had is but slender, Observation it negligent, and Tradition fabulous. In* Tame Creatures, *their degenerate life corrupteth them; in* Wild Creatures, *their exposing to all Weathers often intercepteth them: Neither do those things which may seem Concomitants, give any furtherance to this Information, (the greatness of their Bodies, their time of Bearing in the* Womb, *the number of their* Young ones, *the time of their growth, and the rest) in regard that these things are intermixed, and sometimes they concur, sometimes they sever.*

1. *Mans* age (as far as can be gathered by any certain Narration) doth exceed the age of all other *Living Creatures*, except it be of a very few only; and the *Concomitants* in him are very equally disposed, his *stature* and *proportion* large, his *bearing* in the *Womb* nine Months, his *fruit* commonly one at a birth, his *puberty* at the age of fourteen years, his *time* of *growing* till twenty.

2. The *Elephant*, by undoubted relation, exceeds the ordinary Race of *Mans* life; but his bearing in the Womb the space of ten years, is fabulous; of two years, or at least above one, is certain. Now his Bulk is great, his time of growth until the thirtieth year, his teeth exceeding hard; neither hath it been observed, that his blood is the coldest of all Creatures: His age hath sometimes reached to two hundred years.

3. *Lyons* are accounted long livers, because many of them have been found toothless, a sign not so certain, for that may be caused by their strong breath.

4. The *Bear* is a great sleeper, a dull Beast, and given to ease; and yet not noted

for

for long life: nay, he hath this sign of short life, that his *bearing* in the *Womb* is but short, scarce full forty days.

4. The *Fox* seems to be well disposed in many things for long life: he is well skinned, feeds on flesh, lives in Dens, and yet he is noted not to have that property. Certainly he is a kind of *Dog*, and that kind is but short-liv'd.

5. The *Camel* is a long liver, a lean Creature, and sinewy; so that he doth ordinarily attain to fifty, and sometimes to an hundred years.

6. The *Horse* lives but to a moderate age, scarce to forty years; his ordinary period is twenty years: but perhaps he is beholden for this shortness of life to *Man*; for we have now no *Horses* of the *Sun* that live freely, and at pleasure, in good Pastures: Notwithstanding the *Horse* grows till he be six years old, and is able for Generation in his old age. Besides, the *Mare* goeth longer with her young one than a *Woman*, and brings forth two at a burthen more rarely. The *Asi* lives commonly to the *Horse*'s age; but the *Mule* out lives them both.

7. The *Hart* is famous amongst men for long life, yet not upon any relation that is undoubted. They tell of a certain *Hart* that was found with a Collar about his neck, and that Collar hidden with *Fat*. The long life of the *Hart* is the less credible, because he comes to his perfection at the fifth year; and not long after his *Horns* (which he sheds, and renews yearly) grow more narrow at the Root, and less branched.

8. The *Dog* is but a short liver, he exceeds not the age of twenty years; and, for the most part, lives not to fourteen years: a Creature of the hottest temper, and living in extreams; for he is commonly either in vehement motion, or sleeping: besides, the *Bitch* bringeth forth many at a Burden, and goeth nine Weeks.

9. The *Oxe* likewise, for the greatness of his body and strength, is but a short liver, about some sixteen years, and the *Males* live longer than the *Females*; notwithstanding they bear usually but one at a burden, and go nine months: a Creature dull, fleshy, and soon fatted, and living only upon Herby Substances, without Grain.

10. The *Sheep* seldom lives to ten years, though he be a Creature of a moderate size, and excellently clad; and, that which may seem a Wonder, being a Creature with so little a Gall, yet he hath the most curled Coat of any other, for the *hair* of no Creature is so much curled as *Wooll* is. The *Rams* generate not before the third year, and continue able for Generation until the eighth. The *Ewes* bear young as long as they live. The *Sheep* is a diseased Creature, and rarely lives to his full age.

11. The *Goat* lives to the same age with the *Sheep*, and is not much unlike in other things; though he be a Creature more nimble, and of somewhat a firmer flesh, and so should be longer-liv'd; but then he is much more lasciyious, and that shortens his life.

12. The *Sow* lives to fifteen years, sometimes to twenty: and though it be a Creature of the moistest flesh, yet that seems to make nothing to *length* of *life*. Of the *Wild-Boar*, or *Sow*, we have nothing certain.

13. The *Cat*'s age is betwixt six and ten years: a Creature nimble, and full of spirit, whose seed (as *Ælian* reports) burneth the Female: whereupon it is said, *That the Cat conceives with pain, and brings forth with ease.* A Creature ravenous in eating, rather swallowing down his Meat whole, than feeding.

14. *Hares* and *Coneys* attain scarce to seven years, being both Creatures Generative, and with young ones of several Conceptions in their Bellies. In this they are unlike, that the *Coney* lives under ground, and the *Hare* above ground. And again, that the *Hare* is of a more duskish flesh.

15. *Birds*, for the size of their bodies, are much lesser than *Beasts*; for an *Eagle* or *Swan* is but a small thing, in comparison of an *Oxe* or *Horse*; and so is an *Estrich* to an *Elephant*.

16. *Birds* are excellently well clad: for *Feathers*, for warmth and close sitting to the body, exceed *Wooll* and *Hairs*.

17. *Birds*, though they hatch many young ones together, yet they bear them not all in their bodies at once, but lay their Eggs by turns, whereby their Fruit hath the more plentiful nourishment whilest it is in their bodies.

18. *Birds* chew little or nothing, but their Meat is found whole in their Crops, notwithstanding they will break the shells of Fruits, and pick out the Kernels: they are thought to be of a very hot and strong Concoction.

19.

20. The motion of *Birds* in their flying is a mixt motion, consisting of a moving of the limbs, and of a kind of carriage, which is the most wholesome kind of Exercise.

21. *Aristotle* noted well touching the Generation of *Birds*, (but he transferred it ill to other *living Creatures*) that the seed of the *Male* confers less to Generation than the *Female*, but that it rather affords Activity than Matter; so that fruitful *Eggs*, and unfruitful *Eggs*, are hardly distinguished.

22. *Birds* (almost all of them) come to their full growth the first year, or a little after. It is true, that their Feathers in some kinds, and their Bills in others, shew their years; but for the growth of their Bodies, it is not so.

23. The *Eagle* is accounted a long liver, yet his years are not set down, and it is alledged as a sign of his long life, that he casts his Bill, whereby he grows young again: from whence comes that old Proverb, *The old age of an Eagle*. Notwithstanding perchance the matter may be thus; that the renewing of the *Eagle* doth not cast his Bill, but the casting of his Bill is the renewing of the *Eagle*; for after that his Bill is grown to a great crookedness, the *Eagle* feeds with much difficulty.

24. *Vultures* are also affirmed to be long livers, insomuch that they extend their life well near to an hundred years. *Kites* likewise, and so all *Birds* that feed upon flesh, and *Birds* of Prey, live long. As for *Hawks*, because they lead a degenerate and servile life for the delight of men, the term of their Natural life is not certainly known: notwithstanding amongst *Mewed Hawks* some have been found to have lived thirty years, and amongst *Wild Hawks* forty years.

25. The *Raven* likewise is reported to live long, sometimes to an hundred years: He feeds on Carrion, and flies not often, but rather is a sedentry and melancholick *Bird*, and hath very black flesh. But the *Crow*, like unto him in most things, (except in greatness and voice) lives not altogether so long, and yet is reckoned amongst the long livers.

26. The *Swan* is certainly found to be a long liver, and exceeds not unfrequently an hundred years. He is a *Bird* excellently plumed, a feeder upon Fish, and is always carried, and that in running waters.

27. The *Goose* also may pass amongst the long livers, though his food be commonly Grass, and such kind of nourishment, especially the *Wild Goose*: whereupon this Proverb grew amongst the Germans, *Magis senex quam Anser nivalis*, *Older than a Wild Goose*.

28. *Storks* must needs be long livers, if that be true which was anciently observed of them, that they never came to *Thebes*, because that City was often sacked. This, if it were so, then either they must have the knowledge of more Ages than one, or else the Old Ones must tell their Young the History. But there is nothing more frequent than *Fables*.

29. For *Fables* do so abound touching the *Phœnix*, that the truth is utterly lost, if any such *Bird* there be. As for that which was so much admired, that she was ever seen abroad with a great troop of *Birds* about her, it is no such wonder; for the same is usually seen about an *Owl* flying in the day-time, or a *Parrot* let out of a Cage.

30. The *Parrot* hath been certainly known to have lived threescore years in *England*, how old soever he was before he was brought over; a *Bird* eating almost all kind of Meats, chewing his Meat, and renewing his Bill: Likewise curst and mischievous, and of a black flesh.

31. The *Peacock* lives twenty years, but he comes not forth with his *Argus Eyes* before he be three years old; a *Bird* slow of pace, having whitish flew.

32. The *Dunghill-Cock* is Venerious, Martial, and but of a short life; a crank *Bird*, having also white flesh.

33. The *Indian-Cock*, commonly called the *Turkey-Cock*, lives not much longer than the *Dunghill-Cock*: an angry *Bird*, and hath exceeding white flesh.

34. The *Ring-Doves* are of the longest sort of livers, insomuch that they attain sometimes to fifty years of Age: an Airy *Bird*, and both builds and sits on high. But *Doves* and *Turtles* are but short liv'd, not exceeding eight years.

35. But *Pheasants* and *Partridges* may live to sixteen years. They are great Breeders, but not so white of flesh as the ordinary *Pullen*.

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The *Black Bird* is reported to be, amongst the lesser birds, one of the longest livers; an unhappy bird, and a good singer. 36.

The *Sparrow* is noted to be of a very short life; and it is imputed in the Males to their lasciviousness. But the *Linnet*, no bigger in body than the *Sparrow*, hath been observed to have lived twenty years. 37.

Of the *Estrich* we have nothing certain: those that were kept here have been so unfortunate, that no long life appeared by them. Of the bird *Ibis* we find onely that he liveth long, but his years are not recorded. 38.

The age of is *Fishes* are more uncertain than that of terrestrial Creatures, because living under the water they are the less observed: many of them breath not, by which means their vital spirit is more closed in; and therefore though they receive some refrigeration by their Gills, yet that refrigeration is not so continual as when it is by breathing. 39.

They are free from the *Desiccation* and *Depredation* of the *Air ambient*, because they live in the water, yet there is no doubt but the *Water ambient*, and piercing, and received into the pores of the body, doth more hurt to long life than the Air doth. 40.

It is affirmed too that their blood is not warm. Some of them are great devourers, even of their own kind. Their flesh is softer and more tender than that of terrestrial creatures: they grow exceedingly fat, insomuch that an incredible quantity of Oyl will be extracted out of one *Whale*. 41.

Dolphins are reported to live about thirty years; of which thing a trial was taken in some of them by cutting off their tails: they grow until ten years of age. 42.

That which they report of some *Fishes* is strange, that after a certain age their bodies will waste and grow very slender, onely their head and tail retaining their former greatness. 43.

There were found in *Cæsar*'s Fish ponds *Lampreys* to have lived threescore years: they were grown so familiar with long use, that *Crassus* the Orator solemnly lamented one of them. 44.

The *Pike* amongst Fishes living in Fresh water is found to last longest, sometimes to forty years: he is a Ravener, of a flesh somewhat dry and firm. 45.

But the *Carp*, *Bream*, *Tench*, *Eel*, and the like, are not held to live above ten years. 46.

Salmons are quick of growth, short of life; so are *Trouts*: but the *Pearch* is slow of growth, long of life. 47.

Touching that Monstrous bulk of the *Whale* or *Ork*, how long it is veiled by vital spirit, we have received nothing certain; neither yet touching the *Sea calf*, and *Sea-hog*, and other innumerable *Fishes*. 48.

Crocodiles are reported to be exceeding long liv'd, and are famous for the times of their growth, for that they, amongst all other Creatures, are thought to grow during their whole life. They are of those Creatures that lay Eggs, ravenous, cruel, and well-fenced against the waters, Touching the other kinds of *Shell fish*, we find nothing certain how long they live. 49.

Observation.

TO find out a Rule touching Length *and* Shortness *of* Life *in* Living Creatures *is very difficult, by reason of the negligence of Observations, and the entermixing of Causes. A few things we will set down.*

There are more kinds of Birds *found to be long liv'd than of* Beasts; *as the* Eagle, *the* Vulture, *the* Kite, *the* Pellican, *the* Raven, *the* Crow, *the* Swan, *the* Goose, *the* Stork, *the* Crane, *the Bird called the* Ibis, *the* Parrot, *the* Ring-dove, *with the rest, though they come to their full growth within a year, and are less of bodies: surely their clothing is excellent good against the distemperatures of the weather; and besides, living for the most part in the open Air, they are like the Inhabitants of pure Mountains, which are long liv'd. Again, their* Motion, *which (as I else-where said) is a mixt* Motion, *compounded of a moving of their Limbs and of a carriage in the Air, doth less weary and wear them, and 'tis more wholsome. Neither do they suffer any compression or want of nourishment in their mother's bellies, because the Eggs are laid by turns. But the cheifest cause of all I take to be is this, that* Birds *are made more of the substance of the Mother than of the Father, whereby their Spirits are not so eager and hot.* 1.

2. It may be a Position, that Creatures which partake more of the substance of their Mother than of their Father are longer liv'd, as Birds are; which was said before. Also that those which have a longer time of bearing in the womb, do partake more of the substance of their Mother, less of the Father, and so are longer-liv'd: Insomuch that I am of opinion, that even amongst Men, (which I have noted in some) those that resemble their Mothers most are longest-liv'd; and so are the Children of Old men begotten of young Wives, if the Fathers be found not diseased.

3. The first breeding of Creatures is ever material, either to their hurt or benefit. And therefore it stands with reason, that the lesser Compression, and the more liberal Alimentation of the Young one in the womb, should confer much to Long Life. Now this happens when either the young ones are brought forth successively, as in Birds, or when they are single Birth, as in Creatures bearing but one at a Burthen.

4. But long Bearing in the Womb makes for Length of Life three ways. First, for that the young one partakes more of the substance of the Mother, as hath been said. Secondly, that it comes forth more strong and able. Thirdly, that it undergoes the prædatory force of the Air, later. Besides, it shews that Nature intendeth to finish her periods by larger Circles. Now though Oxen, and Sheep, which are born in the womb about six months, are but short-liv'd, that happens for other causes.

5. Feeders upon Grass and mere Herbs are but short livers, and Creatures feeding upon Flesh, or Seeds, or Fruits, long livers, as some Birds are. As for Harts, which are long-liv'd, they take the one half of their meat (as men use to say) from above their heads, and the Goose, besides Grass, findeth something in the water, and Stubble to feed upon.

6. We suppose that a good Cloathing of the Body maketh much to long life; for it seeneth and armeth against the intemperances of the Air, which do wonderfully assail, and decay the body: which benefit Birds especially have. Now that Sheep, which have so good Fleeces, should be so short-liv'd, that is to be imputed to Diseases, whereof that Creature is full, and to the bare eating of Grass.

7. The seat of the Spirits, without doubt, is principally the Head; which though it be usually understood of the Animal Spirits only, yet this is all in all. Again, it is not to be doubted but the Spirits do most of all waste and prey upon the body, so that when they are either in greater plenty, or in greater inflamation and Acrimony, there the life is much shortned. And therefore I conceive a great cause of long life in Birds to be the smalness of their Heads in comparison of their Bodies; for even Men which have very great Heads I suppose to be the shorter livers.

8. I am of opinion that Carriage is of all other motions the most helpful to long life; which I also noted before. Now there are carried Water-fowls upon the water, as Swans; all Birds in their flying, but with a strong endeavour of their limbs; and Fishes, of the length of whose live we have no certainty.

9. Those Creatures which are long before they come to their perfection (not speaking of growth in stature only, but of other steps to maturity; as Man puts forth, first, his Teeth, next the signs of Puberty, then his beard, and so forward) are long liv'd, for it shews that Nature finished her Periods by larger Circles,

10. Milder Creatures are not long-liv'd, as the Sheep and Dove; for Choler is as the Whetstone and Spur to many Functions in the Body.

11. Creatures whose Flesh is more duskish are longer-liv'd than those that have white Flesh; for it sheweth that the juice of the body is more firm, and less apt to dissipate.

12. In every corruptible Body Quantity maketh much to the conservation of the whole: for a great Fire is longer in quenching, a small portion of Water is sooner evaporated, the Body of a Tree withereth not so fast as a Twig. And therefore generally (I speak it of Species, not of Individuals) Creatures that are large in body are longer-liv'd than those that are small, unless there be some other potent cause to hinder it.

Alimen-

Alimentation, or Nourishment: and the way of Nourishing.

The History.

To the fourth Article.

1. NOurishment ought to be of an inferiour nature, and more simple substance than the thing nourished. *Plants* are nourished with the Earth and Water, *Living Creatures* with Plants, *Man* with living Creatures. There are also certain *Creatures* feeding upon Flesh, and *Man* himself, takes Plants into a part of his Nourishment; but *Man* and *Creatures* feeding upon Flesh are scarcely nourished with Plants alone: perhaps *Fruit* or *Grains*, baked or boiled, may, with long use, nourish them; but *Leaves*, or *Plants* or *Herbs* will not do it, as the *Order* of *Foliatanes* shewed by Experience.

2. Over-great *Affinity* or *Consubstantiality* of the *Nourishment* to the thing nourished proveth not well: Creatures feeding upon Herbs touch no Flesh; and of Creatures feeding upon Flesh, few of them eat their own kind: As for *Men*, which are *Canibals*, they feed not ordinarily upon *Mans* flesh, but reserve it as a Dainty, either to serve their revenge upon their enemies, or to satisfie their appetite at sometimes. So the *Ground* is best sown with *Seed* growing elsewhere, and *Men* do not use to *Graft* or *Innoculate* upon the same Stock.

3. By how much the more the *Nourishment* is better *prepared*, and approacheth nearer in likeness to the thing nourished, by so much the more are *Plants* more fruitful, and *living Creatures* in better liking and plight: for a young *Slip* or *Cion* is not so well nourished if it be pricked into the ground, as if it be grafted into a Stock agreeing with it in Nature, and where it finds the nourishment already digested and prepared neither: (as is reported) will the *Seed* of an *Onion*, or some such like, sown in the bare earth, bring forth so large a fruit as if it be put into another *Onion*, which is a new kind of *Grafting*, into the root, or under ground. Again, it hath been found out lately, that a *Slip* of a *Wild Tree*, as of an *Elm*, *Oak*, *Ash*, or such like, grafted into a Stock of the same kind, will bring forth larger leaves then those that grow without grafting: Also Men are not nourished so well with raw flesh as with that which hath passed the fire.

4. *Living Creatures* are nourished by the *Mouth*, *Plants* by the *Root*, *Young ones* in the womb by the *Navel*: *Birds* for a while are nourished with the *Yolk* in the Egge, whereof some is found in their Crops after they are hatched.

5. All Nourishment moveth from the *Centre* to the *Circumference*, or from the Inward to the Outward: yet it is to be noted, that in *Trees* and *Plants* the Nourishment passeth rather by the Bark and Outward parts then by the Pith and Inward parts; for if the Bark be pilled off, though but for a small breadth, round, they live no more: and the Blood in the Veins of living Creatures doth no less nourish the Flesh beneath it than the Flesh above it.

6. In all *Alimentation* or *Nourishment* there is a two-fold Action, *Extusion* and *Attraction*; whereof the former proceeds from the Inward Function, the latter from the Outward.

7. *Vegetables* assimulate their Nourishment simply, without Excerning: For Gums and Tears of Trees are rather Exumberances then Excrements, and Knots or knobs are nothing but Diseases. But the substance of living Creatures is more perceptible of the like; and therefore it is conjoyned with a kind of disdain, whereby it rejecteth the bad, and assimulateth the good.

8. It is a strange thing of the *stalks* of *Fruits*, that all the Nourishment which produceth sometimes such great Fruits, should be forced to pass through so narrow necks; for the Fruit is never joyn'd to the Stocks without some stalk.

9. It is to be noted, that the Seeds of living Creatures will not be fruitful but when they new shed, but the Seeds of Plants will be fruitful a long time after they are gathered; yet the Slips or Cions of Trees will not grow unless they be grafted green neither will the roots keep long fresh unless they be covered with earth.

10. In *living Creatures* there are degrees of Nourishment according to their Age: in the womb, the young one is nourished with the Mother's blood; when it is new-born, with Milk; afterwards with Meats and Drinks; and in old age the most nourishing and savoury Meats please best,

Above all it maketh to the present *Inquisition*, to inquire diligently and attentively whether a man may not receive *Nourishment* from without, at least some other way beside the Mouth. We know that Baths of Milk are used in some *Hectick Fevers*, and when the body is brought extream low, and *Physitians* do provide *Nourishing glysters*. This matter would be well studied; for if *Nourishment* may be made either from without, or some other way than by the stomach, then the weakness of Concoction, which is incident to old men, might be recompenced by these helps, and Concoction restored to them intire.

Length and Shortness of Life in Man.

The History:

To the 5, 6, 7, 8, 9, and 11 Articles.

1. BEfore the *Floud*, as the *Sacred Scriptures* relate, *Men* lived many hundred years; yet none of the *Fathers* attained to a full thousand. Neither was this *Length* of *Life* peculiar onely to *Grace* or the *Holy Line*; for there are reckoned of the *Fathers* untill the *Floud* eleven Generations; but of the sons of *Adam* by *Cain* onely eight Generations; so as the posterity of *Cain* may seem the longer-liv'd. But this *Length of Life* immediately after the *Floud* was reduced to a moiety, but in the *Post-nati*; for *Noah*, who was born before, equalled the age of his *Ancestors*, and *Shem* saw the six hundredth year of his life. Afterwards three Generations being run from the *Floud*, the *Life* of *Man* was brought down to a fourth part of the primative *Age*, that was, to about two hundred years.

2. *Abraham* lived an hundred seventy and five years: a man of an high courage, and prosperous in all things. *Isaac*, came to an hundred and eighty years of age: a chast man, and enjoying more quietness than his Father. But *Jacob*, after many crosses and a numerous progeny, lasted to the hundred forty seventh year of his life: a patient, gentle, and wise man. *Ismael*, a military man, lived an hundred thirty and seven years. *Sarah* (whose years onely amongst women are recorded) died in the hundred twenty seventh year of her age: a beautifull and magnanimous woman: a singular good Mother and Wife; and yet no less famous for her Liberty than Obsequiousness towards her husband. *Joseph* also, a prudent and politick man, passing his youth in affliction, afterwards advanced to the height of honour and prosperity, lived an hundred and ten years. But his brother *Levi*, elder than himself, attained to an hundred thirty seven years: a man impatient of contumely and revengful. Near unto the same age attained the *son* of *Levi*; also his *grand child*, the *father* of *Aaron* and *Moses*,

3. *Moses* lived an hundred and twenty years: a stout man, and yet the *meekest upon the earth* and of a very *slow tongue*. Howsoever *Moses* in his *Psalm* pronounceth that the life of man is but seventy years, and if a man have strength, then eighty; which term of man's life standeth firm in many particulars even at this day. *Aaron*, who was three years the elder, died the same year with his *Brother*: a man of a readier speech, of a more facile disposition, and less constant. But *Phineas*, *grand-child* of *Aaron*, (perhaps out of extraordinary grace) may be collected to have lived three hundred years; if so be the *War* of the *Israelites* against the *Tribe* of *Benjamin* (in which Expedition *Phineas* was consulted with) were performed in the same order of time in which the *History* hath ranked it: He was a man of a most *eminent Zeal*. *Joshua*, a martial man and an excellent Leader, and evermore victorious, lived to the hundred and tenth year of his life. *Caleb* was his Contemporary, and seemeth to have been of as great years. *Ehud* the Judge seems to have been no less than an hundred years old in regard that after the Victory over the *Moabites* the *Holy Land* had rest under his Government eighty years: He was a man fierce and undaunted, and one that in a sort neglected his life for the good of his People.

4. *Job* lived, after the restauration of his happiness, an hundred and forty years, being before his afflictions, of that age that he had sons at man's estate: a man politick

stick, Eloquent, Charitable, and the *Example* of *Patience*. *Eli* the Priest lived ninety eight years; a corpulent man, calm of disposition, and indulgent to his Children. But *Elizæus* the *Prophet* may seem to have died when he was above an hundred years old: for he is found to have lived after the *Assumption* of *Elias* sixty years; and at the time of that *Assumption* he was of those years, that the Boys mocked him by the name of *Bald head*: A man vehement and severe, and of an austere life, and a contemner of Riches. Also *Isaiah* the *Prophet* seemeth to have been an hundred years old; for he is found to have exercised the Function of a *Prophet* seventy years together; the years both of his beginning to Prophesie, and of his Death, being uncertain: A man of an admirable Eloquence, an *Evangelical Prophet*, full of the Promises of God of the *New Testament*, as a Bottle with sweet Wine.

5. *Tobias* the Elder lived an hundred fifty eight years, the Younger an hundred twenty seven; merciful men, and great Alms-givers. It seems in the time of the *Captivity*, many of the *Jews* who returned out of *Babylon* were of great years, seeing they could remember both *Temples*, (there being no less than seventy years betwixt them) and wept for the unlikeness of them. Many Ages after that, in the time of our *Saviour*, lived old *Simeon*, to the Age of ninety; a devout man, and full both of hope and expectation. Into the same time also fell *Anna* the *Prophetess*, who could not possibly be less than an hundred years old; for she had been seven years a Wife, about eighty four years a Widow, besides the years of her Virginity, and the time that she lived after her Prophecy of our Saviour: She was an holy Woman, and passed her days in Fastings and Prayers.

6. The *long lives* of *Men* mentioned in *Heathen Authors* have no great certainty in them; both for the intermixture of Fables, whereunto those kind of relations were very prone, and for their false Calculation of Years. Certainly of the *Ægyptians* we find nothing of moment in those works that are extant, as touching *long life*; for their *Kings* which reigned longest did not exceed fifty, or five and fifty years; which is no great matter, seeing many at this day attain to those years. But the *Arcadian Kings* are fabulously reported to have lived very long. Surely that Country was Mountainous, full of Flocks of Sheep, and brought forth most wholesome food; notwithstanding, seeing *Pan* was their god, we may conceive that all things about them were *Panick* and vain, and subject to Fables.

7. *Numa*, King of the *Romans*, lived to eighty years: a man peaceable, contemplative, and much devoted to Religion. *Marcus Valerius Corvinus* saw an hundred years compleat, there being betwixt his first and sixth *Consulship* forty six years: a man valorous, affable, popular, and always fortunate.

8. *Solon* of *Athens*, the *Law-giver*, and one of the seven *Wise Men*, lived above eighty years, a man of an high courage, but popular, and affected to his Country: also learned, given to pleasures, and a soft kind of life. *Epimenides* the *Cretian* is reported to have lived an hundred fifty seven years: the matter is mix'd with a *Prodigious Relation*, for fifty seven of those years he is said to have slept in a *Cave*. Half an Age after, *Xenophon* the *Colophonian* lived an hundred and two years, or rather more: for at the Age of twenty five years he left his Country, seventy seven compleat years he travelled, and after that returned: but how long he lived after his return, appears not; a man no less wandring in mind, than in body; for his name was changed for the madness of his Opinions, from *Xenophanes* to *Xenomanes*: a man, no doubt, of a vast conceit, and that minded nothing but *Infinitum*.

9. *Anacreon*, the Poet, lived eighty years, and somewhat better: a man lascivious, voluptuous, and given to drink. *Pindarus*, the *Theban*, lived to eighty years; a Poet of an high fancy, singular in his conceits, and a great Adorer of the *gods*. *Sophocles*, the *Athenian*, attained to the like Age: a lofty Tragick-Poet, given over wholly to Writing, and neglectful of his Family.

10. *Artaxerxes*, King of *Persia*, lived ninety four years: a man of a dull wit, averse to the dispatch of business, desirous of glory, but rather of ease. At the same time lived *Agesilaus*, King of *Sparta*, to eighty four years of Age: a moderate Prince, as being a *Philosopher* among *Kings*; but notwithstanding ambitious, and a Warriour, and no less stout in War, than in business.

11. *Gorgias*, the *Sicilian*, was an hundred and eight years old; a *Rhetorician*, and a great Boaster of his Faculty, one that taught Youth for profit: He had seen many Countries,

Countries, and a little before his death said, *That he had done nothing worthy of blame since he was an old man.* *Protagoras* of *Abdera* saw ninety years of age. This man was likewise a *Rhetorician*, but professed not so much to teach the Liberal Arts as the Art of Governing Commonwealths and States; notwithstanding he was a great Wanderer in the World, no less than *Gorgias*. *Isocrates*, the *Athenian*, lived ninety eight years: he was a *Rhetorician* also, but an exceeding modest man; one that shunned the publick light, and opened his School only in his own house. *Democritus* of *Abdera* reached to an hundred and nine years: he was a great *Philosopher*; and, if ever any man amongst the *Grecians*, a true *Naturalist*; a Surveyour of many Countries, but much more of Nature: also a diligent Searcher into Experiments, and (as *Aristotle* objected against him) one that followed Similitudes more than the Laws of Arguments. *Diogenes*, the *Sinopean*, lived ninety years; a man that used Liberty towards others, but Tyranny over his self; a course Diet, and of much patience. *Zeno* of *Citium* lacked but two years of an hundred; a man of an high mind, and a Contemner of other mens Opinions: also of a great acuteness, but yet not troublesome; chusing rather to take mens minds, than to inforce them. The like whereof afterward was in *Seneca*. *Plato*, the *Athenian*, attained to eighty one years; a man of a great courage, but yet a lover of ease: in his Notions sublimed, and of a fancy; neat and delicate in his life, rather calm than merry, and one that carried a kind of Majesty in his Countenance. *Theophrastus*, the *Eressian*, arrived at eighty five years of age: a man sweet for his Eloquence, sweet for the variety of his matters, and who selected the pleasant things of Philosophy, and let the bitter and harsh go. *Carneades* of *Cyrene*, many years after, came to the like age of eighty five years: a man of a fluent Eloquence, and one who by the acceptable and pleasant variety of his knowledge, delighted both himself and others. But *Orbilius*, who lived in *Cicero*'s time, no *Philosopher* or *Rhetorician*, but a *Grammarian*, attained to an hundred years of age: he was first a Souldier, then a Schoolmaster; a man by nature tart both in his Tongue and Pen, and severe towards his Scholars.

12. *Quintus Fabius Maximus* was *Augur* sixty three years, which shewed him to be above eighty years of age at his death; though it be true, that in the *Augurship* Nobility was more respected than Age: a Wise man, and a great *Deliberator*, and in all his proceedings moderate, and not without affability severe. *Masinissa*, King of *Numidia*, lived ninety years, and being more than eighty five got a Son: a daring man, and trusting upon his Fortune, who in his youth had tasted of the inconstancy of Fortune, but in his succeeding age was constantly happy. But *Marcus Porcius Cato* lived above ninety years of age: a man of an Iron Body and Mind; he had a bitter tongue, and loved to cherish Factions; he was given to Husbandry, and was to himself and his Family a Physitian.

13. *Terentia*, *Cicero*'s Wife, lived an hundred and three years; a woman afflicted with many crosses: first, with the banishment of her Husband; then with the difference betwixt them: lastly, with his last fatal misfortune: She was also oftentimes vexed with the *Gout*. *Lucia* must needs exceed an hundred, by many years, for it is said, that she acted an whole hundred years upon the Stage, at first perhaps representing the person of some young Girl, at last of some decrepit old Woman. But *Caleria Copiola*, a Player also, and a Dancer, was brought upon the Stage as a Novice, in what year of her age is not known; but ninety nine years after, at the *Dedication* of the *Theatre* by *Pompey* the *Great*, she was shewn upon the Stage, not now for an Actress, but for a Wonder. Neither was this all; for after that, in the *Solemnities* for the health and life of *Augustus*, she was shewn upon the Stage the third time.

14. There was another *Actress*, somewhat Inferiour in Age, but much Superiour in Dignity, which lived well near ninety years, I mean *Livia Julia Augusta*, Wife to *Augustus Cæsar*, and Mother to *Tiberius*. For if *Augustus* his life were a Play, (as himself would have it, when as upon his Death bed he charged his Friends they should give him a *Plaudite* after he was dead) certainly this *Lady* was an excellent *Actress*, who could carry it so well with her Husband by a dissembled obedience, and with her Son by Power and Authority: A Woman affable, and yet of a Matronal Carriage, Pragmatical, and upholding her Power. But *Junia*, the Wife of *Caius Cassius*, and Sister of *Marcus Brutus*, was also ninety years old, for she survived the *Philippick* Battle sixty four years: a Magnanimous Woman, in her great wealth

happy,

happy in the calamity of her Husband, and near Kinsfolks, and in a long Widdowhood unhappy; notwithstanding much honoured of all.

The year of our *Lord* seventy six, falling into the time of *Vespasian*, is memorable; in which we shall find, as it were, a *Calendar* of long-liv'd men: for that year there was a *Taxing*, (now a *Taxing* is the most Authentical and truest Informer touching the Ages of men;) and in that part of *Italy* which lieth betwixt the *Apennine Mountains*, and the River *Poe*, there were found an hundred and four and twenty persons that either equalled or exceeded an hundred years of age: namely, of an hundred years just, fifty four persons; of an hundred and ten, fifty seven persons; of an hundred and five and twenty, two only; of an hundred and thirty, four men; of an hundred and five and thirty, or seven and thirty, four more; of an hundred and forty, three men. Besides these, *Parma* in particular afforded five; whereof three fulfilled an hundred and twenty years, and two an hundred and thirty: *Brixels* afforded one of an hundred and twenty five years old: *Placentia* one, aged an hundred thirty and one: *Faventia* one woman, aged one hundred thirty and two. A certain Town, then called *Velleiatium*, situate in the Hills about *Placentia*, afforded ten; whereof six fulfilled an hundred and ten years of age, four an hundred and twenty. Lastly, *Rimini*, one of an hundred and fifty years, whose name was *Marcus Aponius*. 15.

That our Catalogue might not be extended too much in length, we have thought fit, as well in those whom we have rehearsed, as in those whom we shall rehearse, to offer none under eighty years of Age. Now we have affixed to every one a true and short Character *or* Elogy; *but of that sort whereunto, in our judgment,* Length *of* Life *(which is not a little subject to the manners and fortunes of men) hath some relation, and that in a twofold respect; either that such kind of men are for the most part long-liv'd, or that such men may sometimes be of long life, though otherwise not well disposed for it.*

Amongst the *Roman* and *Grecian Emperours*, also the *French* and *Almain*, to these our days, which make up the number of well-near two hundred Princes, there are only four found that lived to eighty years of age: unto whom we may add the two first Emperours, *Augustus* and *Tiberius*; whereof the latter fulfilled the seventy and eighth year, the former the seventy and sixth year of his age, and might both perhaps have lived to fourscore, if *Livia* and *Caius* had been pleased. *Augustus* (as was said) lived seventy and six years: a man of moderate disposition; in accomplishing his designs vehement, but otherwise calm and serene; in meat and drink sober, in Venery intemperate, through all his life-time happy; and who about the thirtieth year of his Life had a great and dangerous sickness, insomuch as they despaired of life in him, whom *Antonius Musa*, the Physitian, when other Physitians had applied hot Medicines, as most agreeable to his disease, on the contrary cured with cold Medicines, which perchance might be some help to the prolonging of his life. *Tiberius* lived to be two years older: *A man with lean Chaps*, as *Augustus* was wont to say, for his Speech stuck within his Jaws, but was weighty. He was bloudy, a Drinker, and one that took Lust into a part of his Diet; notwithstanding a great observer of his health, insomuch that he used to say, That he was a Fool, that after thirty years of age took advice of a Physitian. *Gordian* the Elder lived eighty years, and yet died a violent death, when he was scarce warm in his *Empire*: a man of an high spirit, and Renowned, Learned, and a Poet, and constantly happy throughout the whole course of his life, save only that he ended his days by a violent death. *Valerian*, the *Emperour*, was seventy six years of age before he was taken Prisoner by *Sapor* King of *Persia*. After his Captivity, he lived seven years in reproaches, and then died a violent death also: a man of a poor mind, and not valiant, notwithstanding lifted up in his own, and the opinion of men, but falling short in the performance. *Anastasius*, surnamed *Dicorus*, lived eighty eight years: he was of a setled mind, but too abject, and superstitious, and fearful. *Anicius Justinianus* lived to eighty three years: a man greedy of Glory, performing nothing in his own Person, but in the valour of his Captains happy and renowned: uxorious, and not his own man, but suffering others to lead him. *Helena* of *Britain*, Mother of *Constantine* the *Great*, was fourscore years old: a woman that intermedled not in matters of State, neither in her Husbands nor Sons Reign, but devoted her self wholly to Religion; magnanimous, and perpetually flourishing. *Theodora* the *Empress* (who was Sister to *Zoes*, 16.

Wife of *Monomachus*, and reigned alone after her decease) lived above eighty years: a Pragmatical Woman, and one that took delight in Governing; fortunate in the highest degree, and through her good fortunes credulous.

17. We will proceed now from these *Secular Princes*, to the *Princes* in the *Church* St. *John*, an Apostle of our *Saviour*, and the *Beloved Disciple*, lived ninety three years. He was rightly denoted under the Emblem of the *Eagle*, for his piercing sight into the *Divinity*; and was a *Seraph* amongst the *Apostles*, in respect of his burning Love. St. *Luke* the *Evangelist* fulfilled fourscore and four years: an Eloquent man, and a Traveller; St. *Paul*'s inseparable Companion, and a *Physitian*. *Simeon*, the Son of *Cleophas*, called the *Brother of our Lord*, and Bishop of *Jerusalem*, lived an hundred and twenty years, though he was cut short by Martyrdom: a stout man, and constant, and full of good works. *Polycarpus*, *Disciple* unto the *Apostles*, and Bishop of *Smyrna*, seemeth to have extended his age to an hundred years and more, though he were also cut off by Martyrdom: a man of an high mind, of an Heroical patience, and unwearied with labours. *Dionysius Areopagita*, Contemporary to the Apostle St. *Paul*, lived ninety years: he was called the *Bird of Heaven* for his high flying Divinity; and was famous, as well for his Holy Life, as for his Meditations. *Aquilla* and *Priscilla*, first St. *Paul* the Apostles Hosts, afterward his Fellow-helpers, lived together in a happy and famous Wedlock, at least to an hundred years of age apiece; for they were both alive under Pope *Xistus* the First: a Noble Pair, and prone to all kind of Charity, who amongst other their comforts (which no doubt were great unto the first *Founders* of the *Church*) had this added, to enjoy each other so long in an happy Marriage. St. *Paul*, the *Hermit*, lived an hundred and thirteen years: now he lived in a Cave, his Diet was so slender and strict, that it was thought almost impossible to support Humane Nature therewithal: he passed his years only in Meditations and Soliloquies; yet he was not illiterate, or an Idiot, but learned. Saint *Anthony*, the first Founder of *Monks*, or (as some will have it) the Restorer only, attained to an hundred and five years of age: a man devout and contemplative, though not unfit for Civil Affairs: his life was austere and mortifying, notwithstanding he lived in a kind of glorious solitude, and exercised a Command, for he had his *Monks* under him: And besides, many *Christians* and *Philosophers* came to visit him as a living Image, from which they parted not without some adoration. St. *Athanasius* exceeded the term of eighty years: a man of an Invincible Constancy, Commanding Fame, and not yielding to Fortune: He was free towards the Great Ones, with the People gracious and acceptable, beaten and practised to oppositions; and in delivering himself from them, stout and wise. St. *Hierom*, by the consent of most Writers, exceeded ninety years of age: a man powerful in his Pen, and of a Manly Eloquence, variously learned both in the Tongues and Sciences; also a Traveller, and that lived strictly towards his old age, in an estate private, and not dignified; he bore high Spirits, and shined far out of obscurity.

18. The *Popes* of *Rome* are in number, to this day, two hundred forty and one: Of so great a number, five only have attained to the age of fourscore years, or upwards: But in many of the first *Popes*, their full age was intercepted by the Prerogative and Crown of *Martyrdom*. *John* the twenty third, *Pope* of *Rome*, fulfilled the ninetieth year of his age; a man of an unquiet disposition, and one that studied Novelty: he altered many things, some to the better, others only to the new, a great Accumulator of Riches and Treasures. *Gregory*, called the twelfth, created in Schism; and not fully acknowledged *Pope*, died at ninety years. Of him, in respect of his short *Papacy*, we find nothing to make a Judgment upon. *Paul* the third lived eighty years and one, a temperate man, and of a profound Wisdom: he was Learned, an Astrologer, and one that tended his health carefully: but, after the example of Old *Eli* the Priest, over-indulgent to his Family. *Paul* the fourth attained to the age of eighty three years: a man of an harsh Nature, and severe, of an haughty mind, and imperious, prone to anger; his Speech was Eloquent, and ready. *Gregory* the thirteenth fulfilled the like age of eighty three years: an absolute good man, sound in mind and body; politick, temperate, full of good works, and an Alms-giver.

19. Those that follow are to be more promiscuous in their order, more doubtful in their Faith, and more barren of Observation. King *Arganthonius*, who reigned at *Cadiz* in *Spain*,

Spain lived an hundred and thirty, or (as some would have it) an hundred and forty years, of which he reigned eighty. Concerning his Manners, Institution of his Life, and the time wherein he reigned, there is a general silence. *Cyniras* King of *Cyprus*, living in the *Island*, then termed the *Happy* and *Pleasant Island*, is affirmed to have attained to an hundred and fifty, or sixty years. Two *Latin Kings* in *Italy*, the Father, and the Son, are reported to have lived, the one eight hundred, the other six hundred years: but this is delivered unto us by certain *Philologists*, who though otherwise credulous enough, yet themselves have suspected the truth of this matter, or rather condemned it. Others record some *Arcadian Kings* to have lived three hundred years: the Country, no doubt, is a place apt for long life, but the Relation I suspect to be Fabulous. They tell of one *Dando* in *Illyrium*, that lived without the inconveniences of Old Age to five hundred years. They tell also of the *Epians*, a part of *Æolia*, that the whole Nation of them were exceeding long liv'd, insomuch that many of them were two hundred years old; and that one principal man amongst them, named *Litorius*, a man of a Gyant-like stature, could have told three hundred years. It is recorded, that on the top of the Mountain *Timolus*, anciently called *Tompsis*, many of the Inhabitants lived to an hundred and fifty years. We read that the *Sect* of the *Essens* amongst the *Jews*, did usually extend their life to an hundred years. Now that *Sect* used a single or absternious Diet, after the rule of *Pythagoras*. *Apollonius Tyaneus* exceeded an hundred years, his face bewraying no such age: he was an admirable man, of the *Heathens* reputed to have something Divine in him, of the *Christians* held for a Sorcerer; in his Diet *Pythagorical*, a great traveller, much renowned, and by some adored as a *god*: notwithstanding, towards the end of his life, he was subject to many complaints against him, and reproaches, all which he made shift to escape. But lest his long life should be imputed to his *Pythagorical* Diet, and not rather that it was Hereditary, his *Grandfather* before him lived an hundred and thirty years. It is undoubted, that *Quintus Metellus* lived above an hundred years; and that after several *Consulships* happily administred, in his old age he was made *Pontifex Maximus*, and exercised those holy duties full two and twenty years: in the performance of which Rites his voice never failed, nor his hand trembled. It is most certain, that *Appius Cecus* was very old, but his years are not extant, the most part whereof he passed after he was blind; yet this misfortune no whit softned him, but that he was able to govern a numerous Family, a great Retinue and Dependance, yea, even the Common-wealth it self, with great stoutness. In his extream old age he was brought in a Litter into the *Senate house*, and vehemently dissuaded the Peace with *Pyrrhus*: the beginning of his Oration was very memorable, shewing an invincible spirit and strength of mind: *I have with great grief of mind (Fathers Conscript) these many years born my blindness, but now I could wish that I were deaf also, when I hear you speak to such dishonourable Treaties.* *Marcus Perpenna* lived ninety eight years, surviving all those whose Suffrages he had gathered in the *Senate-house*, being *Consul*, I mean, all the *Senators* at that time; as also all those whom a little after, being *Consul*, he chose into the *Senate*, seven only being excepted. *Hiero*, King of *Sicily*, in the time of the second *Punick War*, lived almost an hundred years: a man moderate both in his Government, and in his Life; a worshipper of the *gods*, and a Religious Conserver of Friendship, liberal, and constantly fortunate. *Statilia*, descended of a Noble Family in the days of *Claudius*, lived ninety nine years. *Clodia*, the Daughter of *Osilius*, an hundred and fifteen. *Xenophilus*, an Ancient Philosopher, of the Sect of *Pythagoras*, attained to an hundred and six years, remaining healthful and vigorous in his old age, and famous amongst the Vulgar for his Learning. The *Islanders* of *Coreyra* were anciently accounted long liv'd, but now they live after the rate of other men. *Hipocrates Cous*, the famous Physitian, lived an hundred and four years, and approved and credited his own Art by so long a life: a man that coupled Learning and Wisdom together, very conversant in Experience and Observations, one that haunted not after Words or Methods, but severed the very Nerves of Science, and so propounded them. *Demonax* a Philosopher, not only in Profession but Practice, lived in the days of *Adrian* almost to an hundred years: a man of an high mind, and a vanquisher of his own mind, and that truly and without affectation; a contemner of the World, and yet civil and courteous. When his Friends spake to him about his Burial, he said, *Take no care for my Burial, for Stench will bury a Carcase.* They replied, *Is it your*

mind than to be cast out to Birds and Dogs? He said again, *Seeing in my life-time I endeavoured to my uttermost to benefit Men; what hurt is it, if when I am dead, I benefit Beasts?* Certain *Indian* people, called *Pandoræ*, are exceedingly long-liv'd, even to no less than two hundred years. They add a thing more marvellous, that having, when they are Boys, an hair somewhat whitish, in their old age, before their grey hairs, they grow coal-black: though indeed this be every where to be seen, that they which have white hair whilst they are Boys, in their Mans Estate change their hairs into a darker colour. The *Seres*, another people of *India*, with their Wine of Palms, are accounted long livers, even to an hundred and thirty years. *Euphronor* the *Grammarian* grew old in his School, and taught Scholars when he was above an hundred years old. The Elder *Ovid*, Father to the *Poet*, lived ninety years, differing much from the disposition of his Son; for he contemned the *Muses*, and dissuaded his Son from Poetry. *Asinius Pollio*, intimate with *Augustus*, exceeded the age of an hundred years: a man of an unreasonable Profuseness, Eloquent, and a Lover of Learning; but vehement, proud, cruel, and one that made his private ends the centre of his thoughts. here was an opinion, that *Seneca* was an extream old man, no less than an hundred and fourteen years of Age: which could not possibly be; it being as improbable that a decrepit old man should be set over *Nero*'s Youth, as on the contrary it was true, that he was able to manage with great dexterity the Affairs of State. Besides, a little before, in the midst of *Claudius* his Reign, he was banished *Rome* for Adulteries committed with some *Noble Ladies*, which was a Crime no way compatible with so extream old age. *Johannes de Temporibus*, among all the men of our latter Ages, out of a Common Fame and Vulgar Opinion, was reputed long-liv'd, even to a Miracle; or rather, even to a Fable: his age hath been counted above three hundred years: He was by Nation a *French-man*, and followed the Wars under *Charles* the *Great*. *Garcius Arctice*, Great Grand-father to *Petrarch*, arrived at the age of an hundred and four years: he had ever enjoyed the benefit of good health; besides, at the last, he felt rather a decay of his strength, than any sickness or malady, which is the true resolution by old age. Amongst the *Venetians* there have been found not a few long livers, and those of the more eminent sort: *Franciscus Donatus*, Duke; *Thomas Contarenus*, Procurator of Saint *Mark*, *Franciscus Molinus*, Procurator also of Saint *Mark*, and others. But most memorable is that of *Cornarus* the *Venetian*, who being in his youth of a sickly body, began first to eat and drink by measure to a certain weight, thereby to recover his health: this Cure turned by use into a Diet, that Diet to an extraordinary long life, even of an hundred years, and better, without any decay in his Senses, and with a constant enjoying of his health. In our age, *William Postel*, a *French-man*, lived to an hundred and well-nigh twenty years, the top of his Beard on the upper lip being black, and not grey at all: a man crazed in his Brain, and of a Fancy not altogether sound; a great Traveller, Mathematician, and somewhat stained with *Heresie*.

20. I suppose there is scarce a *Village* with us in *England*, if it be any whit populous, but it affords some Man or Woman of fourscore years of age; nay, a few years since there was in the County of *Hereford* a May-game, or Morrice-dance, consisting of eight men whose age computed together, made up eight hundred years; insomuch that what some of them wanted of an hundred, others exceeded as much.

21. In the Hospital of *Bethlehem*, corruptly called *Bedlam*, in the *Suburbs* of *London*, there are found from time to time many mad persons that live to a great age.

22. The ages of *Nymphs*, *Fauns* and *Satyrs*, whom they make to be indeed mortal, but yet exceedingly long-liv'd, (a thing which Ancient Superstition, and the late Credulity of some have admitted) we account but for *Fables* and *Dreams*, especially being that which hath neither consent with *Philosophy*, nor with *Divinity*. And as touching the History of *Long Life* in *Man* by *Individuals*, or next unto *Individuals*, thus much. Now we will pass on to *Observations* by certain Heads.

23. The running on of *Ages*, and *Succession* of *Generations*, seem to have no whit abated from the length of life: For we see, that from the time of *Moses*, unto these our days, the term of mans life hath stood about fourscore years of age; neither hath it declined (as a man would have thought) by little and little. No doubt there are times in every Country, wherein men are longer or shorter-liv'd.

Longer,

Longer, for the moſt part, when the times are barbarous, and men fare leſs deliciouſly, and are more given to bodily exerciſes: Shorter, when the times are more civil, and men abandon themſelves to luxury and eaſe. But theſe things paſs on by their turns, the ſucceſſion of Generations alters it not. The ſame, no doubt, is in other living Creatures; for neither Oxen, nor Horſes, nor Sheep, nor any the like, are abridged of their wonted Ages at this day: And therefore the Great abridger of Age was the *Flood*; and perhaps ſome ſuch notable accidents (as particular *Inundations*, *long Droughts*, *Earthquakes*, or the like) may do the ſame again, And the like reaſon is in the dimenſion and ſtature of bodies, for neither are they leſſened by ſucceſſion of Generations; howſoever *Virgil* (following the Vulgar opinion) divined, that After-ages would bring forth leſſer Bodies than the then preſent: Whereupon ſpeaking of ploughing up the *Æmathian* and *Æmonenſian* Fields, he ſaith, *Grandiſque effoſſis mirabitur oſſa Sepulchris*, *That after ages ſhall admire the great bones digged up in Ancient Sepulchres.* For whereas it is manifeſted, that there were heretofore men of Gigantine Statures, (ſuch as for certain have been found in *Sicily*, and elſewhere, in Ancient Sepulchres and Caves) yet within theſe laſt three thouſand years, a time whereof we have ſure memory, thoſe very places have produced none ſuch: although this thing alſo hath certain turns and changes, by the civilizing of a Nation, no leſs than the former. And this is the rather to be noted, becauſe men are wholly carried away with an Opinion, that there is a continual decay by ſucceſſion of Ages, as well in the term of mans Life, as in the ſtature and ſtrength of his Body; and that all things decline and change to the worſe.

In *Cold* and *Northern Countries* men live longer commonly than in *Hot*; which 24.
muſt needs be, in reſpect the skin is more compact and cloſe, and the juices of the body leſs diſſipable, and the Spirits themſelves leſs eager to conſume, and in better diſpoſition to repair, and the Air (as being little heated by the Sun-beams) leſs predatory: And yet under the *Æquinoctial Line*, where the Sun paſſeth to and fro, and cauſeth a double Summer, and double Winter, and where the Days and Nights are more equal, (if other things be concurring) they live alſo very long; as in *Peru*, and *Taprobane*.

Iſlanders are, for the moſt part, longer-liv'd than thoſe that live in *Continents*: for 25.
they live not ſo long in *Ruſſia*, as in the *Orcades*; nor ſo long in *Africa*, though under the ſame Parallel, as in the *Canaries* and *Tercera's*; and the *Japonians* are longer liv'd than the *Chineſes*, though the *Chineſes* are made upon long life. And this thing is no marvel, ſeeing the Air of the Sea doth heat and cheriſh in cooler Regions, and cool in hotter.

High Scituations do rather afford long livers than *Low*, eſpecially if they be not tops 26.
of Mountains, but Riſing Grounds, as to their general Scituations; ſuch as was *Arcadia* in *Greece*, and that part of *Ætolia* where we related them to have lived ſo long. Now there would be the ſame reaſon for *Mountains* themſelves, becauſe of the pureneſs and clearneſs of the Air, but that they are corrupted by accident; namely, by the vapours riſing thither out of the Valleys, and reſting there; and therefore in Snowy *Mountains* there is not found any notable long life, not in the *Alps*, not in the *Pyrenean Mountains*, not in the *Apennine*: yet in the tops of the *Mountains* running along towards *Æthiopia*, and the *Abyſſines*, where by reaſon of the Sands beneath, little or no vapour riſeth to the *Mountains*: they live long, even at this very day, attaining many times to an hundred and fifty years.

Marſhes and *Fens* are propitious to the Natives, and malignant to Strangers, as touch- 27.
ing the lengthning and ſhortning of their lives: and that which may ſeem more marvellous, *Salt-marſhes*, where the Sea ebbs and flows, are leſs wholeſome than thoſe of *Freſh-water*.

The *Countries* which have been obſerved to produce long livers, are theſe; *Arcadia*, 28.
Ætolia, *India* on this ſide *Ganges*, *Braſil*, *Taprobane*, *Britain*, *Ireland*, with the Iſlands of the *Orcades* and *Hebrides*: for as for *Æthiopia*, which by one of the Ancients is reported to bring forth long livers, 'tis but a Toy.

It is a Secret; The *healthfulneſs of Air*; eſpecially in any perfection, is better 29.
found by *Experiment*, than by *Diſcourſe*, or *Conjecture*. You may make a tryal by a Lock of Wooll expoſed for a few days in the open Air, if the weight be not much increaſed;

increased; another by a piece of flesh exposed likewise, if it corrupt not over-soon; another by a Weather-glass, if the Water interchange not too suddenly. Of these, and the like, enquire further.

30. Not only the *Goodness* or *Pureness* of the *Air*, but also the *Equality* of the *Air*, is material to long life. Intermixture of Hills and Dales, is pleasant to the sight, but suspected for long life. A Plain, moderately dry, but yet not over barren or sandy, nor altogether without Trees and Shade, is very convenient for length of life.

31. *Inequality* of *Air*, (as was even now said) in the place of our dwelling is naught; but *Change* of *Air* by travelling, after one be used unto it, is good, and therefore great Travellers have been long liv'd. Also those that have lived perpetually in a little Cottage, in the same place, have been long livers: for, Air accustomed consumeth less, but Air changed nourisheth and repaireth more.

32. As the continuation and number of Successions (which we said before) makes nothing to the length and shortness of life; so the *immediate condition* of the *Parents*, (as well the Father as the Mother) without doubt availeth much. For some are begotten of old men, some of young men, some of men of middle age: Again, some are begotten of Fathers healthful and well-disposed, others of diseased and languishing: Again, some of Fathers immediately after Repletion, or when they are Drunk; others after Sleeping, or in the Morning: Again, some after a long intermission of *Venus*, others upon the act repeated: Again, some in the fervency of the Fathers love, (as it is commonly in Bastards) others after the cooling of it, as in long married Couples. The same things may be considered on the part of the Mother; unto which must be added the condition of the Mother whilst she is with child, as touching her Health, as touching her Diet, the time of her bearing in the Womb, to the tenth Month, or earlier. To reduce these things to a Rule, how far they may concern *Long Life*, is hard; and so much the harder, for that those things which a man would conceive to be the best, will fall out to the contrary: For that alacrity in the Generation which begets lusty and lively children, will be less profitable to long life, because of the Acrimony and inflaming of the Spirits. We said before, that to partake more of the Mothers Bloud, conduceth to long life: Also we suppose all things in moderation to be best; rather Conjugal love than Meretricious; the hour for Generation to be the Morning, a state of body not too lusty or full, and such like. It ought to be well observed, that a strong Constitution in the Parents, is rather good for them than for the Child, especially in the Mothers; And therefore *Plato* thought ignorantly enough, that the virtue of Generations halted, because the Woman used not the same exercise both of mind and body with the Men. The contrary is rather true; for the difference of virtue betwixt the Male and the Female, is most profitable for the Child, and the thinner Women yield more towards the nourishment of the Child; which also holds in Nurses. Neither did the *Spartan Women*, which married not before twenty two, or, as some say, twenty five, (and therefore were called *Men like women*) bring forth a more generous or long-liv'd Progeny than the *Roman*, or *Athenian*, or *Theban Women* did, which were ripe for Marriage at twelve or fourteen years; and if there were any thing eminent in the *Spartans*, that was rather to be imputed to the Parsimony of their Diet, than to the late Marriages of their Women. But this we are taught by experience, that there are some Races which are long-liv'd for a few Descents, so that Life is like some Diseases, a thing Hereditary within certain bounds.

33. *Fair* in *Face*, or *Skin*, or *Hair*, are shorter livers: *Black*, or *Red*, or *Freckled*, longer. Also too fresh a colour in Youth doth less promise long life than paleness. A *hard Skin* is a sign of long life rather than a *soft*: but we understand not this of a *rugged Skin*, such as they call the *Goose-skin*, which is as it were spungy, but of that which is hard and close. A *Forehead* with deep furrows and wrinkles, is a better sign than a smooth and plain *Forehead*.

34. The *Hairs* of the *Head* hard, and like bristles, do betoken longer life than those that are soft and delicate. *Curled Hairs* betoken the same thing, if they be hard withal; but the contrary, if they be soft and shining: the like if the *Curling* be rather thick in large bunches.

35. Early or late *Baldness* is an indifferent thing, seeing many which have been

Bald

Bald betimes have lived long. Also early *grey hairs* (howsoever they may seem forerunners of old age approaching) are no sure signs; for many that have grown *grey* betimes, have lived to great years: nay, hasty *grey hairs* without *Baldness*, is a token of long life, contrarily, if they be accompanied with *Baldness*.

36. *Hairiness* of the *upper parts* is a sign of short life, and they that have extraordinary much *hair* on their breasts live not long: but *hairiness* of the *lower parts*, as of the Thighs and Legs, is a sign of long life.

37 *Tallness* of *Stature* (if it be not immoderate) with convenient making, and not too slender, especially if the body be active withal, is a sign of long life. Also on the contrary, men of low stature live long, if they be not too active and stirring.

38. In the proportion of the body, they which are *short* to the *Wasts*, with *long Legs*, are longer-liv'd than they which are *long* to the *Wasts*, and have *short Legs*. Also they which are large in the *neather parts*, and streight in the *upper*, (the making of their body rising, as it were, into a sharp figure) are longer-liv'd than they that have *broad shoulders*, and are *slender downwards*.

39. *Leanness*, where the affections are setled, calm, and peaceable: also a more *fat habit of body*, joyned with Choler; and a disposition stirring and peremptory, signifie long life: but *Corpulency* in Youth foreshews short life; in Age it is a thing more indifferent.

40. To be *long* and *slow* in *growing*; is a sign of long life; if to a greater stature, the greater sign; if to a lesser stature, yet a sign: though contrarily, to *grow* quickly to a great stature is an evil sign; if to a small stature, the less evil.

41. *Firm Flesh*, a raw-bone body, and veins lying higher than the flesh, betoken long life; the contrary to these, short life.

42. A *Head* somewhat lesser than to the proportion of the body, a moderate *Neck*, not long, nor slender, nor flat, nor too short; wide *Nostrils*, whatsoever the form of the Nose be; a large *Mouth*, and *Ear* grisly, not fleshy: *Teeth* strong and contiguous, small, or thin set, foretoken long life; and much more, if some new *Teeth* put forth in our Elder years.

43. A broad *Breast*, yet not bearing out, but rather bending inwards; *Shoulders* somewhat crooked, and (as they call such persons) round-back'd, a flat *Belly*, a *Hand* large, and with few lines in the Palm; a short and round *Foot*, *Thighs* not fleshy, and *Calves* of the *Legs* not hanging over, but neat, are signs of long life.

44. *Eyes* somewhat large, and the *Circles* of them inclined to greenness; *Senses* not too quick; the *Pulse* in youth slower, towards old age quicker; *Facility* of *holding* the *Breath*, and longer than usual; the body in youth inclined to be bound, in the decline of years more laxative, are also signs of long life.

45. Concerning the *Times* of *Nativity*, as they refer to long life, nothing hath been observed worthy the setting down, save only *Astrological Observations*, which we rejected in our *Opicks*. A *Birth* at the eighth Month is not only long-liv'd, but not likely to live. Also *Winter-births* are accounted the longer-liv'd.

46. A *Pythagorical* or *Monastical Diet*, according to strict Rules, and always exactly equal, (as that of *Cornarus* was) seemeth to be very effectual for long life. Yet on the contrary, amongst those that live freely, and after the common sort; such as have *good stomachs*, and *feed* more *plentifully*, are often the longest-liv'd. The *middle Diet*, which we account the temperate, is commended, and conduceth to good health; but not to long life: for the *spare Diet* begets few *Spirits*, and dull, and so wasteth the body less; and the *liberal Diet* yieldeth more ample nourishment, and so repaireth more: but the *middle Diet* doth neither of both; for where the Extreams are hurtful, there the Mean is best; but where the Extreams are helpful, there the Mean is nothing worth.

Now to that *spare Diet* there are requisite *Watching*, lest the Spirits being few, should be oppressed with much sleep; *little Exercise*, lest they should exhale; *abstinence* from *Venery*, lest they should be exhausted: but to the *liberal Diet*, on the other side, are requisite much *Sleep*, frequent *Exercises*, and a seasonable use of *Venery*. *Baths* and *Anointings* (such as were anciently in use) did rather tend to deliciousness, than to prolonging of life. But of all these things we shall speak more exactly when we come to the *Inquisition*, according to *Intentions*. Mean while that of *Celsus*, who was not only a Learned Physitian, but a wise man, is not to be omitted, who adviseth interchanging and alternation of the Diet, but still with an inclination to the more Benign: as that a man should sometimes accustom himself to watching,

watching, sometimes to sleep, but to sleep oftenest. Again, that he should sometimes give himself to fasting, sometimes to feasting, but to feasting oftenest: that he should sometimes inure himself to great labours of the mind, sometimes to relaxations of the same, but to relaxations oftenest. Certainly this is without all question, that *Diet* well ordered bears the greatest part in the prolongation of life: neither did I ever meet an extream long-liv'd man, but being asked of his course, he observed something peculiar, some one thing, some another. I remember an *Old Man*, above an hundred years of age, who was produced, as Witness, touching an ancient Prescription. When he had finished his Testimony, the *Judge* familiarly asked him how he came to live so long: He answered, beside expectation, and not without the laughter of the hearers, *By eating before I was hungry, and drinking before I was dry.* But of these things we shall speak hereafter.

47. A *Life* led in *Religion*, and in *Holy Exercises*, seemeth to conduce to long life. There are in this kind of life these things, Leisure, Admiration, and Contemplation of Heavenly things, Joys not sensual, Noble hopes, wholesome fears, sweet sorrows. Lastly, continual Renovations by Observances, Penances, Expiations: all which are very powerful to the prolongation of life. Unto which if you add that austere Diet which hardneth the mass of the Body, and humbleth the Spirits, no marvel if an extraordinary length of life do follow: such was that of *Paul* the *Hermite*, *Simeon Stelita* the *Columnar Anchorite*, and of many other *Hermites* and *Anchorites*.

48. Next unto this is the life led in good Letters, such as was that of Philosophers, Rhetoricians, Grammarians. This life is also led in leisure, and in those thoughts, which, seeing they are severed from the affairs of the world, bite not, but rather delight, through their variety and impertinency: They live also at their pleasure, spending their time in such things as like them best, and for the most part in the company of young men, which is ever the most chearful. But in Philosophies there is great difference betwixt the Sects, as touching long life: For those Philosophies which have in them a touch of Superstition, and are conversant in high Contemplations, are the best, as the *Pythagorical* and *Platonick*: Also those which did institute a perambulation of the World, and considered the variety of natural things, and had reachless, and high, and magnanimous thoughts, (as of *Infinitum*, of the Stars, of the Heroical Vertues, and such like) were good for lengthning of life: such were those of *Democritus Philolaus*, *Xenophanes*, the Astrologians and Stoicks. Also those which had no profound Speculation in them, but discoursed calmly on both sides, out of common Sense, and the received Opinions, without any sharp Inquisitions, were likewise good: such were those of *Carneades*, and the *Academicks*: also of the Rhetoricians and Grammarians. But contrary, Philosophies conversant in perplexing Subtilties, and which pronounced peremptorily, and which examined and wrested all things to the Scale of Principles. Lastly, which were thorny and narrow, were evil: such were those commonly of the *Peripateticks*, and of the *School-men*.

49. The *Country-life* also is well fitted for long life: it is much abroad, and in the open air; it is not slothful, but ever in imployment; it feedeth upon fresh Cates, and unbought; it is without Cares and Envy.

50. For the *Military life*, we have a good Opinion of that whilst a man is young. Certainly many excellent *Warriours* have been long liv'd; *Corvinus*, *Camillus*, *Xenophon*, *Agesilaus*, with others, both Ancient and Modern. No doubt it furthereth long life, to have all things from our Youth to our Elder Age mend, and grow to the better, that a Youth full of crosses may minister sweetness to our Old Age. We conceive also, that *Military affections*, inflamed with a desire of Fighting, and hope of Victory, do infuse such a heat into the *Spirits*, as may be profitable for long life.

Medicines

Medicines for Long Life.

THE Art of Physick, *which we now have, looks no further commonly than to* Conservation *of* Health, *and* Cure *of* Diseases: *As for those things which tend properly to* Long Life, *there is but slight mention, and by the way only. Notwithstanding, we will propound those* Medicines *which are notable in this kind, I mean, those which are* Cordials. *For it is consonant to reason, that those things which being taken in* Cures *do defend and fortifie the* Heart, *or, more truly, the* Spirits, *against Poysons and Diseases, being transferred with Judgment and Choice into* Diet, *should have a good effect, in some sort, towards the* Prolonging *of* Life. *This we will do, not heaping them promiscuously together, (as the manner is) but selecting the best.* *To the tenth Article.*

Gold is given in three forms; either in that which they call *Aurum potabile*, or in *Wine* wherein *Gold* hath been *quenched*, or in *Gold* in the *Substance*, such as are *Leaf-gold*, and the *Filings of Gold*. As for *Aurum potabile*, it is used to be given in desperate or dangerous diseases, and that not without good success. But we suppose that the Spirits of the *Salt*, by which the *Gold* is dissolved, do rather minister that vertue which is found in it, than the *Gold* it self, though this secret be wholly suppressed. Now if the body of *Gold* could be opened with these *Corrosive waters*, or by these *Corrosive waters* (so the venomous quality were wanting) well washed, we conceive it would be no unprofitable Medicine. 1.

Pearls are taken either in a fine Powder, or in a certain Mass, or Dissolution, by the juice of sour and new Lemons; and they are given sometimes in Aromatical Confections, sometimes in Liquor. The *Pearl*, no doubt, hath some affinity with the Shell in which it groweth, and may be of the same quality with the Shells of *Crs-fishes*. 2.

Amongst the *transparent precious Stones*, two only are accounted *Cordial*, the *Emerauld*, and the *Jacinth*, which are given under the same forms that the *Pearls* are; save only that the dissolutions of them, as far as we know, are not in use. But we suspect these *Glassie Jewels*, lest they should be cutting. 3.

Of these which we have mentioned, how far, and in what manner they are helpful, shall be spoken hereafter.

Bezoar-stone is of approved vertue for refreshing the Spirits, and procuring a gentle Sweat. As for the *Unicorn's Horn*, it hath lost the credit with us; yet so, as it may keep rank with *Hart's Horn*, and the Bone in the heart of a *Hart*, and *Ivory*, and such like. 4.

Amber-greece is one of the best to appease and comfort the Spirits.

Hereafter follow the names only of the *Simple Cordials*, seeing their Vertues are sufficiently known. 5.

Hot.	Hot.	Cold.	Cold.
Saffron.	*Clove-Gilly-flowers*	*Nitre.*	*Juice of sweet Orenges.*
Folium Indum.	*Orenge flowers.*	*Roses. Violets.*	*Juice of Pearmains.*
Lignum Aloes.	*Rosemary.*	*Strawberry-leaves.*	*Borage.*
Citron Pill or Rind.	*Mint.*	*Strawberries.*	*Bugloss.*
Balm.	*Betony.*	*Juice of sweet Limons.*	*Burnet. Sanders.*
Basil.	*Carduus Benedictus.*		*Camphire.*

Seeing our speech now is of those things which may be transferred into Diet, *all* Hot Waters, *and* Chymical Oyls, *(which, as a certain* Trifler *saith, are under the* Planet Mars, *and have a furious and destructive force) as also all hot and biting* Spices *are to be rejected, and a consideration to be had, how Waters and Liquors may be made of the former Simples: not those phlegmatick distilled Waters, nor again those burning Waters of Spirits of Wine, but such as may be more temperate, and yet lively, and sending forth a benign Vapour.*

I make some question touching the frequent letting of *Blood*, whether it conduceth to long life or not; and I am rather in the opinion that it doth, if it be turned into a habit, and other things be well disposed; for it letteth out the old juice of the body, and bringeth in new. 6.

I suppose also, that some *Emaciating Diseases* well cured, do profit to long life, for they yield new Juice, the old being consumed; and as (he saith) *To recover a sickness, is to renew Youth:* Therefore it were good to make some *Artificial Diseases*, which is done by strict and *Emaciating Diets*, of which I shall speak hereafter.

The Intentions.

To the 12, 13, and 14 Article.

HAving *finished the* Inquisition *according to the* Subjects, *as namely, of* Inanimate Bodies, Vegetables, Living Creatures, Man; *I will now come nearer to the matter, and order mine* Inquisitions *by certain* Intentions, *such as are true and proper, (as I am wholly perswaded) and which are the very paths to* Mortal Life. *For in this part, nothing that is of worth hath hitherto been inquired, but the Contemplations of men have been but simple, and* non-proficients. *For when I hear men on the one side speak of* comforting Natural heat, *and the* Radical Moisture, *and of* Meats *which breed good* Blood, *such as may neither be burnt nor phlegmatick, and of the chearing and recreating the Spirits, I suppose them to be no bad men which speak these things; but none of these worketh effectually towards the end. But when on the other side I hear several discourses touching* Medicines *made of* Gold, *because* Gold *is not subject to corruption; and touching* Precious Stones, *to refresh the spirits by their hidden properties and lustre, and that if they could be taken and retained in Vessels, the* Balsoms *and* Quintessences *of* living Creatures *would make men conceive a proud hope of Immortality. And that the Flesh of* Serpents *and* Harts, *by a certain consent, are powerful to the Renovation of Life, because the one casteth his Skin, the other his Horns: (they should also have added the Flesh of* Eagles, *because the* Eagle *changes his Bill) And that a certain* Man, *when he had found an Ointment hidden under the ground, and had anointed himself therewith from head to foot, (excepting only the soles of his feet) did, by his anointing, live three hundred years without any disease, save only some Tumours in the sides of his feet: And of* Artesius, *who when he found his Spirit ready to depart, drew into his body the Spirit of a certain young man, and thereby made him breathless, but himself lived many years by another mans Spirit: And of* Fortunate Hours, *according to the* Figures *of* Heaven, *in which* Medicines *are to be gathered and compounded for the prolongation of Life: and of the* Seals *of* Planets, *by which vertues may be drawn and fetched down from* Heaven *to prolong Life; and such like fabulous and superstitious vanities: I wonder exceedingly that men should so much dote, as to suffer themselves to be deluded with these things. And again, I do pity Mankind that they should have the hard fortune to be besieged with such frivolous and sensless apprehensions. But mine* Intentions *do both come home to the matter, and are far from vain and credulous imaginations; being also such, as I conceive, Posterity may add much to the matters which satisfie these* Intentions; *but to the* Intentions *themselves, but a little. Notwithstanding there are a few things, and those of very great moment, of which I would have men to be forewarned.*

First, We are of that Opinion, that we esteem the Offices *of* Life *to be more worthy than* Life *it self: Therefore if there be any thing of that kind that may indeed exactly answer our* Intentions, *yet so, that the* Offices *and* Duties *of* Life *be thereby hindred, whatsoever it be of this kind, we reject it. Perhaps we may make some light mention of some things, but we insist not upon them. For we make no serious nor diligent discourse, either of leading the life in Caves, where the Sun beams, and several changes of the Air pierce not, like* Epimenides *his Cave; or of perpetual Baths, made of Liquors prepared; or of Shirts and Sear-cloths so applied, that the Body should be always, as it were, in a Box; or of thick paintings of the Body, after the manner of some* Barbarous Nations; *or of an exact ordering of our Life and Diet, which aimeth only at this, and mindeth nothing else but that a man live, (as was that of* Herodicus *amongst the Ancients, and of* Cornarus *the* Venetian *in our days, but with greater moderation;) or of any such Prodigy, Tediousness, or Inconvenience: but we propound such Remedies and Precepts, by which the* Offices *of Life may neither be deserted, nor receive any great interruptions or molestations.*

Secondly,

Secondly, On the other ſide, we denounce unto men, that they will give over trifling, and not imagine that ſo great a work, as the ſtopping and turning back the powerful courſe of Nature, can be brought to paſs by ſome Morning draught, or the taking of ſome precious Drug, but that they would be aſſured that it muſt needs be, that this is a work of labour, and conſiſteth of many Remedies, and a fit connexion of them amongſt themſelves; for no man can be ſo ſtupid as to imagine, that what was never yet done, can be done, but by ſuch ways as were never yet attempted.

Thirdly, We ingeniouſly profeſs, that ſome of thoſe things which we ſhall propound, have not been tryed by us by way of Experiment, (for our courſe of life doth not permit that) but are derived (as we ſuppoſe) upon good Reaſons, out of our Principles and Grounds, (of which ſome we ſet down, others we reſerve in our mind) and are, as it were, cut and digged out of the Rock *and* Mine *of* Nature *her ſelf. Nevertheleſs we have been careful, and that with all providence and circumſpection, (ſeeing the* Scripture *ſaith of the* Body *of* Man, *that* it is more worth than Rayment) *to propound ſuch Remedies, as may at leaſt be ſafe, if peradventure they be not fruitful.*

Fourthly, We would have men rightly to obſerve and diſtinguiſh, that thoſe things which are good for an Healthful Life, *are not always good for a* Long Life; *for there are ſome things which do further the alacrity of the* Spirits, *and the ſtrength and vigour of the Functions, which notwithſtanding, do cut off from the ſum of Life: and there are other things which are profitable to prolongation of Life, which are not without ſome peril of health, unleſs this matter be ſalved by fit Remedies; of which, notwithſtanding, as occaſion ſhall be offered, we will not omit to give ſome Cautions and Monitions.*

Laſtly, We have thought good to propound ſundry Remedies *according to the ſeveral* Intentions; *but the choice of thoſe* Remedies, *and the order of them, to leave to diſcretion: for to ſet down exactly which of them agreeth beſt, with which* Conſtitution *of Body, which with the ſeveral courſes of Life, which with each mans particular Age, and how they are to be taken one after another, and how the whole Practique of theſe things is to be adminiſtred and governed, would be too long, neither is it fit to be publiſhed.*

In the Topicks *we propounded three* Intentions: *The* Prohibiting *of* Conſumption, *the* Perfecting *of* Reparation, *and the* Renewing *of* Oldneſs. *But ſeeing theſe things which ſhall be ſaid are nothing leſs than words, we will deduce theſe three* Intentions *to ten* Operations.

The firſt is, the Operation *upon the* Spirits, *that they may renew their vigour.* 1.
The ſecond Operation *is upon the* Excluſion *of* Air. 2.
The third Operation *is upon the* Bloud, *and the* Sanguifying Heat. 3.
The fourth Operation *is upon the* Juices *of the* Body. 4.
The fifth Operation *is upon the* Bowels, *for their* Extruſion *of* Aliment. 5.
The ſixth Operation *is upon the* Outward Parts, *for their* Attraction *of* Aliment. 6.
The ſeventh Operation *is upon the* Aliment *it ſelf, for the* Inſinuation thereof. 7.
The eighth Operation *is upon the laſt* Act *of* Aſſimilation. 8.
The ninth Operation *is upon the* Inteneration *of the* Parts, *after they begin to be dried.* 9.
The tenth Operation *is upon the* Purging *away of* Old Juice, *and* ſupplying *of* New Juice. 10.

Of theſe Operations, *the four firſt belong to the firſt* Intention, *the four next to the ſecond* Intention, *and the two laſt to the third* Intention.

But becauſe this part touching the Intentions *doth tend to* Practice, *under the name of* Hiſtory, *we will not only compriſe* Experiments *and* Obſervations, *but alſo* Counſels, Remedies, Explications *of* Cauſes, Aſſumptions, *and whatſoever hath reference hereunto.*

The Operation upon the Spirits, that they may remain Youthful, and renew their Vigour.

The History.

1. THE *Spirits* are the Master-workmen of all effects in the *Body:* This is manifest by consent, and by infinite instances.

2. If any man could procure that a young mans *Spirit* could be conveyed into an old mans *Body*, it is not unlikely but this great Wheel of the *Spirits* might turn about the lesser Wheel of the *Parts*, and so the Course of Nature become Retrogade.

3. In every Consumption, whether it be by Fire, or by Age, the more the *Spirit* of the Body, or the heat, preyeth upon the moisture, the lesser is the duration of that thing. This occurs every where, and is manifest.

4. The *Spirits* are to be put into such a temperament and degree of activity, that they should not (as he saith) *drink* and *guzzle* the juices of the Body, but *sip them only*.

5. There are two kinds of *Flames*, the one eager and weak, which consumes slight substances, but hath little power over the harder; as the flame of straw, or small sticks: the other strong and constant, which converts hard and obstinate substances; as the flame of hard wood, and such like.

6. The eager flames, and yet less robust, do dry bodies, and render them exhaust and sapless; but the stronger flames do intenerate, and melt them.

7. Also in *Dissipating Medicines*, some vapour forth the thin part of the tumors, or swellings, and these harden the tumor; others potently discuss, and these soften it.

8. Also in *Purging* and *Absterging Medicines*, some carry away the fluid humours violently, others draw the more obstinate and viscous.

9. The *Spirits* ought to be invested, and armed with such a heat, that they may chuse rather to stir and undermine hard and obstinate matters, than to discharge and carry away the thin and prepared: for by that means the Body becomes green and solid.

10. *The* Spirits *are so to be wrought and tempered, that they may be in* substance Dense, *not* Rare, *in* heat strong, *not* eager; *in* quantity sufficient *for the Offices of Life, not* Redundant *or* Turgid; *in* motion appeased, *not* dancing *or* unequal.

11. That *Vapours* work powerfully upon the *Spirits*, it is manifest by Sleep, by Drunkenness, by Melancholick Passions, by Letificant Medicines, by Odours, calling the Spirits back again in Swounings and Faintings.

12. The *Spirits* are condensed four ways; either by *putting them to flight*, or by *refrigerating* and *cooling* them, or by *stroaking* them, or by *quieting* them. And first of their *Condensation*, by *putting them to flight*.

13. Whatsoever putteth to flight on all parts, driveth the Body into his Centre, and so *Condenseth*.

14. To the *Condensation* of the *Spirits* by flight, the most powerful and effectual is *Opium*, and next *Opiates*, and generally all *Soporiferous things*.

15. The force of *Opium* to the *Condensation* of the *Spirits* is exceeding strong, when as perhaps three grains thereof will in a short time so coagulate the *Spirits*, that they return no more, but are extinguished, and become immoveable.

16. *Opium*, and the like, put not the *Spirits* to flight by their coldness, for they have parts manifestly hot; but, on the contrary, cool by their putting the *Spirits* to flight.

17. The *Flight* of the *Spirits* by *Opium*, and *Opiate Medicines*, is best seen by applying the same outwardly; for the *Spirits* straight withdraw themselves, and will return no more, but the part is mortified, and turns to a *Gangrene*.

18. *Opiates* in grievous pains, as in the Stone, or the cutting off of a Limb, mitigate pains most of all, by putting the *Spirits* to flight.

19. *Opiates* obtain a good effect from a bad cause; for the *Flight* of the *Spirits* is evil, but the *Condensation* of them through their flight is good.

The

The *Grecians* attributed much, both for health, and for prolongation of life, as *Opiates*, but the *Arabians* much more, insomuch that their *grand Medicines* (which they called the *gods Hands*) had *Opium* for their Basis and principal Ingredient, other things being mixed to abate and correct the noxious qualities thereof; such were *Treacle*, *Methridate*, and the rest. 20.

Whatsoever is given with good success in the curing of *Pestilential* and *Malignant Diseases*, to stop and bridle the *Spirits*, lest they grow turbulent and tumultuous, may very happily be transferred to the prolongation of life; for one thing is effectual unto both, namely, the *Condensation* of the *Spirits*: now there is nothing better for that than *Opiates*. 21.

The *Turks* find *Opium*, even in a reasonable good quantity, harmless and comfortable, insomuch that they take it before their Battles, to excite courage: but to us, unless it be in a very small quantity, and with good Correctives, it is mortal. 22.

Opium and *Opiates* are manifestly found to excite *Venus*; which shews them to have force to corroborate the Spirits. 23.

Distilled Water out of *wild Poppy* is given with good success in Surfeits, Agues, and divers diseases; which, no doubt, is a temperate kind of *Opiate*. Neither let any man wonder at the various use of it; for that is familiar to *Opiates*, in regard that the Spirits, corroborated and condensed, will rise up against any disease. 24.

The *Turks* use a kind of Herb which they call *Caphe*, which they dry and powder, and then drink in warm water; which, they say, doth not a little sharpen them, both in their Courage, and in their Wits; notwithstanding, if it be taken in a large quantity, it affects and disturbs the mind: whereby it is manifest, that it is of the same nature with *Opiates*. 25.

There is a Root much Renowned in all the *Eastern parts*, which they call *Betel*, which the *Indians*, and others, use to carry in their mouths, and to champ it, and by that champing they are wonderfully enabled both to endure labours, and to overcome sicknesses, and to the Act of Carnal Copulation: It seems to be a kind of *Stupefactive*, because it exceedingly blacks the Teeth. 26.

Tobacco in our age is immoderately grown into use, and it affects men with a secret kind of delight, insomuch that they who have once inured themselves unto it, can hardly afterwards leave it: and, no doubt, it hath power to lighten the body, and to shake off weariness, Now the vertue of it is commonly thought to be, because it opens the passages, and voids humours: but it may more rightly be referred to the *Condensation* of the Spirits; for it is a kind of *Henbane*, and manifestly troubles the Head, as *Opiates* do. 27.

There are sometimes *Humours* ingendred in the body, which are, as it were, *Opiate* themselves; as it is in some kind of *Melancholies*, with which if a man be affected, it is a sign of very long life, 28.

The *simple Opiates* (which are also called *Stupefactives*) are these, *Opium* it self, which is the juice of *Poppy*; both the *Poppies*, as well in the Herb as in the Seed; *Henbane*, *Mandrake*, *Hemlock*, *Tobacco*, *Night-shade*. 29.

The compound *Opiates* are, *Treacle*, *Methridate*, *Trifera*, *Ladanum*, *Paracelsi*, *Diacodium*, *Diascordium*, *Philonium*, *Pills* of *Hounds-tongue*. 30.

From this which hath been said, certain Designations or Counsels may be deduced for the prolongation of life, according to the present intension; namely, of *condensing* the *Spirits* by *Opiates*. 31.

Let there be therefore every year, from Adult years of Youth, an *Opiate* diet; let it be taken about the end of *May*, because the Spirits in the Summer are more loose and attenuated, and there are less dangers from cold humours; let it be some *Magistral Opiate*, weaker than those that are commonly in use, both in respect of a smaller quantity of *Opium*, and of a more sparing mixture of extream hot things; let it be taken in the morning betwixt sleeps. The fare for that time would be more simple and sparing than ordinary, without Wine, or Spices, or vaporous things. This Medicine to be taken only each other day, and to be continued for a fortnight. This Designation in our judgment comes home to the Intension. 32.

Opiates also may be taken, not only by the mouth, but also by *Fumes*; but the *Fumes* must be such as may not move the expulsive Faculty too strongly, nor force down humours, but only taken in a Weft, may work upon the Spirits within the brain. And therefore a *Suffumigation* of *Tobacco*, *Lignum-Aloes*, *Rosemary-leaves* dried, 33.

dried, and a little *Myrrhe* smuſſed up in the morning at the Mouth and Noſtrils, would be very good.

34. In *Grand Opiates*, ſuch as are *Treacle*, *Metbridate*, and the reſt: it would not be amiſs (eſpecially in Youth) to take rather the diſtilled Waters of them, than themſelves in their bodies; for the vapour in diſtilling doth riſe, but the heat of the Medicine commonly ſetleth. Now *diſtilled Waters* are good in thoſe vertues which are conveyed by Vapours, in other things but weak.

35. There are Medicines which have a certain weak and hidden degree, and therefore ſafe to an *Opiate* Vertue: Theſe ſend forth a ſlow and copious Vapour, but not malignant, as *Opiates* do; therefore they put not the Spirits to flight notwithſtanding they congregate them, and ſomewhat thicken them.

36. Medicines, in order to *Opiates*, are principally *Saffron*, next *Folium Indum*, *Amber-greeſe*, *Coriander-ſeed prepared*, *Amomum*, *Pſeuda-momum*, *Lignum-Rhodium*, *Orenge flower water*, and much more the *Infuſion* of the ſame *Flowers* new gathered in the *Oyl* of *Almonds*; *Nutmegs* pricked full of holes, and macerated in Roſe-water.

37. As *Opiates* are to be taken very ſparingly, and at certain times, as was ſaid, ſo theſe ſecondaries may be taken familiarly, and in our daily diet, and they will be very effectual to prolongation of life. Certainly an *Apothecary* of *Calecute*, by the uſe of *Amber*, is ſaid to have lived an hundred and ſixty years; and the *Noble-men* of *Barbary*, through the uſe thereof, are certifi'd to be very long-liv'd, whereas the mean people are but of ſhort life. And our *Anceſtors*, who were longer-liv'd than we, did uſe *Saffron* much in their Cakes, Broths, and the like. And touching the firſt way of condenſing the Spirits of *Opiates*, and the *Subordinates* thereto, thus much.

38. Now we will enquire of the ſecond way of condenſing the *Spirits* by *Cold*: For the proper work of *Cold* is *Condenſation*, and it is done without any malignity, or adverſe quality; and therefore it is a ſafer operation than by *Opiates*, though ſomewhat leſs powerful, if it be done by turns only, as *Opiates* are. But then again, becauſe it may be uſed familiarly, and in our daily Diet with moderation, it is much more powerful for the prolongation of life, than by *Opiates*.

39 The *Refrigeration* of the Spirits is effected three ways, either by *Reſpiration*, or by *Vapours*, or by *Aliment*. The firſt is the beſt, but, in a ſort, out of our power: the ſecond is potent, but yet ready, and at hand: the third is weak, and ſomewhat about.

40. *Air clear* and *pure*, and which hath no fogginess in it before it be received into the Lungs, and which is leaſt expoſed to the Sun-beams, condenſeth the Spirits beſt. Such is found either on the tops of dry Mountains, or in Champagnes open to the wind, and yet not without ſome ſhade.

41. As for the *Refrigeration* and *Condenſation* of the *Spirits* by *Vapours*, the Root of this Operation we place in *Nitre*, as a Creature purpoſely made and choſen for this end, being thereunto led, and perſwaded by theſe Arguments.

42. *Nitre* is a kind of cool Spice: this is apparent to the Senſe it ſelf, for it bites the Tongue and Palate with *cold*, as Spices do with *heat*, and it is the only thing, as far as we know, that hath this property.

43. Almoſt all *cold things* (which are cold properly, and not by accident, as *Opium* is) are poor and jejune of ſpirit: Contrarily, things full of *Spirit* are almoſt all hot, only *Nitre* is found amongſt Vegetables, which aboundeth with *Spirit*, and yet is cold. As for *Campbire*, which is full of ſpirit, and yet performeth the actions of cold, it coolleth by accident only; as namely, for that by the thinneſs thereof, without Acrimony, it helpeth perſpiration in inflamations.

44. In *congealing* and *freezing* of *Liquors*, (which is lately grown into uſe) by laying Snow and Ice on the out ſide of the Veſſel, *Nitre* is alſo added, and no doubt it exciteth and fortifieth the *Congelation*. It is true, that they uſe alſo for this work ordinary Bay-ſalt, which doth rather give activity to the coldneſs of the Snow, than cool by it ſelf: But, as I have heard, in the hotter Regions, where Snow falls not, the congealing is wrought by *Nitre* alone; but this I cannot certainly affirm.

45. It is affirmed that *Gun-powder*, which conſiſteth principally of *Nitre*, being taken in drink, doth conduce to valour; and that it is uſed oftentimes by Mariners and Souldiers before they begin their Battles, as the *Turks* do *Opium*.

Nitre is given with good success in burning Agues, and Pestilential Fevers, to mitigate and bridle their pernicious heats. 46.

It is manifest, that *Nitre* in *Gun-powder* doth mightily abhor the Flame, from whence is caused that horrible Crack, and puffing. 47.

Nitre is found to be, as it were, the *Spirit* of the Earth: for this is most certain, that any Earth, though pure and unmixt with Nitrous matter, if it be so laid up and covered, that it be free from the Sun beams, and putteth forth no Vegetable, will gather *Nitre*, even in good abundance. By which it is clear, that the Spirit of *Nitre* is not only inferiour to the Spirit of living Creatures, but also to the Spirit of Vegetables. 48.

Cattle which drink of *Nitrous* water, do manifestly grow fat; which is a sign of the cold in *Nitre*. 49.

The manuring of the Soil is chiefly by *Nitrous substances*; for all Dung is *Nitrous*, and this is a sign of the Spirit in *Nitre*. 50.

From hence it appears, that the Spirits of Man may be cooled and condensed by the Spirit of *Nitre*, and be made more crude, and less eager. And therefore, as strong Wines, and Spices, and the like, do burn the Spirits, and shorten life; so on the contrary side, *Nitre* doth compose and repress them, and furthereth to life. 51.

Nitre may be used with meat, mixed with our Salt, to the tenth part of the Salt; in Broths taken in the morning, for three grains to ten, also in Beer: but howsoever it be used, with moderation, it is of prime force to long life. 52.

As *Opium* holds the preheminence in *condensing* the Spirits, by putting them to *flight*, and hath withal his *Subordinates* less Potent, but more safe, which may be taken both in greater quantity, and in more frequent use, of which we have formerly spoken: So also *Nitre*, which condenseth the Spirits by cold, and by a kind of Frescour (as we now-a days speak) hath also his *Subordinates*. 53.

Subordinates to *Nitre* are, all those things which yield an Odour somewhat Earthy, like the smell of Earth, pure and good, newly digged or turned up; of this sort the chief are, *Borage*, *Bugloss*, *Langue de Bœuf*, *Burnet*, *Strawberry-leaves*, and *Strawberries*, *Framboit*, or *Raspis*, raw *Cucumbers*, raw *Pearmains*, *Vine-leaves*, and *Buds*: also *Violets*. 54.

The next in order, are those which have a certain freshness of smell, but somewhat more inclined to heat, yet not altogether void of that vertue of refreshing by coolness; such as are *Balm*, *green Citrons*, *green Orenges*, *Rose-water distilled*, *roasted Wardens*; also the *Damask*, *Red*, and *Musk Roses*. 55.

This is to be noted, that *Subordinates* to *Nitre* do commonly confer more to this *Intension Raw*, than having passed the Fire, because that the Spirit of Cooling is dissipated by the Fire, therefore they are best taken, either infused in some liquor, or raw. 56.

As the condensation of the Spirits by *Subordinates* to *Opium* is, in some sort, performed by *Odours*, so also that which is by *Subordinates* to *Nitre*: therefore the smell of new and pure *Earth*, taken either by following the Plough, or by Digging, or by Weeding, excellently refresheth the Spirits. Also the Leaves of Trees in Woods, or Hedges, falling towards the middle of Autumn, yield a good refreshing to the Spirits, but none so good as *Strawberry-leaves* dying. Likewise the smell of *Violets*, or *Wall flowers*, or *Bean-flowers*, or *Sweet-briar*, or *Honey-suckles*, taken as they grow, in passing by them only, is of the same nature. 57.

Nay, and we know a certain great Lord who lived long, that had every morning immediately after sleep, a *Clod* of fresh *Earth* laid in a fair Napkin under his Nose, that he might take the smell thereof. 58.

There is no doubt but the cooling and tempering of the blood by cool things, such as are *Endive*, *Succory*, *Lever-wort*, *Purslain*, and the like, do also by consequent cool the Spirits: But this is about, whereas vapours cool immediately. 59.

And as touching the condensing of the Spirits by *Cold*, thus much. The third way of condensing the Spirits, we said to be by that which we call *stroaking* the *Spirits*: The fourth, by *quieting* the *alacrity* and *unrulinesse* of them. 60.

Such things *stroak* the *Spirits* as are pleasing and friendly to them, yet they allure them not to go abroad; but rather prevail, that the Spirits contented, as it were, in 61.

in their own ſociety, do enjoy themſelves, and betake themſelves into their proper Centre.

61. For theſe, if you recollect thoſe things which were formerly ſet down, as Subordinates to *Opium* and *Nitre*, there will need no other *Inquiſition*.

62. As for the quieting of the *unruline ſs* of the Spirits, we ſhall preſently ſpeak of that, when we enquire touching their *motion*. Now then, ſeeing we have ſpoken of that *Condenſation* of the *Spirits* which pertaineth to their ſubſtance, we will come to the temper of *Heat* in them.

63. The *heat* of the *Spirits*, as we ſaid, ought to be of that kind, that it may be *robuſt*, not *eager*, and may delight rather to Maſter the tough and obſtinate, than to carry away the thin and light humours.

64. We muſt beware of *Spices*, *Wine*, and ſtrong *Drinks*, that our uſe of them be very temperate, and ſometimes diſcontinued: Alſo of *Savory*, *wild Marjoram*, *Peny-royal*, and all ſuch as bite and heat the tongue; for they yield unto the *Spirits* an *heat* not *operative*, but *predatory*.

65. Theſe yield a *robuſt heat*, eſpecially *Elecampane*, *Garlick*, *Carduus Benedictus*, *Water-creſſes*, while they are young, *Germander*, *Angelica*, *Zedoary*, *Vervin*, *Valerian*, *Myrrhe*, *Pepper wort*, *Elder-flowers*, *Garden-Cherville*: The uſe of theſe things with choice and judgement, ſometimes in Sallads, ſometimes in Medicines, will ſatisfie this *Operation*.

66. It falls out well, that the *Grand Opiates* will alſo ſerve excellently for this *Operation*, in reſpect that they yield ſuch an *heat* by Compoſition, which is wiſhed, but not to be found in Simples. For the mixing of thoſe exceſſive hot things (ſuch as are *Euphorbium*, *Pellitory* of *Spain*, *Staviſacre*, *Dragon-wort*, *Anacardi*, *Caſtoreum*, *Ariſtolochium*, *Opopanax*, *Ammoniacum*, *Galbanum*, and the like, which of themſelves cannot be taken inwardly) to qualifie and abate the *ſtupefactive* virtue of the *Opium*, they do make ſuch a Conſtitution of a Medicament as we now require; which is excellently ſeen in this, that *Treacle* and *Mithridate*, and the reſt, are not ſharp, nor bite the tongue, but are only ſomewhat bitter, and of ſtrong ſcent, and at laſt manifeſt their heat when they come into the ſtomach, and in their ſubſequent operations.

67. There conduces alſo to the *robuſt heat* of the Spirits *Venus* often excited, rarely performed; and no leſs ſome of the Affections, of which ſhall be ſpoken hereafter. So touching the heat of the Spirits, Analogical to the prolongation of life, thus much.

68. Touching the *Quantity* of the Spirits, that they be not *exuberant* and *boiling*, but rather *ſparing*, and within a mean, (ſeeing a ſmall flame doth not devour ſo much as a great flame) the *Inquiſition* will be ſhort.

69. It ſeems to be approved by Experience, that a *ſpare Diet*, and almoſt a *Pythagorical*, ſuch as is either preſcribed by the ſtrict Rules of a *Monaſtical life*, or practiſed by *Hermites*, which have Neceſſity and Poverty for their Rule, rendreth a man long-liv'd.

70. Hitherto appertain *drinking of Water*, a *hard Bed*, *abſtinence from Fire*, a *ſlender Diet*, (as namely, of *Herbs*, *Fruits*, *Fleſh*, and *Fiſh*, rather *powdred* and *ſalted*, than *freſh* and *hot*) an *Hair-ſhirt*, *frequent Faſtings*, *frequent Watchings*, *few Senſual pleaſures*, and ſuch like; for all theſe diminiſh the Spirits, and reduce them to ſuch a quantity, as may be ſufficient only for the Functions of Life, whereby the depredation is the leſs.

71. But if the *Diet* ſhall not be altogether ſo *rigorous* and *mortifying*, yet notwithſtanding ſhall be always equal and conſtant to it ſelf, it worketh the ſame effect. We ſee it in *Flames*, that a *Flame* ſomewhat bigger (ſo it be always alike and quiet) conſumeth leſs of the fuel, than a leſſer Flame blown with Bellows, and by Guſts ſtronger or weaker: That which the *Regiment* and *Diet* of *Cornarus* the *Venetian* ſhewed plainly, who did eat and drink ſo many years together by a juſt weight, whereby he exceeded an hundred years of age, ſtrong in limbs, and entire in his ſenſes.

72. Care alſo muſt be taken, that a body, plentifully nouriſhed, and not emaciated by any of theſe aforeſaid Diets, omitteth not a ſeaſonable uſe of *Venus*, leſt the Spirits increaſe too faſt, and ſoften and deſtroy the body. So then, touching a moderate *quantity* of Spirits, and (as we may ſay) Frugal, thus much.

73. The *Inquiſition*, touching *bridling* the *motions* of the *Spirits*, followeth next.

Motion

Motion doth manifestly attenuate and inflame them. This bridling is done by three means: by *Sleep*, by *avoiding* of *vehement Labours*, *immoderate exercise*, and in a word, all *Lassitude*; and by refraining *irksome Affections*. And first, touching *Sleep*.

The Fable tells us, that *Epimenides slept* many years together in a Cave, and all that time needed no meat, because the *Spirit* wast not much in *sleep*. 74.

Experience teacheth us that certain Creatures, as *Dormice* and *Bats* *sleep* in some close places an whole Winter together; such is the force of *sleep* to restrain all vital Consumption. That which *Bees* and *Drones* are also thought to do, though sometimes destitute of *Honey*, and likewise *Butter-flies*, and other *Flies*. 75.

Sleep after *Dinner* (the stomach sending up no unpleasing Vapours to the head, as being the first Dews of our Meat) is good for the *spirits*, but derogatory and hurtful to all other points of health. Notwithstanding in extream old age there is the same reason of Meat and *Sleep*, for both our meals and our *sleeps* should be then frequent, but short and little; nay, and towards the last period of old age, a mere *Rest*, and, as it were, a perpetual *Reposing* doth best, especially in Winter-time. 76.

But as moderate *sleep* conferreth to long life, so much more if it be *quiet* and not *disturbed*. 77.

These procure *quiet sleep*, *Violets*, *Lettuce*, especially boiled, *Sirrup* of *dried Roses*, *Saffron*, *Balm*, *Apples*, at our going to bed; a *sop* of *Bread* in *Malmsey*, especially where *Musk-Roses* have been first *infused*: therefore it would not be amiss to make some *Pill* or a small Draught of these things, and to use it familiarly. Also those things which shut the mouth of the stomach close, as *Coriander-seed* prepared, *Quinces* and *Wardens* roasted, do induce sound sleep; but above all things in youth, and for those that have sufficient strong stomachs, it will be best to take a good draught of *clear cold Water* when they go to bed. 78.

Touching voluntary and procured Trances, *as also* fixed *and* profound Thoughts, *so as they be without irksomness, I have nothing certain: no doubt they make to this* Intension, *and* condense *the* Spirits, *and that more potently than* Sleep, *seeing they lay asleep, and suspend the senses as much or more. Touching them, let further inquiery be made. So far touching* Sleep.

As for *Motion* and *Exercise*, Lassitude hurteth, and so doth all Motion and Exercise which is too nimble and swift, as Running, Tennis, fencing, and the like: and again, when our strength is extended and strained to the uttermost, as Dancing, Wrestling, and such like: for it is certain, that the *spirits* being driven into streights, either by the swiftness of the motion, or by the straining of the forces, do afterward become more eager and predatory. On the other side, *Exercises* which stir up a good strong motion, but not over-swift, or to our utmost strength, (such as are Leaping, Shooting, Riding, Bowling, and the like) do not hurt, but rather benefit. 79.

We must come now to the *Affections* and *Passions* of the *Mind*, and see which of them are hurtful to long life, which profitable.

Great Joys attenuate and diffuse the *spirits*, and shorten life; *familiar Chearfulness* strengthens the *spirits*, by calling them forth, and yet not resolving them. 80.

Impressions of *Joy* in the sense are naught; ruminations of *Joy* in the memory, or apprehensions of them in hope or fancy, are good. 81.

Joy suppressed, or communicated sparingly, doth more comfort the *spirits* than *Joy* poured forth and published. 82.

Grief and *sadness*, if it be void of *Fear*, and afflict not too much, doth rather prolong life; for it contracteth the *spirits*, and is a kind of *condensation*. 83.

Great Fears shorten the life: for though *Grief* and *Fear* do both strengthen the *spirit*, yet in *Grief* there is a simple contraction; but in *Fear*, by reason of the cares taken for the remedy, and hopes intermixed, there is a turmoil and vexing of the *spirits* 84.

Anger suppressed is also a kind of vexation, and causeth the *spirit* to feed upon the juices of the body; but let loose and breaking forth, it helpeth: as those *Medicines* do, which induce a *robust heat*. 85.

Envy is the worst of all *Passions*, and feedeth upon the *spirits*, and they a gain upon the *body*, and so much the more because it is perpetual, and, as it is said, *keepeth no holidays*. 86.

Pity of another man's misfortune, which is not likely to befall our selves, is good: 87.

but *Pity*, which may reflect with some similitude upon the party pitying, is naught, because it exciteth *Fear*.

88. *Light Shame* hurteth not, seeing it contracteth the *Spirits* a little, and then straight diffuseth them: insomuch that *shamefac'd* persons commonly live long: but *shame* for some great ignominy, and which afflicteth the mind long, contracteth the *spirits* even to suffocation, and is pernicious.

89. *Love*, if it be not unfortunate, and too deeply wounding, is a kind of *Joy*, and is subject to the same Laws which we have set down touching *Joy*.

90. *Hope* is the most beneficial of all the *Affections*, and doth much to the prolongation of life, if it be not too often frustrated, but entertaineth the Fancy with an expectation of good: therefore they, which fix and propound to themselves some end, as the mark and scope of their life, and continually and by degrees go forward in the same, are, for the most part, long liv'd; in so much that when they are come to the top of their hope, and can go no higher therein, they commonly droop, and live not long after: So that *Hope* is a *Leaf-joy*, which may be beaten out to a great extension, like *Gold*.

91. *Admiration* and *light contemplation* are very powerful to the prolonging of life; for they hold the *spirits* in such things as delight them, and suffer them not to tumultuate, or to carry themselves unquietly and waywardly. And therefore all the *contemplators* of *Natural things*, which had so many, and eminent Objects to admire, (as *Democritus*, *Plato*, *Parmedides*, *Apollonius*) were long-liv'd: also *Rhetoricians*, which tasted but lightly of things, and studied rather Exornation of speech than profundity of matters, were also long lived; as *Gorgias*, *Protagoras*, *Isocrates*, *Seneca*. And certainly, as old men are for the most part talkative, so talkative men do often grow very old; for it shews a *light contemplation*, and such as do not much stain the *spirits*, or vex them: but subtil, and acute, and eager inquisition shortens life; for it tireth the *spirits*, and wasteth it.

And as touching the *motion* of the *Spirits*, by the *Affections* of the *Mind*, thus much. Now we will add certain other general *Observations* touching the *Spirits*, beside the former, which fall not into the precedent distribution.

92. Especial care must be taken that the *Spirits* be not too often *resolved*; for attenuation goeth before resolution, and the *spirit* once attenuated doth not very easily retire, or is *condensed*. Now *Resolution* is caused by over-great labours, over vehement affections of the mind, over great sweats, over great evacuation, hot Baths, and an untemperate and unseasonable use of *Venus*; also by over great cares and carpings, and anxious expectations; lastly, by malignant diseases, and intolerable pains and torments of the body: all which, as much as may be, (which our vulgar *Physitians* also advise) must be avoided.

93. The *spirits* are delighted both with *wonted* things, and with *new*. Now it maketh wonderfully to the conservation of the *spirits* in vigour, that we neither use *wonted* things to a satiety and glutting; nor *new* things, before a quick and strong appetite. And therefore both *customes* are to be broken off with judgment and care, before they breed a fulness; and the *appetite* after new things to be restrained for a time until it grow more sharp and jocond: and moreover, the *life*, as much as may be, so to be ordered, that it may have many *renovations*, and the *spirits*, by perpetual conversing in the same action:, may not wax dull. For though it were noill saying of *Seneca's The fool doth ever begin to live*; yet this folly, and many more such, are good for long life.

94. It is to be observed touching the *spirits*, (though the contrary used to be done) That when men perceive their *spirits* to be in good, placid, and healthful state, (that which will be seen by the tranquility of their Mind, and chearful disposition) that they cherish them, and not change them: but when, in a turbulent and untoward state, (which will also appear by their sadness, lumpishness, and other indisposition of their mind) that then they straight overwhelm them, and alter them. Now the *spirits* are contained in the same state, by a restraining of the affections, temperateness of diet, abstinence from *Venus*, moderation in labour, indifferent rest and repose: and the contrary to these do alter and overwhelm the *spirits*; as namely, vehement affections, profuse feastings, immoderate *Venus*, difficult labours, earnest studies, and prosecution of business. Yet men are wont, when they are merriest and best disposed, then to apply themselves to feastings;

Venus

Venus, Labours, Endeavours, Buſineſſes, whereas if they have a regard to long life, (which may ſeem ſtrange) they ſhould rather practiſe the contrary. For we ought to cheriſh and preſerve good *Spirits*, and for the evil diſpoſed *Spirits* to diſcharge and alter them.

95. *Ficinus* ſaith not unwiſely, That *old men*, for the comforting of their ſpirits, ought often to remember and ruminate upon the *Acts* of their *Childhood* and *Youth*. Certainly ſuch a remembrance is a kind of peculiar Recreation to every *old man*: and therefore it is a delight to men to enjoy the ſociety of them which have been brought up together with them, and to viſit the places of their education. *Veſpaſian* did attribute ſo much to this matter, that when he was *Emperour*, he would by no means be perſwaded to leave his Fathers houſe, though but mean, leſt he ſhould loſe the wonted object of his eyes, and the memory of his Childhood: And beſides, he would drink in a *wooden Cup* tipped with ſilver, which was his *Grandmothers*, upon *Feſtival days*.

96. One thing above all is grateful to the *Spirits*, that there be a *continual progreſs* to the more *benign*; therefore we ſhould lead ſuch a Youth and Manhood, that our Old Age ſhould find new ſolaces, whereof the chief is *moderate eaſe*: And therefore old men in Honourable Places lay violent hands upon themſelves, who retire not to their eaſe: whereof may be found an eminent example in *Caſſiodorus*, who was of that reputation amongſt the *Gothiſh Kings* of *Italy*, that he was as the Soul of their Affairs: Afterwards, being near eighty years of age, he betook himſelf to a Monaſtery, where he ended not his days before he was an hundred years old. But this thing doth require two Cautions: one, that they drive not off till their bodies be utterly worn out, and diſeaſed; for in ſuch bodies all mutation, though to the more *benign*, haſteneth death: the other, that they ſurrender not themſelves to a *ſluggiſh eaſe*, but that they imbrace ſomething which may entertain their thoughts and mind with Contentation; in which kind, the chief delights are Reading and Contemplation; and then the deſires of Building and Planting.

97. Laſtly, The ſame *Action*, *Endeavour* and *Labour* undertaken *chearfully*, and with a *good will*, doth refreſh the *Spirits*; but with an *averſation* and *unwillingneſs*, doth fret and deject them. And therefore it conferreth to long life, either that a man hath the art to inſtitute his life ſo as it may be free and ſuitable to his own humour, or elſe to lay ſuch a command upon his mind, that whatſoever is impoſed by Fortune, it may rather lead him, than drag him.

98. Neither is that to be omitted towards the government of the *Affections*, that eſpecial care be taken of the *mouth* of the *Stomach*, eſpecially that it be not too much relaxed; for that part hath a greater dominion over the affections, eſpecially the daily affections, than either the Heart or Brain; only thoſe things excepted which are wrought by potent vapours, as in Drunkenneſs and Melancholly.

99. Touching the *Operation* upon the *Spirits*, that they may *remain youthful*, and *renew* their *vigour*, thus much: which we have done more accurately, for that there is, for the moſt part, amongſt *Phyſitians*, and other Authors, touching theſe *Operations*, a deep ſilence; but eſpecially, becauſe the *Operation* upon the *Spirits*, and their *waxing green again*, is the moſt ready and compendious way to long life; and that for a twofold compendiouſneſs: one, becauſe the *Spirits* work compendiouſly upon the body: the other, becauſe *Vapours*, and the *Affections*, work compendiouſly upon the *Spirits*; ſo as theſe attain the end, as it were, in a right line, other things rather in lines circular.

The Operation upon the Excluſion of the Air. 2.

The Hiſtory.

1. THE *Excluſion* of the *Air Ambient*, tendeth to length of life two ways: Firſt, for that the *External Air*, next unto the *Native Spirits*, (howſoever the *Air* may be ſaid to animate the Spirit of Man, and conferreth not a little to health) doth moſt of all prey upon the Juices of the body,

and hasten the Deficcation thereof; and therefore the *Exclusion* of it is effectual to length of life.

2. Another effect which followeth the *Exclusion* of *Air*, is much more subtil and profound; namely, that the Body closed up, and not perspiring by the pores, detaineth the *Spirits* within, and turneth it upon the harder parts of the body, whereby the *Spirit* mollifies and intenerates them.

3. Of this thing, the reason is explained in the *Deficcation* of *Inanimate Bodies*; and it is an Axiom almost infallible, that the *Spirit* discharged and issuing forth, drieth Bodies; detained, melteth and intenerateth them. And it is further to be assumed, that all Heat doth properly attenuate and moisten, and contracteth and drieth only by accident.

4. Leading the life in *Dens* and *Caves*, where the *Air* receives not the Sun-beams, may be effectual to long life. For the *Air* of it self doth not much towards the depredation of the body, unless it be stirred up by heat. Certainly, if a man shall recal things past to his memory, it will appear that the statures of men have been anciently much greater than those that succeeded, as in *Sicily*, and some other places: but this kind of men led their lives, for the most part, in *Caves*. Now length of life, and largeness of limbs, have some affinity: The *Cave* also of *Epimenides* walks among the Fables. I suppose likewise, that the life of *Columnar Anchorites* was a thing resembling the life in *Caves*, in respect the Sun-beams could not much pierce thither, nor the *Air* receive any great changes or inequalities. This is certain, both the *Simeon Stelita's*, as well *Daniel* as *Saba*, and other *Columnar Anchorites*; have been exceeding long-liv'd. Likewise the *Anchorites* in our days, closed up and immured either within Walls or Pillars, are often found to be long-liv'd.

5. Next unto the life in *Caves*, is the life on *Mountains*: for as the beams of the Sun do not penetrate into *Caves*; so on the tops of *Mountains*, being destitute of Reflexion, they are of small force. But this is to be understood of *Mountains* where the Air is clear and pure; namely, whether by reason of the driness of the Valleys, Clouds and Vapours do not ascend: as it is in the Mountains which incompass *Barbary*, where, even at this day, they live many times to an hundred and fifty years, as hath been noted before.

6. And this kind of *Air* of *Caves* and *Mountains*, of its own proper nature, is little or nothing predatory; but *Air*, such as ours is, which is predatory through the heat of the Sun, ought as much as is possible, to be excluded from the body.

7. But the *Air* is prohibited and excluded two ways: First, by *closing* the Pores: Secondly, by *filling* them up.

8. To the *closing* of the Pores, help coldness of the Air, going naked, whereby the skin is made hard, washing in cold water, Astringents applied to the skin, such as are *Mastick*, *Myrrhe*, *Myrtle*.

9. But much more may we satisfie this *Operation* by *Baths*, yet those rarely used, (especially in Summer) which are made of *Astringent mineral waters*, such as may safely be used, as Waters participating of Steel and Coperas; for these do potently contract the skin.

10. As for *filling* up the *Pores*, *Paintings*, and such like *Unctuous daubings*, and (which may most commodiously be used) *Oyl* and *fat things*, do no less conserve the substance of the body, than Oyl-colours and Varnish do preserve Wood.

11. The ancient *Britains* painted their bodies with *Woad*, and were exceeding long liv'd: The *Picts* also used Paintings, and are thought by some to have derived their name from thence.

12. The *Brasilians* and *Virginians* paint themselves at this day, who are (especially the former) very long-liv'd; insomuch that five years ago the *French Jesuites* had speech with some who remembred the building of *Fernambuck*, which was done an hundred and twenty years since; and they were then at Man's estate.

13. *Joannes de temporibus*, who is reported to have extended his life to three hundred years, being asked how he preserved himself so long, is said to have answered, *By Oyl without, and by Honey within.*

14. The *Irish*, especially the *Wild-Irish*, even at this day live very long: certainly they report, that within these few years the *Countess* of *Desmond* lived to an hundred and forty years of age, and bred Teeth three times. Now the *Irish* have a fashion to chafe, and, as it were, to baste themselves with old Salt-butter against the fire.

The

The same *Irish* use to wear *Saffroned Linnen* and *Shirts*: which though it were at first devised to prevent Vermin, yet howsoever I take it to be very useful for lengthning of life; for *Saffron*, of all things that I know, is the best thing for the skin, and the comforting of the flesh, seeing it is both notably Astringent, and hath besides an Oleosity and subtil heat, without any Acrimony. I remember a certain *English-man*, who when he went to Sea, carried a bag of *Saffron* next his stomach, that he might conceal it, and so escape Custom: And whereas he was wont to be always exceeding Sea-sick, at that time he continued very well, and felt no provocation to vomit. 15.

Hippocrates adviseth in Winter to wear clean Linnen, and in Summer foul Linnen, and besmeared with Oyl: The reason may seem to be, because in Summer the *Spirits* exhale most, therefore the pores of the skin would be filled up. 16.

Hereupon we are of opinion, that the use of *Oyl*, either of *Olives* or Sweet *Almonds*, to anoint the skin therewith, would principally conduce to long life: The *anointing* would be done every morning, when we rise out of bed, with Oyl, in which a little *Bay-salt* and *Saffron* is mixed. But this *anointing* must be lightly done with Wooll, or some soft Sponge, not laying it on thick, but gently touching and wetting the skin. 17.

It is certain, that *Liquors*, even the Oily themselves, in great quantities draw somewhat from the body: but contrarily, in small quantities are drunk in by the body; therefore the anointing would be but light, as we said, or rather the shirt it self, would be besmeared with Oyl. 18.

It may happily be objected, that this anointing with Oyl which we commend, (though it were never in use with us, and amongst the *Italians* is cast off again) was anciently very familiar amongst the *Grecians* and *Romans*, and a part of their Diet; and yet men were not longer-liv'd in those days than now. But it may rightly be answered, Oyl was in use only after Baths, unless it were perhaps amongst *Champions*: Now hot Baths are as much contrary to our Operation, as *Anointings* are congruous, seeing the one opens the Passages, the other stops them up: therefore the Bath, without the anointing following, is utterly bad; the anointing, without the Bath, is best of all. Besides, the anointing amongst them was used only for *delicacy*, or (if you take it at the best) for *health*, but by no means in order to long life; and therefore they used them with all precious Oyntments, which were good for deliciousness, but hurtful to our intention, in regard of their heat: So that *Virgil* seemeth not to have said amiss, 19.

——*Nec Casiâ liquidi corrumpitur usus Olivi,*
That odoriferous Casia hath not supplanted the use of neat Oyl-Olive.

Anointing with *Oyl* conduceth to health, both in Winter, by the exclusion of the *cold Air*, and in Summer, by detaining the Spirits within, and prohibiting the resolution of them, and keeping off the force of the Air which is then most predatory. 20.

Seeing the anointing with *Oyl* is one of the most potent Operations to long life, we have thought good to add some cautions, lest the health should be endangered: They are four, according to the four *Inconveniences* which may follow thereupon. 21.

The first *Inconvenience* is, that by *repressing sweats*, it may ingender diseases from those excrementitious humours. To this a remedy must be given by *Purges* and *Clysters*, that evacuation may be duly performed. This is certain, that evacuation by sweats commonly advanceth health, and derogateth from long life; but gentle *Purges* work upon the humours, not upon the spirits, as sweat doth. 22.

The second *Inconvenience* is, *that* it may heat the body, and in time inflame it; for the spirits shut in, and not breathing forth, acquire heat. This inconvenience may be prevented, if the *Diet* most usually incline to the colder part, and that at times some proper cooling Medicines be taken, of which we shall straight speak in the operation upon the *Blood*. 23.

The third is, that it may *annoy the head*; for all *Oppletion* from without strikes back the vapours, and sends them up unto the head. This inconvenience is remedied by *Purgers*, especially *Clysters*, and by shutting the mouth of the stomach strongly with Stipticks, and by combing and rubbing the head, and by washing it with convenient Lees, that something may exhale, and by not omitting competent and good exercises, that something also may perspire by the skin. 24.

25. The fourth *Inconvenience* is a more subtil Evil; namely, that the Spirit being detained by the closing up of the *Pores*, is likely to multiply it self too much: for when little issueth forth, and new Spirit is continually ingendred, the Spirit increaseth too fast, and so preyeth upon the body more plentifully. But this is not altogether so; for all Spirit closed up is dull, (for it is blown and excited with motion as Flame is) and therefore it is less active, and less generative of it self: Indeed it is thereby increased in heat, (as Flame is) but slow in motion. And therefore the remedy to this inconvenience must be by cold things, being sometimes mixed with *Oyl*, such as are *Roses* and *Myrtles*, for we must altogether disclaim hot things, as we said of *Cassia*.

26. Neither will it be unprofitable to wear next the body Garments that have in them some *Unctuosity*, or *Oleosity*, not *Aquosity*, for they will exhaust the body less; such as are those of Woollen, rather than those of Linnen. Certainly it is manifest in the Spirits of Odours, that if you lay sweet Powders amongst Linnen, they will much sooner lose their smell, than amongst Woollen. And therefore Linnen is to be preferred for delicacy and neatness, but to be suspected for our *Operation*.

27. The *Wild Irish*, as soon as they fall sick, the first thing they do is to take the Sheets off their Beds, and to wrap themselves in the Woollen Cloaths.

28. Some report, that they have found great benefit in the conservation of their health, by wearing *Scarlet Waistcoats* next their skin, and under their shirts, as well down to the neather parts, as on the upper.

29. It is also to be observed, that *Air* accustomed to the body doth less prey upon it, than new *Air*, and often changed: and therefore poor people in small Cottages, who live always within the smell of the same Chimney, and change not their Seats, are commonly longest-liv'd: Notwithstanding, to other operations (especially for them whose Spirits are not altogether dull) we judge change of Air to be very profitable, but a mean must be used, which may satisfie on both sides. This may be done by removing our habitation four times a year, at constant and set times, unto convenient Seats, that so the body may neither be in too much Peregrination, nor in too much Station. And touching the *Operation* upon the *Exclusion* of *Air*, and avoiding the Predatory force thereof, thus much.

The Operation upon the Bloud, and the Sanguifying Heat. 3.

The History.

1. THE following *Operations* answer to the two precedent, and are in the relation of *Passives* and *Actives*: For the two precedent intend this, that the *Spirits* and *Air* in their actions may be the less depredatory; and the two latter, that the *Bloud* and *Juice* of the Body may be the less depredable. But because the Bloud is an irrigation or watering of the Juices and Members, and a preparation to them, therefore we will put the Operation upon the *Bloud*, in the first place: Concerning this *Operation*, we will propound certain Counsels, few in number, but very powerful in virtue. They are three.

2. First, There is no doubt, but that if the Bloud be brought to a cold temper, it will be so much the less dissipable. But because the cold things which are taken by the mouth agree but ill with many other Intentions, therefore it will be best to find out some such things as may be free from these inconveniences. They are two.

3. The first is this: Let there be brought into use, especially in Youth, *Clysters* not *purging* at all, or *abstersing*, but only cooling, and somewhat opening: Those are approved which are made of the Juices of *Lettuce*, *Purslane*, *Liver-wort*, *Housleek*, and the *Mucilage* of the seed of *Flea-wort*, with some temperate opening decoction, and a little

little *Camphire* : but in the declining age let the *Houſleek* and *Purſlane* be left out, and the juices of *Borrage* and *Endive*, and the like be put in their rooms. And let theſe *Clyſters* be retained, if it may be, for an hour or more.

The other is this, Let there be in uſe, eſpecially in Summer, *Baths* of freſh water, and but luke-warm, altogether without *Emollients*, as *Mallows*, *Mercury*, *Milk*, and the like; rather take new *whey* in ſome good quantity, and *Roſes*. 4.

But (that which is the principal in this intention, and new) we adviſe that before the bathing, the body be anointed with Oil, with ſome *thickneſs*, whereby the quality of the cooling may be received, and the water excluded : yet let not the pores of the body be ſhut too cloſe; for when the outward cold cloſeth up the body too ſtrongly, it is ſo far from furthering coolneſs, that it rather forbids, and ſtirs up heat. 5.

Like unto this is the uſe of *Bladders*, with ſome decoctions and cooling juices, applied to the inferiour region of the body, namely, from the ribbs to the privy parts, for this alſo is a kind of *bathing*, where the body of the liquor is for the moſt part excluded, and the cooling quality admitted. 6.

The third counſel remaineth, which belongeth not to the quality of the *blood*, but to the ſubſtance thereof, that it may be made more firm and leſs diſſipable, and ſuch as the heat of the ſpirit may have the leſs power over it. 7.

And as for the uſe of *Filings* of *Gold*, *Leaf-gold*, *Powder* of *Pearl*, *Precious ſtones*, *Coral*, and the like, we have no opinion of them at this day, unleſs it be onely as they may ſatisfie this preſent *Operation*. Certainly, ſeeing the *Arabians*, *Grecians* and *modren Phyſicians*, have attributed ſuch vertues to theſe things, it cannot be altogether Nothing which ſo great men have obſerved of them. And therefore omitting all fantaſtical opinions about them we do verily believe, that if there could be ſome ſuch things conveyed into the whole maſs of the blood in minute and fine portions, over which the ſpirits and heat ſhould have little or no power, abſolutely it would not only reſiſt *Putrefaction*, but *Arefaction* alſo, and be a moſt effectual means to the prolongation of life. Nevertheleſs in this thing ſeveral cautions are to be given. Firſt, that there be a moſt exact comminution. Secondly, that ſuch hard and ſolid things be void of all malignant qualities, leſt while they be diſperſed and lurk in the veins, they breed ſome ill convenience. Thirdly, that they be never taken together with meats, nor in any ſuch manner as they may ſtick long, leſt they beget dangerous obſtructions about the Meſentery. Laſtly, that they be taken very rarely, that they may not congregate and knot together in the veins. 8.

Therefore let the manner of taking them be *faſting*, in *white wine*, a little *Oil* of *Almonds* mingled therewith, *Exerciſe* uſed immediately upon the taking of them. 9.

The *Simples* which may ſatisfie this *Operation* are, in ſtead of all, *Gold*, *Pearls*, and *Coral* : for all *Metal*, except *Gold*, are not without ſome malignant quality in the diſſolutions of them, neither will they be beaten to that exquiſite fineneſs that *Leaf-gold* hath. As for all *glaſſie* and *tranſparent Jewels*, we like them not, (as we ſaid before) for fear of Corroſion. 10.

But, in our judgment, the ſafer and more effectual way would be by the uſe of *Woods* in Infuſions and Decoctions; for there is in them ſufficient to cauſe *firmneſs* of *blood*, and not the like danger for breeding obſtructions; but eſpecially, becauſe they may be taken in meat and drink, whereby they will find the more eaſie entrance into the veins, and not be avoided in excrements. 11.

The *Woods* fit for this purpoſe are *Sanders*, the *Oak* and *Vine*. As for all *hot woods* or ſomething *Roſennie*, we reject them : notwithſtanding you may add the *woody ſtalks* of *Roſemary* dried, for *Roſemary* is a Shrub, and exceedeth in age many Trees, alſo the *woody ſtalks* of *Ivy*, but in ſuch quantity as they may not yield an unpleaſing taſte. 12.

Let the *Woods* be taken either boiled in *Broths*, or infuſed in *Muſt* or *Ale* before they leave working; but in *Broths* (as the cuſtome is for *Guaiacum* and the like) they would be infuſed a good while before the boiling, that the firmer part of the *wood*, and not that onely which lieth looſely, may be drawn forth. As for *Aſſe*, though it be uſed for Cups, yet we like it not. And touching the *Operation* upon the *Blood* thus much. 13.

The Operation upon the Juices of the Body. 4.

The History.

1. THere are two kinds of *Bodies* (as was said before in the *Inquisition* touching *Inanimates*) which are hardly consumed, *Hard* things and *Fat* things; as is seen in *Metals* and *Stones*, and in *Oil* and *Wax*.

2. It must be ordered therefore, that the *juice* of the *body* be somewhat *hard*, and that it be *fat* or *subroscid*.

3. As for *hardness*, it is caused three ways: by *Aliment of a firm nature*, by *cold* condensing the skin and flesh, and by *Exercise*, binding and compacting the juices of the body, that they be not soft and frothy.

4. As for the *Nature* of the *Aliment*, it ought to be such as is not easily *dissipable*, such as are *Beef*, *Swine's flesh*, *Deer*, *Goat*, *Kid*, *Swan*, *Goose*, *Ring-dove*, especially if they be a little powdred; *Fish* likewise salted and dryed, *Old Cheese* and the like.

5. As for the *Bread* *Oaten-Bread* or *bread* with some mixture of *Pease*, in it, or *Rye-bred*, or *barly-bread*, are more solid than *Wheat bread*, and in *Wheat-bread*, the course *Wheat-bread* is more solid than the pure *Manchet*.

6. The Inhabitants of the *Orcades*, which live upon *salted fish*, and generally all *Fish-eaters*, are long liv'd.

7. The *Monks* and *Hermites* which fed sparingly, and upon dry *Aliment*, attained commonly to a great age.

8. Also *pure Water* usually drunk makes the juices of the body less frothy? unto which if, for the dulness of the spirits, (which no doubt in *Water* are but a little penetrative) you shall adde a little *Nitre*, we conceive it would be very good. And touching the *firmness* of the *Aliment* thus much.

9. As for the *Condensation* of the *skin* and *flesh* by *cold*: They are longer liv'd for the most part that live abroad in the *open air*, than they that live in *Houses*; and the Inhabitants of the *cold Countries*, than the Inhabitants of the *hot*.

10. Great store of *cloathes*, either upon the bed or back, do resolve the body.

11. Washing the *body* in *cold Water* is good for length of life; use of *hot Baths* is nought, Touching *Baths* of *Astringent Mineral Waters* we have spoken before.

12. As for *Exercise*; an *idle life* doth manifestly make the flesh soft and dissipable: *robust exercise* (so it be without over-much sweating or wearyness) maketh it hard and compact. Also *exercise* within cold Water, as swimming, is very good; and generally *exercise* abroad is better than that within houses.

13. Touching *Frications*, (which are a kind of *exercise*) because they do rather call forth the Aliment that harden the flesh, we will inquire hereafter in the due place.

14. Having now spoken of *hardning* the *juices* of the *body*, we are to come next to the *Oleosity* and *Fattiness* of them, which is a more perfect and potent Intention than *Induration*, because it hath no inconvenience or evil annexed. For all those things which pertain to the *hardning* of the *juices* are of that nature, that while they prohibit the absumption of the aliment, they also hinder the operation of the same; whereby it happens, that the same things are both propitious and adverse to length of life: but those things which pertain to making the *Juices Oily* and *Roscid*, help on both sides, for they render the Aliment both less dissipable, and more reparable.

15. But whereas we say that the *Juice* of the *body* ought to be *Roscid* and *Fat*, it is to be noted that we mean it not of a visible *Fat*, but of a *Dewiness* dispersed, or (if you will call it) *Radical* in the very substance of the body.

16. Neither again let any man think, that *Oile*, or the *Fat* of *Meats*, or *Marrow* do engender the like, and satisfie our intention: for those things which are once perfect are not brought back again; but the Aliments ought to be such, which after digestion and maturation do then in the end engender *Oleosity* in the *Juices*.

17. Neither again let any man think, that *Oil* or *Fat* by it self and simple is hard of dissipation; but in mixture it doth not retain the same nature: for as *Oil* by it self is much more longer in consuming than *Water*; so in Paper or Linnen it sticketh longer, and is latter dried, as we noted before.

To

To the Irroration of the body, roaſted meats or baked meats are more effectual than boiled meats, and all preparation of meat with water is inconvenient: beſides, Oil is more plentifully extracted out of dried bodies than out of moiſt bodies. 81.

Generally, to the *Irroration* of the body much uſe of ſweet things is profitable, as of *Sugar*, *Honey*, *ſweet-Almonds*, *Pin apples*, *Piſtachio's*, *Dates*, *Raiſins* of the *Sun*, *Corans*, *Figs*, and the like. Contrarily, all ſour, and very ſalt, and very biting things are oppoſite to the generation of *Roſcid Juice*. 19.

Neither would we be thought to favour the *Maeniebyes*, or their diet, though we commend the frequent uſe of all kinds of Seeds, Kernels, and Roots in Meats or Sauces, conſidering all Bread (and bread is that which maketh the Meat firm) is made either of Seeds or Roots. 20.

But there is nothing makes ſo much to the *Irroration* of the body, as the quality of the Drink, which is the convoy of the Meat; therefore let there be in uſe ſuch Drinks as without all acrimony or ſowrneſs are notwithſtanding ſubtile: ſuch are thoſe Wines which are (as the old woman ſaid in *Plautus*) *vetuſtate edentula*, toothleſs with age, and *Ale* of the ſame kind. 21.

Mead (as we ſuppoſe) would not be ill if it were ſtrong and old: but becauſe all Honey hath in it ſome ſharp parts, (as appears by that ſharp water which the *Chymiſts* extract out of it, which will diſſolve metals) it were better to take the ſame portion of Sugar, not lightly infuſed in it, but ſo incorporated as honey uſeth to be in *Mead*, and to keep it to the age of a year, or at leaſt ſix months, whereby the Water may loſe the crudity, and the Sugar acquire ſubtilty. 22.

Now ancientneſs in Wine or Beer hath this in it, that it ingenders ſubtilty in the parts of the Liquor, and acrimony in the Spirits, whereof the firſt is profitable, and the ſecond hurtful. Now to rectifie this evil commixture, let there be put into the veſſel, before the Wine be ſeparated from the Muſt, *Swines-fleſh* or *Deers-fleſh* well boiled, that the Spirits of the Wine may have whereupon to ruminate and feed, and ſo lay aſide their mordacity. 23.

In like manner, if *Ale* ſhould be made not only with the grains of Wheat, Barley, Oates, Peaſe, and the like; but alſo ſhould admit a part (ſuppoſe a third part to theſe grains) of ſome fat roots, ſuch as are *Potado-roots*, *Pith* of *Artichokes*, *Burre-roots*, or ſome other ſweet and eſculent roots; we ſuppoſe it would be a more uſeful drink for long life than *Ale* made of grains onely. 24.

Alſo ſuch things as have very thin parts, yet notwithſtanding are without all acrimony or mordacity, are very good Sallets: which vertue we find to be in ſome few of the Flowers; namely, Flowers of *Ivy*, which infuſed in Vinegar are pleaſant even to the taſt; *Marigold-leaves*, which are uſed in Broths; and Flowers of *Betony*. And touching the operation upon the *Juices* of the *Body* thus much. 25.

The Operation upon the Bowels of their Extruſion of Aliment. 5.

The Hiſtory.

WHat thoſe things are which comfort the *Principal Bowels*, which are the fountains of Concoctions, namely, the *Stomack*, *Liver*, *Heart and Brain*, to perform their functions well, (whereby *Aliment* is diſtributed into the parts, *Spirits* are diſperſed, and the *Reparation* of the whole body is accompliſhed) may be derived from *Phyſitians* and from their Preſcripts and Advices. 1.

Touching the *Spleen*, *Gall*, *Kidneys*, *Meſenteries*, *Guts* and *Lungs*, we ſpeak not, for theſe are members miniſtring to the principal and whereas ſpeech is made touching health, they require ſometimes a moſt ſpecial conſideration, becauſe each of theſe have their diſeaſes, which unleſs they be cured, will have influence upon the *Principal Members*. But as touching the prolongation of life, and reparation by aliments, and retardation of the incoction of old age; if the Concoctions and 2.

those *principal Bowels* be well disposed, the rest will commonly follow according to ones wish.

3. And as for those things which, according to the different state of every mans body, may be transferred into his Diet, and the Regiment of his life, he may collect them out of the Books of Physitians, which have written of the comforting and preserving the four *principal Members*: For conservation of health hath commonly need of no more than some short courses of Physick; but length of life cannot be hoped without an orderly diet, and a constant Race of *Soveraign Medicines*. But we will propound some few, and those the most select and prime directions.

4. The *Stomach* (which, as they say, is the Master of the house, and whose strength and goodness is Fundamental to the other concoctions) ought so to be guarded and confirmed, that it may be without *intemperateness* hot; next *astricted*, or *bound*, not loose: Furthermore *clean*, not surcharged with foul Humours, and yet (in regard it is nourished from it self, not from the veins) not altogether *empty* or *hungry*: Lastly, it is to be kept ever in *appetite*, because *appetite* sharpens digestion.

5. I wonder much how that same *Calidum bibere*, to drink warm drink, (which was in use amongst the Ancients) is laid down again. I knew a Physitian that was very famous, who in the beginning of Dinner and Supper, would usually eat a few spoonfuls of very warm *Broth* with much greedines, and then would presently wish that it were out again, saying, *He had no need of the Broth, but only of the warmth.*

6. I do verily conceive it good, that the first draught either of *Wine*, or *Ale*, or any other Drink, (to which a man is most accustomed) be taken at Supper *warm*.

7. *Wine* in which *Gold* hath been quenched, I conceive, would be very good once in a Meal; not that I believe the *Gold* conferreth any vertue thereunto, but that I know that the quenching of all Metals in any kind of liquer doth leave a most potent Astriction. Now I chuse *Gold*, because besides that Astriction which I desire, it leaveth nothing else behind it of a metalline impression.

8. I am of opinion, that the Sops of Bread dipped in Wine, taken at the midst of the Meal, are better than Wine it self, especially if there were infused into the Wine in which the Sops were dipped, *Rosemary* and *Citron-pill*, and that with *Sugar*, that it may not slip too fast.

9. It is certain, that the use of *Quinces* is good to strengthen the Stomach; but we take them to be better, if they be used in that which they call *Quiddeny* of *Quinces*, than in the bodies of the *Quinces* themselves, because they lie heavy in the Stomach. But those *Quiddenies* are best taken after Meals, alone; before Meals, dipped in Vinegar.

10. Such things as are good for the Stomach above other Simples, are these, *Rosemary*, *Elecampane*, *Mastick*, *Wormwood*, *Sage*, *Mint*.

11. I allow Pills of *Aloes*, *Mastick* and *Saffron* Winter-time, taken before Dinner; but so, as the *Aloes* be not only oftentimes washed in *Rose-water*, but also in *Vinegar* in which *Tragacanth* hath been infused, and after that be macerated for a few hours in Oyl of sweet *Almonds* new drawn, before it be made into Pills.

12. *Wine* or *Ale* wherein *Wormwood* hath been infused, with a little *Elecampane* and yellow *Sanders*, will do well, taken at times, and that especially in Winter.

13. But in Summer, a draught of *White-wine* allayed with *Strawberry-water*, in which Wine-powder of Pearls, and of the shells of *Cra-fishes* exquisitely beaten, and (which may perhaps seem strange) a little *Chalk* have been infused, doth excellently refresh and strengthen the Stomach.

14. But generally, all *Draughts* in the morning (which are but too frequently used) of *cooling* things, as of Juices, Decoctions, Whey, Barley-waters, and the like) are to be avoided, and nothing is to be put into the Stomach fasting which is purely *cold*. These things are better given, if need require, either at five in the Afternoon, or else an hour after a light Breakfast.

15. Often Fastings are bad for long life; besides, all Thirst is to be avoided, and the Stomach is to be kept clean, but always moist.

16. *Oyl* of *Olives* new and good, in which a little *Methridate* hath been dissolved, anointed upon the Back-bone, just against the mouth of the Stomach, doth wonderfully comfort the Stomach.

17. A small Bag filled with Locks of Scarlet-wooll steeped in Red-wine, in which *Myrtle*,

Myrtle, and *Citron-pill*, and a little *Saffron* have been infused, may be always worn upon the stomach. And touching those things which comfort the stomach thus much, seeing many of those things also which serve for other Operations are helpful to this.

The *Liver*, if it be preserved from *Torrefaction*, or *Disiccation*, and from *Obstruction*, it needeth no more; for that looseness of it which begets *Aquosities* is plainly a disease, but the other two, old age approaching induceth. 18.

Hereunto appertain most especially those things which are set down in the *Operation* upon the *Blood*: we will add a very few things more, but those selected. 19.

Principally let there be in use the Wine of sweet *Pomegranates*; or, if that cannot be had, the juice of them newly expressed: let it be taken in the morning with a little *Sugar*, and into the Glass into which the Expression is made put a small piece of *Citron-pill* green, and three or four whole *Cloves*: let this be taken from *February*, till the end of *April*. 20.

Bring also into use, above all other Herbs, *Water-cresses*, but young, not old: they may be used either raw in Sallets, or in Broths, or in Drinks: and after that take *Spoonwort*. 21.

Aloes, however washed or corrected, is hurtful for the *Liver*, and therefore it is never to be taken ordinarily. Contrariwise, *Rhubarb* is Soveraign for the *Liver*, so that these three Cautions be interposed. First, that it be taken before Meat, lest it dry the body too much, or leave some impressions of the *Stipicity* thereof. Secondly, that it be macerated an hour or two in Oyl of sweet *Almonds* new drawn, with *Rose-water*, before it be infused in Liquor, or given in the proper substance. Thirdly, that it be taken by turns, one while simple, another while with *Tartar*, or a little *Bay-salt*, that it carry not away the lighter parts only, and make the mass of the Humours more obstinate. 22.

I allow *Wine*, or some decoction with *Steel*, to be taken three or four times in the year, to open the more strong obstructions; yet so, that a draught of two or three spoonfuls of Oyl of sweet *Almonds* new drawn ever go before, and the motion of the Body, especially of the arms and sides, constantly follow. 23.

Sweetned Liquors, and that with some fatness, are principally, and not a little effectual to prevent the *Arefaction*, and *Saltness*, and *Torrefaction*; and, in a word, the *Oldness* of the *Liver*, especially if they be well incorporated with age. They are made of sweet Fruits and Roots; as namely, the Wines and Julips of *Raisins* of the *Sun* new, *Jujubaes*, *dried Figs*, *Dates*, *Parsnips*, *Potatoes*, and the like, with the mixture of *Liquorish* sometimes: Also a Julip of the *Indian* grain, (which they call *Maiz*) with the mixture of some sweet things, doth much to the same end. But it is to be noted, that the intention of preserving the *Liver* in a kind of softness and fatness, is much more powerful than that other which pertains to the opening of the *Liver*, which rather tendeth to health, than to length of life, saving that that *Obstruction* which induceth *Torrefaction*, is as opposite to long life, as those other *Arefactions*. 24.

I commend the Roots of *Succory*, *Spinage* and *Beets* cleared of their Piths, and boiled till they be tender in Water, with a third part of *White-wine*, for ordinary Sallets, to be eaten with Oyl and Vinegar: Also *Asparagus*, pith of *Artichoaks*, and *Burroots* boiled and served in after the same manner: Also Broths in the Spring-time of *Vine-buds*, and the green blades of *Wheat*. And touching the preserving of the *Liver*, thus much. 25.

The *Heart* receiveth benefit or harm most from the *Air* which we breath, from *Vapours*, and from the *Affections*. Now many of those things which have been formerly spoken, touching the Spirits, may be transferred hither; but that indigested mass of Cordials collected by Physitians avails little to our intention: notwithstanding, those things which are found to be good against Poysons, may with good judgment be given to strengthen and fortifie the *Heart*, especially if they be of that kind, that they do not so much resist the particular Poysons, as arm the heart and spirits against Poyson in general. And touching these several Cordials, you may repair to the *Table* already set down. 26.

The goodness of the Air is better known by experience than by signs. We hold that Air to be best where the Country is level and plain, and that lieth open on all sides, so that the soyl be dry, and yet not barren or sandy; which puts forth 27.

Wild Thyme, and *Eye-bright*, and a kind of *Marjoram*, and here and there ſtalks of *Calamint*; which is not altogether void of wood, but conveniently ſet with ſome Trees for ſhade, where the *Sweet-bryar-roſe* ſmelleth ſomething Musky, and Aromatically. If there be *Rivers*, we ſuppoſe them rather hurtful than good, unleſs they be very ſmall, and clear, and gravelly.

28. It is certain, that the *morning air* is more lively and refreſhing than the *evening air*, though the latter be preferr'd out of delicacy.

29. We conceive alſo, that the *Air ſtirred* with a *gentle wind* is more wholeſome than the *Air* of a *ſerene* and *calm Skie*: but the beſt is, the *Wind* blowing from the *Weſt* in the Morning, and from the *North* in the Afternoon.

30. *Odours* are eſpecially profitable for the comforting of the *heart*, yet not ſo, as though a good *Odour* were the Prerogative of a good *Air*: for it is certain, that as there are ſome *Peſtilential Airs* which ſmell not ſo ill as others that are leſs hurtful; ſo, on the contrary, there are ſome *Airs* moſt wholeſome and friendly to the *ſpirits*, which either ſmell not at all, or are leſs pleaſing and fragrant to the ſenſe. And generally, where the *Air* is good, *Odours* ſhould be taken but now and then; for a continual *Odour*, though never ſo good, is burthenſome to the *ſpirits*.

31. We commend, above all others, (as we have touched before) *Odour* of *Plants growing*, and not *plucked*, taken in the open *air*: the principal of that kind are *Violets*, *Gilliflowers*, *Pinks*, *Bean flowers*, *Lime-tree-bloſſoms*, *Vine-buds*, *Honey ſuckles*, *yellow Wall-flowers*, *Muſk-Roſes*, (for other *Roſes* growing are faſt of their ſmells) *Strawberry-leaves*, eſpecially *dying*, *Sweet-bryar*, principally in the early Spring, *wild Mint*, *Lavender flowred*; and in the hotter Countries, *Orenge tree*, *Citron-tree*, *Myrtle*, *Laurel*: Therefore to walk or ſit near the breath of theſe *Plants*, would not be neglected.

32. For the comforting of the *Heart*, we prefer cool ſmells before hot ſmells: therefore the beſt perfume is, either in the morning, or about the heat of the day, to take an equal portion of *Vinegar*, *Roſe water*, and *Claret-wine*, and to pour them upon a Fire-pan ſomewhat heated.

33. Neither let us be thought to ſacrifice to our Mother the *Earth*, though we adviſe, that in *digging* or *ploughing* the *Earth* for health, a quantity of *Claret-wine* be poured thereon:

34. *Orenge-flower-water*, pure and good, with a ſmall portion of *Roſe-water*, and *briſk Wine*, ſnuffed up into the Noſtrils, or put into the Noſtrils with a *Syringe*, after the manner of an *Errhine*, (but not too frequently) is very good.

35. But *champing* (though we have no *Betel*) or holding in the mouth only of ſuch things as cheat the Spirits, (even daily done) is exceeding comfortable. Therefore for that purpoſe make *Grains*, or little *Cakes* of *Amber-greece*, *Muſk*, *Lignum Aloes*, *Lignum Rhodium*, *Orras Powder*, and *Roſes*; and let thoſe *Grains* or *Cakes* be made up with *Roſe-water* which hath paſſed through a little *Indian Balſam*.

36. The *Vapours* which ariſing from things inwardly taken, do fortifie and cheriſh the *heart*, ought to have theſe three properties, that they be Friendly, Clear, and Cooling; for hot *vapours* are naught, and *Wine* it ſelf, which is thought to have only an heating *vapour*, is not altogether void of an *Opiate quality*. Now we call thoſe *vapours* Clear, which have more of the *vapour* than of the *exhalation*, and which are not ſmoaky, or fuliginous, or unctuous, but moiſt and equal.

37. Out of that unprofitable Rabble of *Cordials*, a few ought to be taken into daily diet: inſtead of all, *Amber-greece*, *Saffron*, and the grain of *Kermes*, of the hotter ſort; Roots of *Bugloſs* and *Borrage*, *Citrons*, *Sweet Lemons*, and *Pearmains*, of the colder ſort. Alſo that way which we ſaid, both *Gold* and *Pearls* work a good effect, not only within the veins, but in their paſſage, and about the parts near the heart; namely, by cooling, without any malignant quality.

38. Of *Bezoar-ſtone* we believe well, becauſe of many tryals: but then the manner of taking it ought to be ſuch, as the vertue thereof may more eaſily be communicated to the *ſpirits*: Therefore we approve not the taking of it in *Broths* or *Syrups*, or in *Roſe-water*, or any ſuch like; but only in *Wine*, *Cinnamon-water*, or the like diſtilled water, but that weak or ſmall, not burning or ſtrong.

39. Of the *Affections* we have ſpoken before, we only add this, that every *Noble*, and *Reſolute*, and (as they call it) *Heroical Deſire*, ſtrengthneth and inlargeth the powers of the Heart. And touching the *Heart*, thus much.

As

As for the *Brain*, where the Seat and Court of the *Animal ſpirits* is kept, thoſe things which were inquired before touching *Opium*, and *Nitre*, and the *Subordinates* to them both; alſo touching the procuring of *placid ſleep*, may likewiſe be referred hither. This alſo is moſt certain, that the *Brain* is in ſome ſort in the cuſtody of the *Stomach*; and therefore thoſe things which comfort and ſtrengthen the *Stomach*, do help the *Brain* by conſent, and may no leſs be transferred hither. We will add a few Obſervations, three Outward, one Inward. 40.

We would have *bathing* of the *Feet* to be often uſed, at leaſt once in a week; and the *Bath* to be made of *Lye* with *Bay-ſalt*, and a little *Sage*, *Chamomile*, *Fennel*, *Sweet-marjoram*, and *Pepper-wort*, with the leaves of *Angelica* green. 41.

We commend alſo a *Fume* or *Suffumigation* every morning of dried *Roſemary*, *Bay-leaves* dried, and *Lignum-Aloes*: for all ſweet *Gums* oppreſs the head. 42.

Eſpecially care muſt be taken that no *hot things* be applied to the *Head* outwardly; ſuch are all kind of Spices, the very *Nutmeg* not excepted: for thoſe hot things, we debaſe them to the ſoles of the *Feet*, and would have them applied there only; but a light anointing of the *Head* with *Oil*, mixed with *Roſes*, *Myrtle*, and a little *Salt* and *Saffron*, we much commend. 43.

Not forgetting thoſe things which we have before delivered touching *Opiates*, *Nitre*, and the like, which ſo much *condenſe* the *ſpirits*; we think it not impertinent to that effect, that once in fourteen days *Broth* be taken in the morning with three or four grains of *Caſtoreum*, and a little *Angelica-ſeed*, and *Calamus*, which both fortifie the *Brain*, and in that aforeſaid denſity of the ſubſtance of the *ſpirits*, (ſo neceſſary to long life) add alſo a *vivacity* of *motion* and *vigour* to them. 44.

In handling the *Comforters* of the four *principal Bowels*, we have propounded thoſe things which are both proper and choice, and may ſafely and conveniently be transferred into Diets and Regiment of Life: for variety of *Medicines* is the *Daughter* of *Ignorance*; and it is not more true, that *many Diſhes have cauſed many Diſeaſes*, as the *Proverb* is, than this is true, that *many Medicines have cauſed few Cures*. And touching the *Operation* upon the *principal Bowels* for their *Extruſion* of *Aliment*, thus much. 45.

The Operation upon the Outward Parts for their Attraction of Aliment. 6.

The Hiſtory.

ALthough a good *Concoction* performed by the *Inward Parts* be the principal towards a perfect Alimentation; yet the actions of the *Outward Parts* ought alſo to concur; that like as the *Inward Faculty* ſendeth forth and extrudeth the Aliment, ſo the *Faculty* of the *Outward Parts* may call forth, and attract the ſame: and the more weak the *Faculty* of *Concoction* ſhall be, the more need is there of a concurring help of the *attractive Faculty*. 1.

A *ſtrong attraction* of the *outward parts* is chiefly cauſed by the motion of the Body, by which the parts being heated and comforted, do more chearfully call forth and *attract* the Aliment unto themſelves. 2.

But this is moſt of all to be foreſeen and avoided, that the ſame motion and heat which calls the new juice to the members, doth not again deſpoil the member of that juice wherewith it had been before refreſhed. 3.

Frications uſed in the morning ſerve eſpecially to this Intention: but this muſt evermore accompany them, that after the *Frication*, the part being lightly anointed with Oyl, leſt the Attrition of the outward parts make them by Perſpiration dry and juiceleſs. 4.

The next is *Exerciſe*, (by which the parts confricate and chafe themſelves) ſo it 5.

be moderate, and which (as was noted before) is not swift, nor to the utmost strength, nor unto weariness. But in *Exercise* and *Friction* there is the same reason and caution, that the body may not perspire, or exhale too much: Therefore *Exercise* is better in the open Air, than in the House, and better in Winter, than in Summer. And again, *Exercise* is not only to be concluded with Unction, as *Friction* is, but in vehement *Exercises* Unction is to be used both in the beginning, and in the end, as it was anciently to *Champions*.

6. That *Exercise* may resolve either the spirits or the juices as little as may be, it is necessary that it be used when the stomach is not altogether empty: and therefore that it may not be used upon a full stomach, (which doth much concern health) nor yet upon an empty stomach, (which doth no less concern long life) it is best to take a breakfast in the morning, not of any Physical Drugs, or of any Liquors, or of Raisins, or of Figs, or the like, but of plain Meat and Drink; yet that very light, and in moderate quantity.

7. *Exercises* used for the irrigation of the members, ought to be equal to all the members, not (as *Socrates* said) *that the Legs should move, and the Arms should rest*, or on the contrary; but that all the parts may participate of the motion. And it is altogether requisite to long life, that the Body should never abide long in one posture, but that every half hour, at least, it change the posture, saving only in sleep.

8. Those things which are used to *Mortification*, may be transferred to *Vivification*: for both Hair-shirts, and Scourgings, and all vexations of the outward parts, do fortifie the Attractive force of them.

9. *Cardan* commends *Nettling*, even to let out *Melancholy*: but of this we have no experience: And besides, we have no good opinion of it, lest, through the venomous quality of the *Nettle*, it may with often use breed Itches, and other diseases of the skin. And touching the *Operation* upon the *Outward Parts* for their *Attraction* of *Aliment*, thus much.

The Operation upon the Aliment it self, for the Insinuation thereof. 7.

The History.

1. THe vulgar reproof touching many Dishes, doth rather become a severe *Reformer*, than a *Physitian*: or howsoever it may be good for preservation of health, yet it is hurtful to length of life, by reason that a various mixture of Aliments, and somewhat heterogeneous, finds a passage into the veins and juices of the body more lively and chearfully, than a simple and homogeneous diet doth: besides, it is more forcible to stir up *Appetite*, which is the spur of Digestion: Therefore we allow both a *full Table*, and a *continual changing of Dishes*, according to the seasons of the year, or upon other occasions.

2. Also that Opinion of the *Simplicity* of *Meats* without *Sawces*, is but a simplicity of judgment; for good and well-chosen *Sawces* are the most wholesome preparation of *Meats*, and conduce both to health, and to long life.

3. It must be ordered, that with Meats hard of digestion be conjoyned strong Liquors, and Sawces that may penetrate and make way, but with Meats more easie of digestion, smaller Liquors, and fat Sawces.

4. Whereas we advised before, that the first *Draught* at *Supper* should be taken warm; now we add, that for the preparation of the stomach, a good draught of that Liquor (to which every man is most accustomed) be taken warm half an hour before Meat also, but a little spiced, to please the taste.

5. The preparation of Meats, and Bread, and Drinks, that they may be rightly handled, and in order to this Intention, is of exceeding great moment, howsoever it may seem a Mechanical thing, and savouring of the Kitchin and Buttery; yet it is of more consequence than those Fables of Gold, and Precious Stones, and the like.

The

6. The moiſtning of the Juices of the Body by a moiſt preparation of the Aliment, is a childiſh thing; it may be ſomewhat available againſt the fervours of diſeaſes, but it is altogether averſe to Roſcid Alimentation. Therefore boiling of Meats, as concerning our Intention, is far inferiour to Roaſting, and Baking, and the like.

7. Roaſting ought to be with a quick fire, and ſoon diſpatched; not with a dull fire, and in long time.

8. All ſolid fleſhes ought to be ſerved in, not altogether freſh, but ſomewhat powdered or corned; the leſs Salt may be ſpent at the Table with them, or none at all: for Salt incorporated with the Meat before, is better diſtributed in the body, than eaten with it at the Table.

9. There would be brought into uſe ſeveral and good *Macerations*, and *Infuſions* of Meats in convenient Liquors, before the roaſting of them: the like whereof are ſometime in uſe before they Bake them, and in the Pickles of ſome Fiſhes.

10. But *beatings*, and as it were *ſcourgings*, of Fleſh-meats before they be boiled, would work no ſmall matter. We ſee it is confeſſed, that *Partridges* and *Pheaſants* killed with an *Hawk*, alſo *Bucks* and *Stags* killed in *Hunting*, if they ſtand not out too long, eat better even to the taſte; and ſome *Fiſhes* ſcourged and beaten, become more tender and wholeſome: Alſo hard and ſowre *Pears*, and ſome other Fruits, grow ſweet with rowling them. It were good to practiſe ſome ſuch beating and bruiſing of the harder kinds of Fleſhes before they be brought to the Fire; and this would be one of the beſt preparations of all.

11. Bread a little levened, and very little ſalted, is beſt, and which is baked in an Oven throughly heated, and not with a faint heart.

12. The preparation of Drinks, in order to long life, ſhall not exceed one Precept: And as touching *Water drinkers*, we have nothing to ſay; ſuch a Diet (as we ſaid before) may prolong life to an indifferent term, but to no eminent length: but in other Drinks that are full of ſpirit, (ſuch as are *Wine*, *Ale*, *Mead*, and the like) this one thing is to be obſerved and purſued, as the ſum of all, That the parts of the *Liquor* may be exceeding thin and ſubtil, and the *Spirit* exceeding mild. This is hard to be done by *Age* alone, for that makes the parts a little more ſubtil, but the ſpirits much more ſharp and eager: therefore of the *Infuſions* in the Veſſels of ſome fat ſubſtance, which may reſtrain the Acrimony of the ſpirits, counſel hath been given before. There is alſo another way without *Infuſion* or *Mixture*; this is, that the Liquor might be continually agitated, either by carriage upon the Water, or by carriage by Land, or by hanging the Veſſels upon lines, and daily ſtirring them, or ſome ſuch other way: for it is certain, that this *Local motion* doth both ſubtilize the parts, and doth ſo incorporate and compact the ſpirits with the parts, that they have no leiſure to turn to ſowrneſs, which is a kind of *putrefaction*.

But in extream *old age* ſuch a preparation of Meats is to be made, as may be almoſt in the middle way to *Chylus*. And touching the *Diſtillations* of *Meats*, they are meer toys; for the Nutritive part, at leaſt the beſt of it, doth not aſcend in *Vapours*.

14. The incorporating of Meat and Drink before they meet in the ſtomach, is a degree to *Chylus*: therefore let *Chickens*, or *Partridges*, or *Pheaſants*, or the like, be taken and boiled in water with a little ſalt, then let them be cleanſed and dried, afterward let them be infuſed in *Muſt* or *Ale* before it hath done working, with a little *Sugar*.

15. Alſo *Grazies* of meat, and the *mincings* of them ſmall well ſeaſon'd, are good for *old perſons*; and the rather, for that they are deſtituted of the Office of their *Teeth* in chewing, which is a principal kind of preparation.

16. And as for the helps of that defect, (namely, of the ſtrength of *Teeth* to grind the Meat) there are three things which may conduce thereunto. Firſt, that new *Teeth* may put forth: that which ſeems altogether difficult, and cannot be accompliſhed without an inward and powerful reſtauration of the body. Secondly, that the *Jaws* be ſo confirmed by due *Aſtringents*, that they may in ſome ſort ſupply the office of the *Teeth*; which may poſſibly be effected. Thirdly, that the Meat be ſo prepared, that there ſhall be no need of chewing; which remedy is at hand.

17. We have ſome thought alſo touching the *Quantity* of the Meat and Drink, that the ſame taken in a larger *quantity* at ſome times, is good for the *irrigation* of the *body*: therefore both *great Feaſtings*, and *free Drinkings*, are not altogether to be inhibited. And touching the *Operation* upon the *Aliments*, and the preparation of them, thus much.

The Operation upon the last Act of Assimilation 8.

Touching the last Act *of* Assimilation *(unto which the three* Operations *immediately preceeding chiefly tend) our advice shall be brief and single, and the thing it self rather needs explication, than any various Rules.*

1. It is certain, that all bodies are endued with some desire of *Assimilating* those things which are next them. This the rare and pneumatical bodies, as *Flame*, *Spirit*, *Air* perform generously and with lacrity: on the contrary, those that carry gross and tangible bulk about them, do but weakly, in regard that the desire of *assimilating* other things is bound in by a stronger desire of Rest, and containing themselves from *Motion*.

2. Again, it is certain that the desire of *assimilating* being bound, as we said, in a Gross body, and made ineffectual, is somewhat freed and stired up by the *heat* and *neighbouring Spirits*, so that it is then actuated: which is the onely cause why *Inanimates assimilate not*, and *Animates assimilate*.

3. This also is certain, that the harder the Consistence of the body is, the more doth that body stand in need of a greater heat to prick forward the *assimilation*: which falls out ill for old men, because in them the parts are more obstinate, and the heat weaker; and therefore either the obstinacy of their parts is to be softened, or their heat increased. And as touching the *Malacissation* or *mollifying* of the members, we shall speak afterward, having also formerly propounded many things which pertain to the prohibiting and preventing of this kind of hardness. For the other, touching the increasing of the heat, we will now deliver a single precept, after we have first assumed this *Axiom*.

4. The *Act of assimilation* (which, as we said, is excited by the heat circumfused) is a motion exceeding acurate, subtile, and in little; now all such motions do then come to their vigour, when the *local motion* wholly ceaseth which disturbeth it. For the *Motion* of *Separation* into *homogeneal* parts, which is in Milk, that the Cream should swim above, and the Whey sink to the bottom, will never work, if the Milk be never so little agitated; neither will any *putrefaction*, proceed in Water or mixt Bodies, if the same be in continual *Local Motion*. So then, from this *Assumption* we will conclude this for the present Inquisition.

5. The *Act* it self of *Assimilation* is chiefly accomplished in Sleep and Rest, especially towards the morning, the distribution being finished. Therefore we have nothing else to advise, but that men keep themselves hot in their sleep; and further, that towards the morning there be used some Anointing, or shirt tincted with Oil, such as may gently stir up heat, and after that to fall asleep again. And touching the last *Act* of *Assimilation* thus much.

The Operation upon the Inteneration of that which begins to be Arefied, or the Malacissation of the Body. 9.

WE have inquired formerly touching the Intencration *from within, which is done by many Windings and Circuits, as well of* Alimentation *as of* Detaining *the* Spirit *from issuing forth, and therefore is accomplished slowly. Now we are to inquire, touching that* Intencration *which is from without, and is effected, as it were, suddenly; or touching the* Malacissation *and* suppling *of the* Body.

The History.

1. IN the *Fable* of restoring *Pelias* to youth again, *Media*, when she feigned to do it propounded this way of accomplishing the same, That the Old man's body should be cut into several pieces, and then boiled in a Cauldron with certain Medicaments. There may, perhaps, some boiling be required to this matter, but the cutting into pieces is not needful.

Not-

Notwithstanding, this cutting into pieces seems, in some sort, to be used, not with a Knife, but with Judgment. For whereas the consistence of the *Bowels* and *Parts* is very diverse, it is needful that the *Intenebration* of them both be not effected the same way, but that there be a Cure designed of each in particular, besides those things which pertain to the *Intenebration* of the whole mass of the body; of which, notwithstanding, in the first place. 2.

This *Operation* (if perhaps it be within our power) is most likely to be done by Baths, Unctions, and the like; concerning which, these things that follow are to be observed. 3.

We must not be too forward in hoping to accomplish this matter, from the Examples of those things which we see done in the *Imbibitions* and *Macerations* of *Inanimates*, by which they are *intenebrated*, whereof we introduced some instances before: For this kind of Operation is more easie upon *Inanimates*, because they attract and suck in the Liquor: but upon the bodies of *Living Creatures* it is harder, because in them the motion rather tendeth outward, and to the *Circumference*. 4.

Therefore the *Emolient Baths* which are in use do little good; but on the contrary hurt, because they rather draw forth than make entrance, and resolve the structure of the body, rather than consolidate it 5.

The *Baths* and *Unctions* which may serve to the present *Operation* (namely, of *Intenebrating* the *body* truly and really) ought to have three properties. 6.

The first and principal is, That they consist of those *things*, which in their whole substance are like unto the *body* and *flesh* of *man*, and which have a *feeding* and *nursing* vertue from without. 7.

The second is, That they be mixed with such things, as through the *subtilty* of their *parts* may *make entrance*, and so insinuate and conveigh their *nourishing vertue* into the *body*. 8.

The third is, That they receive some *mixture* (though much *inferiour* to the rest) of such things as are *Astringent*; I mean not sowre or tart things, but unctuous and comforting; that while the other two do operate, the exhaling out of the body, which destroyeth the vertue of the things *intenebrating*, may (as much as is possible) be *prohibited*; and the motion to the inward parts, by the *Astriction* of the skin, and closing of the passages, may be promoted and furthered. 9.

That which is most *Consubstantial* to the body of man, is *warm Blood*, either of man, or of some other *Living Creature*: But the device of *Ficinus*, touching the sucking of *Blood* out of the arm of a wholesome young man, for the restauration of strength in old men, is very frivolous; for that which nourisheth from *within*, ought no way to be equal or homogeneal to the body nourished, but in some sort *inferiour* and *subordinate*, that it may be converted. But in things applyed outwardly, by how much the *substance* is *liker*, by so much the *consent* is *better*. 10.

It hath been anciently received, that a *Bath* made of the *blood* of *Infants* will cure the *Leprosie*, and heal the flesh already putrefi'd; insomuch that this thing hath begot envy towards some *Kings* from the common people. 11.

It is reported that *Heraclitus*, for cure of the *Dropsie*, was put into the *warm belly* of an *Oxe* newly slain. 12.

They use the *blood* of *Kidlins* warm to cure the *disease* called St. *Anthony's Fire*, and to restore the flesh and skin. 13.

An *Arm*, or other *Member* newly cut off, or that upon some other occasion, will not leave *bleeding*, is with good success put into the *Belly* of some *Creatures newly ripped up*, for it worketh potently to stanch the *blood*; the *blood* of the member cut off, by consent sucking in, and vehemently drawing to it self the *warm blood* of the Creature slain, whereby it self is stopped, and retireth. 14.

It is much used in extreme and desperate *diseases* to cut in two *young Pigeons* yet living, and apply them to the *soles* of the *feet*, and to shift them one after another, whereby sometime there followeth a wonderful ease. This is imputed vulgarly, as if they should draw down the malignity of the disease; but howsoever, this application goeth to the *Head*, and comforteth the *Animal Spirits*. 15.

But these *bloody Baths* and *Unctions* seem to us sluttish and odious: Let us search out some others, which perhaps have less loathsomness in them, and yet no less benefit. 16.

17. Next unto *warm blood*, *things alike in substance* to the body of a man are *Nutritives* *fat fleshes of Oxen, Swine, Dear, Oysters* amongst *Fishes, Milk, Butter, Yolks* of *Eggs*. *Flower* of *Wheat*, *sweet Wine*, either sugred, or before it be fined.

18. Such things as we would have mixed to make impression, are instead of all *Salts*, especially *Bay salt*: Also Wine (when it is full of Spirit) maketh entrance, and is an excellent Convoy.

19. *Astringents* of that kind which we described, namely, unctuous and comfortable things, are *Saffron*, *Mastick*, *Myrrhe*, and *Myrtle-berries*.

20. Of these parts, in our judgment, may very well be made such a *Bath* as we design: *Physitians* and *Posterity* will find out better things hereafter.

21. But the *Operation* will be much better, and more powerful, if such a *Bath* as we have propounded (which we hold to be the principal matter) be attended with a fourfold *Course* and *Order*.

22. First, that there go before the *Bath* a *Friction* of the body, and an *Anointing* with *Oyl*, with some thickning substance, that the vertue and moistning heat of the *Bath* may pierce the body, and not the watry part of the Liquor: Then let the *Bath* follow, for the space of some two hours. After the *Bath*, let the body be *Emplaistered* with *Mastick*, *Myrrhe*, *Tragacanth*, *Diapalma*, and *Saffron*, that the perspiration of the body may (as much as is possible) be *inhibited*, till the *supple matter* be by degrees turned into *solid*. This to be continued for the space of twenty four hours, or more. Lastly, the *Emplaistering* being removed, let there be an *Anointing* with *Oyl* mixed with *Salt* and *Saffron*. And let this *Bath*, together with the *Emplaistering* and *Unction*, (as before) be renewed every fifth day. This *Malaciſſation*, or *supplying* of the body, be continued for one whole Month.

23. Also during the time of this *Malaciſſation*, we hold it useful and proper, and according to our intention, that men nourish their bodies well, and keep out of the cold Air, and drink nothing but warm drink.

24. Now this is one of those things (as we warned in general in the beginning) whereof we have made no tryal by *Experiment*, but only set it down out of our aiming and levelling at the end: For having set up the Mark, we deliver the Light to others.

25. Neither ought the *warmths* and *cherishings* of *living bodies* to be neglected. *Ficinus* saith, and that seriously enough, *That the laying of the young Maid in* David's *Bosom*, *was wholesome for him, but it came too late.* He should also have added, that the *young Maid*, after the manner of the *Persian Virgins*, ought to have been anointed with *Myrrhe*, and such like, not for deliciousness, but to encrease the vertue of this cherishing by a living body.

26. *Barbarossa* in his extreme old age, by the advice of a *Physitian*, a *Jew*, did continually apply young Boys to his Stomach and Belly, for warmth and cherishing: Also some old men lay Whelps (Creatures of the hottest kind) close to their Stomachs every night.

27. There hath gone a report, almost undoubted, and that under several names, of certain men that had great *Noses*, who being weary of the derision of people, have cut off the bunches or hillocks of their *Noses*, and then making a wide gash in their arms, have held their *Noses* in the place for a certain time, and so brought forth fair and comely *Noses*: Which if it be true, it shews plainly the *consent* of *flesh* unto *flesh*, especially in *live fleshes*.

28. Touching the particular *intueration* of the *principal Bowels*, the *Stomach*, *Lungs*, *Liver*, *Heart*, *Brain*, *Marrow* of the *Back-bone*, *Guts*, *Reins*, *Gall*, *Veins*, *Arteries*, *Nerves*, *Cartilages*, *Bones*, the *Inquisition* and *Direction* would be too long, seeing we now set not forth a *Practick*, but certain *Indications* to the *Practick*.

The

The Operation upon the Purging away of old Juice, and supplying of new Juice; or of Renovation by turns. 10.

The History.

ALthough those things which we shall here set down have been, for the most part, spoken of before; yet because this Operation is one of the principal, we will handle them over again more at large.

1. It is certain, that *Draught-Oxen*, which have been worn out with working, being put into fresh and rich Pastures, will gather tender and young flesh again: and this will appear even to the Taste and Palate; so that the *Inteneration* of flesh is no hard matter. Now it is likely that this *Inteneration* of the *flesh* being often repeated, will in time reach to the *Inteneration* of the *Bones* and *Membranes*, and like *parts* of the *body*.

2. It is certain, that Diets which are now much in use, principally of *Guaiacum*, and of *Sarsaperilla*, *China*, and *Sassafras*, if they be continued for any time, and according to strict Rules, do first attenuate the whole *juice* of the body, and after consume it, and drink it up. Which is most manifest, because that by these Diets the *French-Pox*, when it is grown even to an hardness, and hath eaten up and corrupted the very marrow of the body, may be effectually cured. And further, because it is manifest, that men, who by these Diets, are brought to be extream lean, pale, and as it were Ghosts, will soon after become fat, well-coloured, and apparently young again: Wherefore we are absolutely of opinion, that such kind of diets in the decline of age, being used every year, would be very useful to our Intention; like the old skin or spoil of *Serpents*.

3. We do confidently affirm, (neither let any man reckon us among those *Heretieks* which were called *Cathari*) that often *Purges*, and made even familiar to the body, are more available to long life than *Exercises* and *Sweats*: And this must needs be so, if that be held which is already laid for a ground, that Unctions of the body, and Oppletion of the passages from without, and exclusion of Air, and detaining of the Spirit within the mass of the body, do much conduce to long life. For it is most certain, that by Sweats, and outward Perspirations, not only the Humours and Excrementitious Vapours are exhaled and consumed, but together with them the Juices also, and good Spirits, which are not so easily repaired: but in Purges (unless they be very immoderate) it is not so, seeing they work principally upon the Humours. But the best Purges for this Intention are those which are taken immediately before Meat, because they dry the body less; and therefore they must be of those Purgers which do least trouble the Belly.

These Intentions *of the* Operations *which we have propounded (as we conceive) are most true, the* Remedies *faithful to the* Intentions. *Neither is it credible to be told (although not a few of these* Remedies *may seem but vulgar) with what care and choice they have been examined by us, that they might be (the* Intention *not at all impeached) both safe and effectual.* Experience, *no doubt, will both verifie and promote these matters: And such, in all things, are the* works *of every* prudent counsel, *that they are* admirable *in their* Effects, excellent *also in their* Order, *but seeming* vulgar *in the* Way *and* Means.

The Porches of Death.

WE are now to enquire touching the Porches *of* Death, *that is, touching those things which happen unto men at the point of* Death, *both a little before and after; that seeing there are many* Paths *which lead to* Death, *it may be understood in what* Common way

way they all end, especially in those Deaths which are caused by Indigence of Nature, rather than by Violence: although something of this latter also must be inserted, because of the connexion of things.

The History.

1. THe living Spirit stands in need of three things that it may subsist; *Convenient Motion*, *Temperate Refrigeration*, and *Fit Aliment*. Flame seems to stand in need but of two of these, namely, *Motion* and *Aliment*, because Flame is a simple substance, the Spirit a compounded, insomuch that if it approach somewhat too near to a flamy nature, it overthroweth it self.

2. Also Flame by a greater and stronger Flame is extinguished and slain, as *Aristotle* well noted, much more the *Spirit*.

3. Flame, if it be much compressed and streightned, is extinguished: as we may see in a Candle having a Glass cast over it, for the Air being dilated by the heat, doth contrude and thrust together the Flame, and so lesseneth it, and in the end extinguisheth it; and fires on Hearths will not flame, if the Fuel be thrust close together, without any space, for the flame to break forth.

4. Also things fired are extinguished with compression; as if you press a burning coal hard with the Tongs, or the foot, it is streight extinguished.

5. But to come to the Spirit; if Blood or Phlegm get into the Ventricles of the Brain, it causeth sudden death, because the Spirit hath no room to move it self.

6. Also a great blow on the head induceth sudden death, the Spirits being streightned within the Ventricles of the Brain.

7. *Opium*, and other strong *Stupefactives*, do coagulate the Spirit, and deprive it of the motion.

8. A *venemous Vapour*, totally abhorred by the spirit, causeth sudden death: as in deadly poysons, which work (as they call it) by a specifical malignity; for they strike a loathing into the Spirit, that the Spirit will no more move it self, nor rise against a thing so much detested.

9. Also extreme Drunkenness, or extreme Feeding, sometime cause sudden death, seeing the spirit is not only oppressed with over-much *condensing*, or the malignity of the vapour, (as in *Opium* and malignant poysons) but also with the abundance of the vapours.

10. Extreme Grief or Fear, especially if they be sudden, (as it is in a sad and unexpected message) cause sudden death.

11. Not only over-much Compression, but also over-much Dilatation of the spirit, is deadly.

12. Joys excessive and sudden have bereft many of their lives.

13. In greater Evacuations, as when they cut men for the *Dropsie*, the waters flow forth abundantly, much more in great and sudden Fluxes of blood, oftentimes present death followeth: and this happens by the meer flight of *Vacuum* within the body, all the parts moving to fill the empty places; and amongst the rest, the spirits themselves. For as for slow fluxes of blood, this matter pertains to the indigence of nourishment, not to the diffusion of the spirits. And touching the motion of the spirit so far, either compressed or diffused, that it bringeth death, thus much.

14. We must come next to the want of Refrigeration: Stopping of the breath causeth sudden death; as in all suffocation, or strangling. Now it seems this matter is not so much to be referred to the impediment of Motion, as to the impediment of Refrigeration; for Air over-hot, though attracted freely, doth no less suffocate, than if breathing were hindred; as it is in them who have been sometime suffocated with burning Coals, or with Char-coal, or with walls new plastered in close Chambers where a fire is made: which kind of death is reported to have been the end of the Emperour *Jovinian*. The like happeneth from dry Baths over-heated, which was practised in the killing of *Fausta*, Wife to *Constantine* the Great.

15. It is a very small time which Nature taketh to repeat the breathing, and in

which

which she desireth to expel the Foggy Air drawn into the *Lungs*, and to take in new, scarce the third part of a minute.

Again, the beating of the *Pulse*, and the motion of the *Systole* and *Diastole* of the heart, are three times quicker than that of breathing: insomuch, that if it were possible that that motion of the heart could be stopped without stopping the breath, death would follow more speedily thereupon, than by strangling. 16.

Notwithstanding, Use and Custom prevail much in this natural action of breathing; as it is in the *Delian* Divers and Fishers for Pearl, who by long use can hold their breaths at least ten times longer than other men can do. 17.

Amongst living Creatures, even of those that have *Lungs*, there are some that are able to hold their breaths a long time, and others that cannot hold them so long, according as they need more or less Refrigeration. 18.

Fishes need less Refrigeration than *Terrestrial Creatures*, yet some they need, and take it by their Gills. And as *Terrestrial Creatures* cannot bear the Air that is too hot, or too close; so *Fishes* are suffocated in waters, if they be totally and long frozen. 19.

If the Spirit be assaulted by another *heat* greater than it self, it is dissipated and destroyed: for it cannot bear the proper *heat* without Refrigeration, much less can it bear another heat which is far stronger. This is to be seen in *Burning-Fevers*, where the heat of the putrified humours doth exceed the native heat, even to extinction or dissipation. 20.

The want also and use of *Sleep* is referred to *Refrigeration*: For Motion doth attenuate and rarifie the spirit, and doth sharpen and increase the heat thereof: Contrarily, *Sleep* settleth and restraineth the motion and gadding of the same: For though Sleep doth strengthen and advance the actions of the parts and of the liveless spirits, and all that motion which is to the circumference of the body, yet it doth in great part quiet and still the proper motion of the *living Spirit*. Now Sleep regularly is due unto Humane Nature once within four and twenty hours, and that for six, or five hours at the least; though there are, even in this kind, sometimes Miracles of Nature: As it is recorded of *Mecænas*, that he slept not for a long time before his death. And as touching the want of *Refrigeration* for conserving of the *Spirit*, thus much. 21.

As concerning the third *Indigence*, namely of *Aliment*, it seems to pertain rather to the *parts*, than to the *living Spirit*; for a man may easily believe that the *living Spirit* subsisteth in Identity, not by Succession or Renovation. And as for the *reasonable Soul* in men, it is above all question, that it is not ingendred of the Soul of the Parents, nor is repaired, nor can die. They speak of the *Natural Spirit* of living Creatures, and also of Vegetables, which differs from that other Soul essentially and formally: For out of the confusion of these, that same transmigration of Souls, and innumerable other devices of Heathens and Hereticks have proceeded. 22.

The Body of man doth regularly require *Renovation* by *Aliment* every day, and a body in health can scarce endure Fasting three days together; notwithstanding, use and custom will do much, even in this case: but in sickness Fasting is less grievous to the body. Also *Sleep* doth supply somewhat to nourishment; and on the other side, *Exercise* doth require it more abundantly. Likewise there have some been found who sustained themselves (almost to a Miracle in Nature) a very long time without Meat or Drink. 23.

Dead bodies, if they be not intercepted by *Putrefaction*, will subsist a long time without any notable *Absumption*; but *living bodies*, not above three days, (as we said) unless they be repaired by nourishment: which sheweth that quick *Absumption* to be the work of the *living Spirit*, which either repairs it self, or puts the parts into a necessity of being repaired, or both. This is testified by that also which was noted a little before; namely, that living Creatures may subsist somewhat the longer without *Aliment*, if they sleep: now sleep is nothing else but a reception and retirement of the *living Spirit* into it self. 24.

An abundant and continual *Effluxion* of blood, which sometimes happeneth in the *Hæmorrhoides*, sometimes in vomiting of blood, the inward Veins being unlocked or broken, sometimes by wounds, causeth sudden death, in regard that the blood of the *Veins* ministreth to the *Arteries*, and the blood of the *Arteries* to the *Spirit*. 25.

26. The quantity of meat and drink which a man, eating two meals a day, receiveth into his body, is not small; much more than he voideth again either by Stool, or by Urine, or by Sweating. You will say, no marvel, seeing the remainder goeth into the Juices and substance of the body. It is true; but consider then, that this addition is made twice a day, and yet the body aboundeth not much. In like manner, though the spirit be repaired, yet it grows not excessively in the quantity.

27. It doth no good to have the Aliment ready, in a degree removed, but to have it of that kind, and so prepared and supplied, that the spirit may work upon it: for the staff of a *Torch* alone will not maintain the flame, unless it be fed with Wax, neither can men live upon Herbs alone. And from thence comes the *Inconcoction* of old age, that though there be flesh and blood, yet the spirit is become so penurious and thin, and the juices and blood so heartless and obstinate, that they hold no proportion to *Alimentation*.

28. Let us now cast up the *Accounts* of the *Needs* and *Indigences*, according to the ordinary and usual course of Nature. The Spirit hath need of opening and moving it self in the *Ventricles* of the Brain and Nerves even continually, of the motion of the *Heart* every third part of a moment, of breathing every moment, of sleep and nourishment once within three days, of the power of nourishment commonly till eighty years be past: And if any of these *Indigences* be neglected, *Death* ensueth. So there are plainly three *Porches* of *Death*; destitution of the Spirit in the *Motion*, in the *Refrigeration*, in the *Aliment*.

It is an Errour to think that the Living Spirit *is perpetually generated and extinguished, as* Flame *is, and abideth not any notable time: for even* Flame *it self is not thus out of its own proper nature, but because it liveth amongst Enemies; for* Flame *within* Flame *endureth. Now the* Living Spirit *liveth amongst Friends, and all due obsequiousness. So then, as* Flame *is a momentany substance,* Air *is a fixed substance, the* Living Spirit *is betwixt both.*

Touching the extinguishing *of the* Spirit *by the* destruction *of the* Organs *(which is caused by Diseases and Violence) we enquire not now, as we foretold in the beginning, although that also endeth in the same three* Porches. *And touching the* Form *of* Death *it self, thus much.*

29. There are two great *Forerunners* of Death, the one sent from the *Head*, the other from the *Heart*; *Convulsion*, and the extreme labour of the *Pulse*: for, as for the deadly *Hiccough*, it is a kind of *Convulsion*. But the deadly labour of the *Pulse* hath that unusual swiftness, because the *Heart* at the point of death doth so tremble, that the *Systole* and *Diastole* thereof are almost confounded. There is also conjoyned in the *Pulse* a weakness and lowness, and oftentimes a great intermission, because the motion of the *Heart* faileth, and is not able to rise against the assault stoutly, or constantly.

30. The immediate proceeding signs of *Death* are, great unquietness and tossing in the Bed, fumbling with the hands, catching and grasping hard, gnashing with the teeth, speaking hollow, trembling of the neather lip, paleness of the face, the memory confused, speechless, cold sweats, the body shooting in length, lifting up the white of the eye, changing of the whole visage, (as the Nose sharp, Eyes hollow, Cheeks fallen) contraction and doubling of the coldness in the *extreme parts* of the body, in some, shedding of blood, or sperm, shrieking, breathing thick and short, falling of the neather Chap, and such like.

31. There follow Death a privation of all Sense and Motion, as well of the Heart and Arteries, as of the Nerves and Joynts, an inability of the body to support it self upright, stiffness of the Nerves and parts, extreme coldness of the whole body; after a little while, putrefaction and stinking.

32. *Eels*, *Serpents*, and the *Insects*, will move a long time in every part after they are cut asunder, insomuch that Country-people think that the parts strive to joyn together again. Also *Birds* will flutter a great while after their heads are pulled off; and the hearts of living creatures will pant a long time after they are plucked out. I remember I have seen the Heart of one that was bowelled, as suffering for High Treason, that being cast into the fire, leaped at the first at least a foot and half in height, and after, by degrees, lower and lower, for the space, as I remember, of seven or eight minutes. There is also an ancient and credible Tradition of an *Oxe* lowing after his bowels were plucked out. But there is a more certain Tradition of a Man, who being under the

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Executioners hand for High Treason, after his *Heart* was plucked out, and in the Executioners hand, was heard to utter three or four words of prayer: which therefore we said to be more credible than that of the *Oxe* in *Sacrifice*, because the Friends of the party suffering do usually give a reward to the Executioner to dispatch his Office with the more speed, that they may the sooner be rid of their pain; but in *Sacrifices* we see no cause why the Priest should be so speedy in his office.

33 For *reviving* those again which fall into sudden *Swooning* and *Catalepses* of *astonishments*, (in which Fits many, without present help, would utterly expire) these things are used, putting into their mouths water distilled of Wine, which they call *Hot-waters*, and *Cordial-waters*, bending the body forwards, stopping the Mouth and Nostrils hard, bending or wringing the Fingers, pulling the hairs of the Beard or Head, rubbing of the Parts, especially the Face and Legs, sudden casting of cold water upon the face, shrieking out aloud, and suddenly; putting *Rose-water* to the Nostrils, with *Vinegar* in faintings; burning of Feathers, or Cloth, in the suffocation of the *Mother*; but especially a *Frying-pan* heated red hot, is good in *Apoplexies*: Also a close imbracing of the body hath helped some.

34 There have been many examples of men in shew dead, either laid out upon the cold Floor, or carried forth to burial: nay, of some buried in the Earth; which notwithstanding have lived again, which hath been found in those that were buried (the Earth being afterwards opened) by the bruising and wounding of their head, through the stringling of the body within the Coffin; whereof the most recent and memorable example was that of *Joannes Scotus*, called the *Subtil*, and a *School-man*, who being digged up again by his Servant, (unfortunately absent at his burial, and who knew his Masters manner in such fits) was found in that state: And the like happened in our days in the person of a Player, buried at *Cambridge*. I remember to have heard of a certain *Gentleman* that would needs make tryal, in curiosity, what men did feel that were hanged; so he fastened the Cord about his neck, raising himself upon a stool, and then letting himself fall, thinking it should be in his power to recover the Stool at his pleasure, which he failed in, but was helped by a Friend then present. He was asked afterward what he felt: He said he felt no pain, but first he thought he saw before his eyes a great fire, and burning; then he thought he saw all black, and dark: lastly, it turned to a pale blew, or Sea-water green; which colour is also often seen by them which fall into *Swoonings*. I have heard also of a Physitian, yet living, who recovered a man to life which had hanged himself, and had hanged half an hour, by *Frications*, and hot *Baths*: And the same Physitian did profess, that he made no doubt to recover any man that had hanged so long, so his Neck were not broken with the first swing.

The Differences of Youth, and old Age.

THe Ladder of Man's Body is this, to be conceived, to be quickned in the Womb to be born, to suck, to be weaned, to feed upon Pap, to put forth Teeth the first time, about the second year of age, to begin to go, to begin to speak, to put forth Teeth, the second time, about seven years of age, to come to *Puberty* about twelve or fourteen years of age, to be able for Generation, and the flowing of the *Menstrua*, to have hairs about the legs and arm-holes, to put forth a Beard; and thus long, and sometimes later, to grow in stature, to to come to full years of strength and agility, to grow grey and bald; the *Menstrua* ceasing, and ability to Generation, to grow decrepit, and a Monster with three legs, to die. Mean while the Mind also hath certain periods, but they cannot be described by years, as to decay in the *Memory*, and the like; of which hereafter. *To the 16 Article.* 1.

The Differences of *Youth* and *old Age*, are these: A young man's skin is smooth and plain, an old man's dry and wrinkled, especially about the Forehead and Eyes; a young man's flesh is tender and soft, an old man's hard; a young man hath strength and agility, an old man feels decay in his strength, and is slow of motion; a young man hath 2.

hath good digestion, an old man bad; a young mans bowels are soft and succulent, an old man's salt and parched; a young man's body is erect and streight, an old man's bowing and crooked; a young man's limbs are steady, an old man's weak and trembling; the humours in a young man are cholerick, and his blood inclined to heat, in an old man phlegmatick and melancholick, and his blood inclined to coldness; a young man ready for the act of *Venus*, an old man slow unto it; in a young man the juices of his body are more roscid, in an old man more crude and wateriſh; the spirit in a young man plentiful and boiling, in an old man scarce and jejune; a young man's spirit is dense and vigorous, an old man's eager and rare; a young man hath his senses quick and entire, an old man dull and decayed; a young mans teeth are strong and entire, an old man's weak, worn, and fallen out; a young man's hair is coloured, an old man's (of what colour soever it were) grey; a young man hath hair, an old man baldness; a young man's Pulse is stronger and quicker, an old man's more confused and slower; the diseases of young men are more acute and curable, of old men longer and hard to cure, a young man's wounds soon close, an old man's later; a young man's cheeks are of a fresh colour, an old man's pale, or with a black blood; a young man is less troubled with Rheums, an old man more: Neither do we know in what things old men do improve, as touching their body, save only sometimes in fatness; whereof the reason is soon given, because old men's bodies do neither perspire well, nor assimilate well: Now fatness is nothing else but an exuberance of nourishment above that which is voided by Excrement, or which is perfectly assimilated. Also some old men improve in the appetite of feeding, by reason of the *acid humours*, though old men digest worſt. And all these things which we have said, *Physitians* negligently enough will refer to the *diminution* of the *Natural heat* and *Radical moisture*, which are things of no worth for use. This is certain, *Dryness* in the coming on of years doth forego *Coldness*; and bodies, when they come to the top and strength of heat, do decline in *Drineſs*, and after that follows *Coldness*.

3. Now we are to consider the *affections* of the *Mind*. I remember when I was a young man, at *Poictiers* in *France*, I conversed familiarly with a certain *French-man*, a witty young man, but something talkative, who afterwards grew to be a very Eminent man: he was wont to inveigh against the manners of *old men*, and would say, That if their Minds could be seen as their Bodies are, they would appear no less deformed. Besides, being in love with his own Wit, he would maintain, that the Vices of old mens Minds have some correspondence, and were parallel to the putrefactions of their Bodies: For the dryness of their skin, he would bring in *Impudence*; for the hardness of their bowels, *Unmercifulness*; for the *lippitude* of their eyes, an *evil Eye*, and *Envy*; for the casting down of their eyes, and bowing their body towards the Earth, *Atheism*; (*for*, saith he, *they look no more up to Heaven as they are wont*) for the trembling of their members, *Irresolution* of their *Decrees* and *light Inconstancy*; for the bending of their fingers, as it were to catch, *Rapacity* and *Covetousness*; for the buckling of their knees, *Fearfulness*; for their wrinkles, *Craftiness* and *Obliquity*: and other things which I have forgotten. But to be serious, a young man is modest and shamefac'd, an old man's Forehead is hardned, a young man is full of bounty and mercy, an old man's heart is brawny; a young man is affected with a laudable emulation, an old man with a malignant envy; a young man is inclined to Religion and Devotion, by reason of his Fervency and Inexperience of evil, an old man cooleth in Piety through the coldness of his Charity, and long converſation in evil, and likewise through the difficulty of his belief; a young man's desires are vehement, an old man's moderate: a young man is light and moveable, an old man more grave and constant: a young man is given to *Liberality*, and Beneficence, and Humanity, an old man to covetousness, wisdom for his own self, and seeking his own ends: a young man is confident, and full of hope, an old man diffident, and given to suspect most things: a young man is gentle and obsequious, an old man froward and disdainful: a young man is sincere, and open-hearted, an old man cautelous and close: a young man is given to desire great things, an old man to regard things necessary: a young man thinks well of the present times, an old man preferreth times past before them: a young man reverenceth his Superiours, an old man is more forward to tax them: and many other things, which pertain rather to Manners, than to the present Inquisition. Notwithstanding old men, as in some things they improve in their Bodies, so also in their Minds, unless they be altogether out of date: namely, that as they are less apt for Invention,

tion, so they excel in judgment, and prefer safe things, and sound things, before specious: Also they improve in Garrulity and Ostentation, for they seek the fruit of speech while they are less able for action: So as it was not absurd that the *Poets* feigned old *Tython* to be turned into a *Grasshopper*.

Moveable Canons of the Duration of Life and Form of Death.

Canon I.

COnsumption *is not caused, unless that which is departed with by one body, passeth into another.*

The Explication.

THere is in Nature no *annihilating*, or *reducing* to *nothing*: Therefore that which is consumed, is either resolved into Air, or turned into some Body adjacent. So we see a *Spider*, or *Fly*, or *Ant* in Amber, intombed in a more stately Monument than Kings are; to be laid up for Eternity, although they be but tender things, and soon dissipated: But the matter is this, that there is no Air by, into which they should be resolved, and the substance of the *Amber* is so *heterogeneous*, that it receives nothing of them. The like we conceive would be if a stick, or root, or some such thing were buried in *Quick-silver*: also *Wax*, and *Honey*, and *Gums* have the same *Operation*, but in part only.

Canon II.

THere is in every Tangible Body *a* Spirit, *covered and encompassed with the grosser parts of the body, and from it all* Consumption *and* Dissolution *hath the beginning.*

The Explication.

NO Body known unto us here in the upper part of the Earth is without a Spirit, either by *Attenuation* and *Concoction* from the heat of the Heavenly Bodies, or by some other way: for the *Concavities* of *Tangible things* receive not *Vacuum*, but either Air, or the proper *Spirit* of the thing. And this *Spirit* whereof we speak, is not some *Virtue*, or *Energie*, or *Act*, or a *Trifle*, but plainly a *Body*, rare and invisible; notwithstanding circumscribed by Place, Quantitative, Real. Neither again is that Spirit Air, (no more than Wine is Water) but a Body rarefied, of kin to Air, though much different from it. Now the grosser parts of bodies (being dull things, and not apt for motion) would last a long time; but the Spirt is that which troubleth, and plucketh, and undermineth them, and converteth the moisture of the body, and whatsoever it is able to digest, into new Spirit; and then as well the pre-existing Spirit of the body, as that newly made fly away together by degrees. This is best seen by the *Diminution* of the *weight* in bodies dryed through *Perspiration*; for neither all that which is issued forth was Spirit when the body was ponderous, neither was it not Spirit when it issued forth.

Canon III.

THe Spirit issuing forth Dryeth; detained *and working within either* melteth, *or* putrefieth, *or* vivifieth.

The Explication.

THere are four Processes of the Spirit; to *Arefaction*, to *Colliquation*, *Putrefaction*, to *Generation* of bodies. *Arefaction* is not the proper work of the Spirit, but of the grosser parts after the Spirit issued forth; for then they contract themselves partly by their flight of *Vacuum*, partly by the union of the *Homogeneals*: as appears in all things which are Arefied by Age, and in the dryer sort of bodies which have passed the fire; as *Bricks*, *Charcoal*, *Bread*. *Colliquation* is the meer work of the Spirit; neither is it done, but when they are excited by heat: for when the Spirits dilating themselves, yet not getting forth, do insinuate and disperse themselves among the grosser parts, and so make them soft and apt to run, as it is in *Metals* and *Wax*: for *Metals*, and all tenacious things, are apt to inhibit the Spirit; that being

excited, it issueth not forth. *Putrefaction* is a mixed work of the Spirits, and of the grosser parts; for the Spirit (which before restrained and bridled the parts of the thing) being partly issued forth, and partly infeebled all things in the body do dissolve and return to their *Homogeneities*, or (if you will) to their Elements: that which was *Spirit* in it is congregated to it self, whereby things putrefied begin to have an ill savour: the *Oily* parts to themselves, whereby things putrefied have that slipperiness and unctuosity; the *watry* parts also to themselves, the *Dregs* to themselves: whence followeth that *confusion* in *bodies putrefied*. But *Generation* or *Vivification* is a work also mixed of the Spirit and grosser parts, but in a far different manner; for the Spirit is totally detained, but it swelleth and moveth locally; and the grosser parts are not dissolved, but follow the motion of the spirit; and are, as it were, blown out by it, and extruded into divers figures, from whence cometh that *Generation* and *Organization*: and therefore *Vivification* is always done in a matter tenacious and clammy, and again, yielding and soft, that there may be both a detention of the spirit, and also a gentle cession of the parts, according as the spirit forms them. And this is seen in the matter, as well of all Vegetables, as of living Creatures, whether they be ingendred of Putrefaction, or of Sperm; for in all these things there is manifestly seen a matter hard to break through, easie to yield.

Canon IV.

IN all living Creatures *there are two kinds of* Spirits: Liveless Spirits, *such as are in bodies* Inanimate, *and a* Vital Spirit *superadded*.

The Explication.

IT was said before, that to procure long life, the Body of Man must be considered first, as *Inanimate*, and not repaired by nourishment: secondly, as *Animate*, and repaired by nourishment: For the former, consideration gives Laws touching *Consumption*, the latter touching *Reparation*. Therefore we must know, that there are in humane flesh Bones, Membranes, Organs: Finally, in all the parts such spirits diffused in the substance of them while they are alive, as there are in the same things (Flesh, Bones, Membranes, and the rest) separated and dead, such as also remain in a *Carkass*: but the *Vital Spirit*, although it ruleth them, and hath some consent with them, yet it is far differing from them, being integral, and subsisting by it self. Now there are two special differences betwixt the *liveless Spirit*, and the *vital Spirits*: The one, that the *liveless Spirits* are not continued to themselves, but are, as it were, cut off, and incompassed with a gross body, which intercepts them, as *Air* is mixed with *Snow* or *Froth*; but the *vital Spirit* is all continued to it self by certain Conduit-pipes through which it passeth, and is not totally intercepted. And this Spirit is twofold also; the one branched, only passing through small Pipes, and, as it were, strings, the other hath a *Cell* also, so as it is not only continued to it self, but also congregated in an hollow space in reasonable good quantity, according to the Analogy of the body; and in that *Cell* is the Fountain of the Rivulets which branch from thence. The *Cell* is chiefly in the Ventricles of the Brain, which in the ignobler sort of Creatures are but narrow, insomuch that the spirits in them seem scattered over their whole body, rather than Celled; as may be seen in *Serpents*, *Eels*, and *Flies*, whereof every of their parts move long after they are cut asunder. *Birds* also leap a good while after their heads are pulled off, because they have little Heads, and little Cells: But the Nobler sort of Creatures have those Ventricles larger, and Man the largest of all. The other difference betwixt the Spirits is, that the vital Spirit hath a kind of inkindling, and is like a Wind or Breath compounded of Flame and Air, as the Juices of living Creatures have both *Oyl* and *Water*. And this inkindling ministreth peculiar motions and faculties: for the Smoak which is inflamable, even before the Flame conceived, is hot, thin, and moveable, and yet it is quite another thing after it is become Flame: but the inkindling of the vital spirits is by many degrees gentler than the softest Flame, as of *Spirit* of *Wine*, or otherwise; and besides, it is in great part mixed with an *Aerial* substance, that it should be a *Mystery* or *Miracle*, both of a *Flammeous* and *Aereous* nature.

Canon V.

THe Natural Actions *are proper to the* several Parts, *but it is the* Vital Spirit *that excites and sharpens them.*

The Explication.

THe *Actions* or *Functions* which are in the several *Members*, follow the nature of the *Members* themselves, (*Attraction*, *Retention*, *Digestion*, *Assimilation*, *Separation*, *Excretion*, *Perspiration* even *Sense* it self) according to the propriety of the several *Organs*, (the *Stomach*, *Liver*, *Heart*, *Spleen*, *Gall*, *Brain*, *Eye*, *Ear*, and the rest:) yet none of these Actions would ever have been actuated but by the vigour and presence of the *Vital spirit*, and heat thereof: as one *Iron* would not have drawn another *Iron*, unless it had been excited by the *Load-stone*; nor an *Egge* would ever have brought forth a *Bird*, unless the substance of the *Hen* had been actuated by the treading of the *Cock*.

Canon VI.

THe liveless Spirits *are next Consubstantial to* Air; *the* vital Spirits *approach more to the substance of* Flame.

The Explication.

THe Explication of the precedent fourth *Canon* is also a Declaration of this present *Canon*: But yet further, from hence it is, that all fat and oily things continue long in their being: For neither doth the *Air* much pluck them, neither do they much desire to joyn themselves with *Air*. As for that conceit, it is altogether vain, that Flame should be Air set on fire, seeing *Flame* and *Air* are no less *Heterogeneal*, than *Oyl* and *Water*. But whereas it is said in the *Canon*, that the *vital spirits* approach more to the substance of *Flame*; it must be understood, that they do this more than the *liveless spirits*, not that they are more *Flamy* than *Airy*.

Canon VII.

THe Spirit *hath two* Desires; *one of* multiplying *it self*, *the other of* flying forth, *and congregating it self with the* Connaturals.

The Explication.

THe *Canon* is understood of the *liveless spirits*; for as for the *second Desire*, the *vital spirit* doth most of all abhor flying forth of the body, for it finds no Connatural here below to joyn withal: Perhaps it may sometimes fly to the outward parts of the body, to meet that which it loveth; but the flying forth, as I said, it abhorreth. But in the *liveless spirits* each of these two *Desires* holdeth. For to the former this belongeth, *Every spirit seated amongst the grosser parts dwelleth unhappily*; and therefore when it finds not a like unto it self, it doth so much the more labour to create and make a like, as being in a great solitude, and endeavour earnestly to multiply it self, and to prey upon the *volatile* of the *grosser parts*, that it may be encreased in quantity. As for the *second Desire* of flying forth, and betaking it self to the *Air*, it is certain, that all light things (which are ever moveable) do willingly go unto their Likes near unto them, as a *Drop* of water is carried to a *Drop*, *Flame* to *Flame*; but much more this is done in the flying forth of *spirit* into the *Air* Ambient, because it is not carried to a Particle like unto it self, but also as unto the *Globe* of the *Connaturals*. Mean while this is to be noted, that the going forth, and flight of the *spirit* into *Air* is a redoubled action, partly out of the *appetite* of the *spirit*, partly out of the *appetite* of the *Air*; for the common Air is a needy thing, and receiveth all things speedily, as *Spirits*, *Odours*, *Beams*, *Sounds*, and the like.

Canon VIII.

SPirit detained, *if it have no possibility of begetting new* spirits, iteneraeth *the grosser parts.*

The Explication.

GEneration of new Spirit is not accomplished but upon those things which are in some degree near to the spirit, such as are humid bodies. And therefore if the grosser parts (amongst which the Spirit converseth) be in a remote degree, although the spirit cannot convert them, yet (as much as it can) it weakneth, and softneth, and subdueth them, that seeing it cannot encrease in quantity, yet it will dwell more at large, and live amongst good Neighbours and Friends. Now this *Aphorism* is most useful to our end, because it tendeth to the Inteneration of the obstinate parts by the detention of the spirit.

Canon IX.

THe Inteneration *of the* harder parts *cometh to good effect*, *when the* Spirit *neither* flieth forth, *nor* begetteth new Spirit.

The

The Explication.

THis *Canon* solveth the knot and difficulty in the Operation of Intenerating by the Detention of the *Spirit*: for if the *Spirit* not flying forth wasteth all within, there is nothing gotten to the Intenerating of the parts in their substitance, but rather they are dissolved and corrupted. Therefore together with the *Detention*, the *Spirits* ought to be cooled and restrained, that they may not be too active.

Canon X

THe heat of the Spirit *to keep the body fresh and green, ought to be* Robust, *not* Eager.

The Explication.

ALso this *Canon* pertaineth to the solving of the knot aforesaid, but it is of a much larger extent, for it setteth down of what temperament the heat in the body ought to be for the obtaining of long life. Now this is useful, whether the *Spirits* be detained, or whether they be not. For howsoever the heat of the *Spirits* must be such, as it may rather turn it self upon the hard parts, than waste the soft; for the one desiccateth, the other intenerateth. Besides, the same thing is available to the well-perfecting of *Assimilation*; for such an heat doth excellently excite the faculty of *Assimilation*, and withal doth excellently prepare the matter to be assimilated. Now the properties of this kind of heat ought to be these: First, that it be slow, and heat not suddenly: Secondly, that it be not very *intense*, but moderate: Thirdly, that it be equal, not incomposed; namely, intending and remitting it self: Fourthly, that if this heat meet any thing to resist it, it be not easily suffocated or languish. This *Operation* is exceeding subtil, but seeing it is one of the most useful, it is not to be deserted. Now in those *Remedies* which we propounded to invest the spirits with a *Robust heat*, or that which we call *Operative*, not *Predatory*, we have in some sort satisfied this matter.

Canon XI.

The Condensing *of the* Spirits *in their* substance, *is available to long life.*

The Explication.

THis *Canon* is subordinate to the next precedent, for the *Spirit* condensed receiveth all those four properties of heat whereof we speak; but the ways of Condensing them are set down in the first of the ten *Operations*.

Canon XII.

THe Spirit *in* great quantity *hasteneth more to flying forth, and preyeth upon the body more, than in* small quantity.

The Explication.

THis *Canon* is clear of it self, seeing meer Quantity doth regularly encrease vertue. And it is to be seen in flames, that the bigger they are the stronger they break forth, and the more speedily they consume. And therefore over-great plenty, or exuberance of the spirits, is altogether hurtful to long life; neither need one wish a greater store of spirits, than what is sufficient for the Function of life, and the Office of a good Reparation.

Canon XIII.

THe Spirit equally *dispersed, maketh less haste to fly forth, and preyeth less upon the body, than* unequally *placed.*

The Explication.

NOt only abundance of spirits, in respect of the whole, is hurtful to the Duration of things, but also the same abundance, unevenly placed, is in like manner hurtful; and therefore the more the spirit is shred and inserted by small portions, the less it preyeth; for Dissolution ever beginneth at that part where the spirit is loser. And therefore both Exercise and Frications conduce much to long life, for Agitation doth finelieft diffuse and commix things by small portions.

Canon XIV.

THe inordinate *and* subsultory motion *of the* spirits *doth more hasten to going forth, and doth prey upon the body more, than the* constant *and* equal.

The Explication.

IN Inanimates this *Canon* holds for certain, for inequality is the Mother of Dissolution; but in Animates (because not only the Consumption is considered, but the Repara

Reparation, and Reparation proceedeth by the Appetites of things, and Appetite is sharpned by variety) it holdeth not rigorously; but it is so far forth to be received, that this variety be rather an alternation or enterchange, than a confusion; and, as it were, constant in inconstancy.

Canon XV.

The Spirit *in a* Body *of a* solid composure *is detained, though unwillingly.*

The Explication.

ALl things do abhor a *Solution* of their *Continuity*, but yet in proportion to their *Density* or *Rarity:* for the more rare the bodies be, the more do they suffer themselves to be thrust into small and narrow passages: for *water* will go into a passage which *dust* will not go into, and *Air* which water will not go into, nay, *flame* and *spirit* which *Air* will not go into. Notwithstanding of this thing, there are some bounds, for the *spirit* is not so much transported with the desire of going forth, that it will suffer it self to be too much discontinued, or be driven into over-streight pores and passages; and therefore if the spirit be encompassed with an *hard* body, or else with an *unctuous* and *tenacious*, (which is not easily divided) it is plainly bound; and, as I may say, imprisoned, and layeth down the appetite of going out; wherefore we see that *Metals* and *Stones* require a long time for their spirit to go forth, unless either the spirit be excited by the fire, or the grosser parts be dissevered with corroding and strong waters. The like reason is there of *tenacious bodies*, such as are *Gums*, save only that they are melted by a more gentle heat: and therefore the *Juices* of the body hard, a *close* and *compact skin*, and the like, (which are procured by the driness of the *Aliment*, and by *Exercise*, and by the *coldness* of the *Air*) are good for long life, because they detain the spirit in close prison, that it goeth not forth.

Canon XVI.

In Oily *and* Fat *things the* Spirit *is detained willingly, though they be not* tenacious.

The Explication.

THe spirit, if it be not irritated by the Antipathy of the body including it, nor fed by the over-much likeness of that body, nor sollicited nor invited by the *external body*, it makes no great stir to get out: all which are wanting to *Oily bodies*; for they are neither so pressing upon the spirits as *hard bodies*, nor so near as *watry bodies*, neither have they any good agreement with the *Air Ambient*.

Canon XVII.

THe speedy flying forth *of the* Watry Humour, *conserves the* Oily *the longer in his being.*

The Explication.

WE said before, that the *Watry Humours*, as being consubstantial to the *Air*, fly forth soonest; the *Oily* later, as having small agreement with the *Air*. Now whereas these two *humours* are in most bodies, it comes to pass that the *Watry* doth in a sort betray the *Oily*, for that issuing forth insensibly carrieth this together with it. Therefore there is nothing more furthereth the conservation of bodies, than a *gentle drying* of them, which causeth the *watry humour* to expire, and inviteth not the *Oily*; for then the *Oily* enjoyeth the proper nature. And this tendeth not only to the inhibiting of *Putrefaction*, (though that also followeth) but to the conservation of *Greenness*. Hence it is, that *gentle Fications*, and *moderate Exercises*, causing rather *Perspiration* than *Sweating*, conduce much to long life.

Canon XVIII.

Air excluded *conferreth to long life, if other* inconveniences *be avoided.*

The Explication.

WE said a little before, that the flying forth of the *Spirit* is a redoubled action, from the appetite of the *Spirit*, and of the *Air*; and therefore if either of these be taken out of the way, there is not a little gained. Notwithstanding divers inconveniences follow hereupon, which how they may be prevented, we have shewed in the second of our *Operations*.

Canon XIX.

YOuthful Spirits *inserted into an* old Body, *might soon turn* Natures course *back again.*

The Explication.

THe nature of the *Spirits* is as the uppermost *Wheel*, which turneth about the other *Wheels* in the body of man; and therefore in the *Intention* of long life, that ought to be first placed. Hereunto may be added, that there is an easier and more expedite way to alter the *spirits*, than to other *Operations*. For the *Operation* upon the *spirits* is two-fold; the one by *Aliments*, which is slow, and, as it were, about; the other, (and that two-fold) which is sudden, and goeth directly to the spirits, namely, by *Vapours*, or by the *Affections*.

Canon XX.

Juices *of the* Body hard *and* roscid *are good for long life.*

The Explication.

THe reason is plain, seeing we shewed before, that *hard* things, and *oily* or *roscid*, are hardly dissipated: notwithstanding there is difference, (as we also noted in the tenth *Operation*) that *Juice* somewhat *hard* is indeed less *dissipable*, but then it is withal less *reparable*; therefore *a Convenience* is interlaced with an *Inconvenience*, and for this cause no wonderful matter will be atchieved by this But *roscid juice* will admit both *operations*; therefore this would be principally endeavoured.

Canon XXI.

WHatsoever is of thin parts *to penetrate, and yet hath no* Acrimony *to* bite, *begetteth* Roscid Juices.

The Explication.

THis *Canon* is more hard to practise than to understand. For it is manifest, whatsoever *penetrateth* well, but yet with a *sting* or *tooth*, (as do all sharp and sowre things) it leaveth behind it, wheresoever it goeth, some mark or print of *drinesi* and *cleaving*, so that it hardneth the *juices*, and chappeth the *parts*: Contrarily, whatsoever things *penetrate* through their *thinness* meerly, as it were by stealth, and by way of insinuation without violence, they *bedew* and *water* in their passage. Of which sort we have recounted many in the fourth and seventh *Operations*.

Canon XXII.

Assimilation *is best done when all* Local Motion *is expended.*

The Explication.

THis *Canon* we have sufficiently explained in our Discourse upon the eighth *Operation*.

Canon XXIII.

ALimentation from without, *at least some other way than by the* Stomach, *is most profitable for long life, if it can be done.*

The Explication.

WE see that all things which are done by *Nutrition* ask a long time, but those which are done by *imbracing* of the *like* (as it is in *Infusions*) require no long time. And therefore *Alimentation* from without would be of principal use; and so much the more, because the *Faculties* of *Concoction* decay in old age: so that if there could be some Auxiliary *Nutritions* by *Bathings*, *Unctions*, or else by *Clysters*, these things in conjunction might do much, which single are less available.

Canon XXIV.

WHere the Concoction *is weak to* thrust *forth the* Aliment, *there the* Outward parts *should be strengthened to* call *forth the* Aliment.

The Explication.

THat which is propounded in this *Canon*, is not the same thing with the former, for it is one thing for the *outward Aliment* to be attracted *inward*, another for the *inward Aliment* to be attracted *utward*: yet herein they concur, that they both help the weakness of the *inward Concoctions*, though by divers ways.

Canon XXV.

ALL sudden Renovation *of the Body is wrought either by the* Spirit, *or by* Malaciss*a*tions.

The Explication.

THere are two things in the Body, *Spirits* and *Parts*: to both these the way by Nutrition is long and about; but it is a short way to the *Spirits* by *Vapours*, and by the *Affections*, and to the *Parts* by *Malaciss*ations. But this is diligently to be noted, that by no means we confound *Alimentation from without* with *Malaciss*ation; for the intention of *Malaciss*ation is not to nourish the parts, but only to make them more fit to be nourished.

Canon

Canon XXVI.

MAlaciſſation *is wrought by* Conſubſtantials, *by* Imprinters, *and by* Cloſers up.

The Explication.

THe reaſon is manifeſt, for that *Conſubſtantials* do properly ſupple the body, *Imprinters* do carry in, *Cloſers up* do retain and bridle the *Perſpiration*, which is a motion oppoſite to *Malaciſſation*. And therefore (as we deſcribed in the ninth *Operation*) *Malaciſſation* cannot well be done at once, but in a courſe or order. Firſt, by excluding the *Liquor* by *Thickners*: for an outward and groſs Infuſion doth not well compact the body: that which entreth muſt be ſubtil, and a kind of vapour. Secondly, by *Intenerating* by the conſent of *Conſubſtantials*: for bodies upon the touch of thoſe things which have good agreement with them, open themſelves, and relax their pores. Thirdly, *Imprinters* are *Convoys*, and inſinuate into the parts the *Conſubſtantials*, and the mixture of gentle *Aſtringents* doth ſomewhat reſtrain the *Perſpiration*. But then, in the fourth place, follows that great *aſtriction* and *cloſure* up of the body by *Emphaiſtration*, and then afterward by *Inunction*, until the *Supple* be turned into *Solid*, as we ſaid in the proper place.

Canon XXVII.

FRequent Renovation *of the* Parts Repairable, *watereth and renewеth the leſs* Repairable *alſo*.

The Explication.

WE ſaid in the Preface to this Hiſtory, that the *way* of *Death* was this, That the *Parts reparable* died in the fellowſhip of the *Parts leſs reparable*: ſo that in the *repairation* of theſe ſame *leſs reparable Parts*, all our forces would be imployed. And therefore being admoniſhed by *Ariſtotle*'s obſervation, touching *Plants*, namely, *That the putting forth of new ſhoots and branches refreſheth the body of the Tree in the paſſage*; we conceive the like reaſon might be, if the *fleſh* and *blood* in the body of man were often renewed, that thereby the *bones* themſelves, and *membranes*, and other parts, which in their own nature are *leſs reparable*, partly by the chearful paſſage of the *Juices*, partly by that new cloathing of the young *fleſh* and *blood*, might be *watered* and *renewed*.

Canon XXVIII.

REfrigeration, *or* Cooling *of the body, which paſſeth ſome other ways than by the* Stomach, *is uſeful for long life.*

The Explication.

THe reaſon is at hand: for ſeeing a *Refrigeration* not temperate, but powerful, (eſpecially of the *blood*) is above all things neceſſary to long life: this can by no means be effected from within as much as is requiſite, without the deſtruction of the *Stomach* and *Bowels*.

Canon XXIX.

THat Intermixing, *or* Intangling, *that as well* Conſumption *as* Reparation *are the works of Heat, is the greateſt obſtacle to long life.*

The Explication.

ALmoſt all great works are deſtroyed by the *Natures* of things *Intermixed*, when as that which helpeth in one reſpect, hurteth in another: therefore men muſt proceed herein by a ſound judgment, and a diſcreet practice. For our part, we have done ſo far as the matter will bear, and our memory ſerveth us, by ſeparating *benign heats* from *hurtful*, and the *Remedies* which tend to both.

Canon XXX.

CUring *of Diſeaſes is effected by* Temporary Medicines; *but* Lengthning *of* Life *requireth* Obſervation *of* Diets.

The Explication.

THoſe things which come by accident, as ſoon as the cauſes are removed, ceaſe again; but the continual courſe of Nature, like a running River, requires a continual rowing and ſailing againſt the ſtream, therefore we muſt work regularly by Diets. Now Diets are of two kinds: *Set Diets*, which are to be obſerved at certain times, and *Familiar Diet*, which is to be admitted into our daily repaſt: But the *Set Diets* are the more potent, that is, a courſe of *Medicines* for a time; for thoſe things which are of ſo great virtue that they are able to turn Nature back again, are, for the moſt part, more ſtrong, and more ſpeedily altering, than thoſe which may without danger be received into a continual uſe. Now in the Remedies ſet down in our *Intentions*, you

ſhall

shall find only three set Diets, the *Optate Diet*, the *Diet Malaciſſant* or *Suppling*, and the *Diet Emaciant* and *Renewing*. But amongſt thoſe which we preſcribed for *Familiar Diet*, and to be uſed daily, the moſt efficacious are theſe that follow, which alſo come not far ſhort of the vertue of Set Diets: *Nitre*, and the *ſubordinates* to *Nitre*; the *Regiment* of the *Affections*, and *courſe* of our *Life*; *Refrigerators* which paſs not by the Stomach; *Drinks Reſcidating*, or *ingendring Oily Juices*; beſprinkling of the bloud with ſome firmer matter, as *Pearls*, certain *Woods*, competent *Unctions* to keep out the Air and to keep in the Spirit; Heaters from without, during the Aſſimilation after ſleep; avoiding of thoſe things which inflame the Spirit, and put it into an eager heat, as *Wine* and *Spices*. Laſtly, a moderate and ſeaſonable uſe of thoſe things which endue the ſpirits with a Robuſt heat, as *Saffron*, *Croſſes*, *Garlick*, *Elecampane*, and *compound Opiates*.

Canon XXXI.

THE Living Spirit *is inſtantly extinguiſhed, if it be deprived either of* Motion, *or of* Refrigeration, *or of* Aliment.

The Explication.

NAmely, theſe are thoſe three which before we called the *Porches of Death*, and they are the proper and immediate paſſions of the Spirit. For all the *Organs* of the principal parts ſerve hereunto, that theſe three *Offices* be performed; and again, all deſtruction of the *Organs* which is deadly brings the matter to this point, that one or more of theſe three fail: Therefore all other things are the divers ways to Death, but they end in theſe three. Now the whole *Fabrick* of the *Parts* is the *Organ* of the *Spirit*, as the *Spirit* is the *Organ* of the *Reaſonable Soul*, which is *Incorporeous* and *Divine*.

Canon XXXII.

FLame *is a* Momentany ſubſtance, Air *a* Fixed; *the* Living Spirit *in Creatures is of a* middle Nature.

The Explication.

THis matter ſtands in need both of an higher Indagation, and of a longer Explication than is pertinent to the preſent Inquiſition. Mean while we muſt know this, that Flame is almoſt every moment generated and extinguiſhed; ſo that it is continued only by ſucceſſion; but *Air* is a *fixed body*, and it not diſſolved: for though Air begets new Air out of watery moiſture, yet notwithſtanding the old Air ſtill remains; whence cometh that Super-oneration of the Air whereof we have ſpoken in the Title *De Ventis*. But *Spirit* is participant of both Natures, both of *Flame* and *Air*, even as the nouriſhments thereof are, as well Oyl, which is homogeneous to Flame, as Water, which is homogeneous to Air: for the Spirit is not nouriſhed either of Oily alone, or of Watry alone, but of both together; and though Air doth not agree well with Flame, nor Oyl with Water, yet in a *mix'd body* they agree well enough. Alſo the *Spirit* hath from the *Air* his eaſie and delicate impreſſions and yieldings, and from the *Flame* his Noble and Potent Motions and Activities. In like manner the *Duration* of *Spirit* is a mixed thing, being neither ſo momentany as that of *Flame*, nor ſo fixed as that of *Air*: And ſo much the rather it followeth not the condition of *Flame*, for that *Flame* it ſelf is extinguiſhed by accident, namely, by contraries, and Enemies environing it; but *Spirit* is not ſubject to the like conditions and neceſſities. Now the *Spirit* is repaired from the lively and florid bloud of the ſmall *Arteries* which are inſerted into the *Brain*; but this Reparation is done by a peculiar manner, of which we ſpeak not now.

FINIS.

ARTICLES
OF
ENQUIRY,
TOUCHING
METALS & MINERALS.

Written by the Right Honourable
FRANCIS BACON,
BARON of *VERULAM*,
Viſcount *St. Albans.*

Thought fit to be added, to this WORK
OF HIS
NATURAL HISTORY.
Newly put forth in the YEAR, 1661.
By the former Publiſher.

LONDON,
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FRANCIS BACON.

NETTLE & MINERVA

ENGLISH

OF

ARTICLES

ARTICLES OF ENQUIRY,

TOUCHING

METALS & MINERALS.

THe first Letter of the Alphabet is, the Compounding Incorporating or Union, of Metals or Minerals.

With what Metals Gold will incorporate, by Simple Colliquefactions, and with what not? and in what quantity it will incorporate? and what kind of Body the Compound makes?

Gold with Silver, which was the ancient *Electrum*.
Gold with Quick-silver.
Gold with Lead.
Gold with Copper.
Gold with Brass.
Gold with Iron.
Gold with Tin.

So likewise of Silver.

Silver with Quick silver.
Silver with Lead.
Silver with Copper.
Silver with Brass.
Silver with Iron.
Silver with Tin.

So likewise of Quick-silver.

Quick-silver with Lead.
Quick-silver with Copper.
Quick-silver with Brass.
Quick-silver with Iron.
Quick-silver with Tin.

So of Lead

Lead with Copper.
Lead with Brass.
Lead with Iron.
Lead with Tin.

So of Copper.

Copper with Brass.
Copper with Iron.
Copper with Tin.

So of Brass.

Brass with Iron.
Brass with Tin.

So of Iron.

Iron with Tin.

What are the Compound Metals, which are common, and known? And what are the Propositions of their mixtures? As

Latin of Brass, and the Calaminar-stone.

Bell-metal of, *&c.*

The counterfeit Plate, which they call Alchumy.

The Decompositions of three Metals or more, are too long to enquire, except there be some Comportions of them already observed.

It is also to be observed, Whether any two Metals which will not mingle of themselves, will mingle with the Help of another; and what?

What Compounds will be made of Metal with Stone, and other Fossiles? As Lattin is made with Brass, and the Calaminar-stone. As all the Metals with Vitriol: All with Iron poudered. All with Flint, *&c.*

Some few of these would be enquired of, to disclose the Nature of the Rest.

WHether Metals, or other Fossiles, will incorporate with Molten Glass? and what Body it makes?

The quantity in the mixture would be well considered: For some small quantity, perhaps would incorporate; as in the Allays of Gold, and Silver Coyn.

Upon the Compound Body, three things are chiefly to be observed. The Colour, the Fragility or Pliantness, the Volatility or Faxation, compared with the Simple Bodies.

For present use or profit; this is the Rule. Consider the price of the two Simple Bodies, consider again the Dignity of the one above the other

other, in use. Then see, if you can make a compound that will save more in the price, then it will lose in the dignity of the use. As for example, Consider the price of Brass Ordnance; consider again the price of Iron Ordnance; and consider, wherein the Brass Ordnance doth excel the Iron Ordnance in use. Then if you can make a Compound of Brass and Iron Ordnance, that will be near as good in use, and much cheaper in price, there is profit both to the private, and to the Commonwealth.

So of Gold and Silver, the price is double of Twelve. The Dignity of Gold above Silver is not much; the splendor is alike, and more pleasing to some eye. As in Cloth of Silver, Silver Lace, silvered Rapiers, *&c.* The main dignity is, that Gold bears the fire, which Silver doth not; but that is an excellency in Nature, but it is nothing at all in use. For any dignity in use, I know none, but that Silvering will sully and canker more than Guilding; which if it may be corrected, with a little mixture of Gold, there is profit: And I do somewhat marvel, that the latter Ages have lost the ancient *Electrum*, which was a mixture of Silver with Gold; whereof, I conceive, there may be much use both in Coyn, Plate, and Guilding.

It is to be noted, that there is in the Version of Metals, impossibility, or at least great difficulty; as in making of Gold, Silver, Copper: On the other side, in the adulterating or counterfeiting of Metals there is deceit and Villany; but it should seem there is a middle way, and that is by new compounds, if the ways of incorporating were well known.

What Incorporation or Imbibition Metals will receive from Vegetables, without being dissolved, might be inquired. As when the Armorers make their Steel more tough and plyant by the aspersion of Water, or Juice of Herbs: When Gold being grown somewhat churlish by recovering, is made more plyant by throwing in shreds of Tanned Leather, or by Leather oyled.

Note, that in these, and the like shews of Imbibition, it were good to try by the weight, whether the weight be increased or no? for if it be not, it is to be doubted, that there is no Imbibition of Substance: but onely, that the Application of the other Body, doth dispose and invite the Metal to another posture of parts than of it self it would have taken.

After the Incorporation of Metals, by simple Colliquefaction, for the better discovery of the Nature: And Consents and Dissents of Metals by incorporating of their Dissolutions, it would be enquired.

What Metals being dissolved by Strong-waters, will incorporate well together, and what not? which is to be inquired particularly, as it was in Colliquefactions.

There is to be observed in those Dissolutions, which will not incorporate what the effects are: As the Ebullition, the Precipitation to the bottom, the Ejaculation towards the top, the Suspension in the midst and the like.

Note, that the Dissents of the Menstrua, or Strong-waters, may hinder the Incorporation, as well as the Dissents of the Metals themselves: Therefore where the Menstrua are the same, and yet the Incorporation followeth not, you may conclude, the Dissent is in the Metals, but where the Menstrua are several, not so certain.

THe Second Letter of the Croſs Row, is the Separation of Metals, and Minerals. Separation is of three ſorts; the firſt is, The ſeparating of the pure Metal from the Ure or Droſs, which we call Refining. The ſecond is, The drawing one Metal or Mineral out of another, which we may call Extracting. The third, The ſeparating of any Metal into his Original or Elements, (or call them what you will) which work we call Precipitation.

For Refining, we are to enquire of it according to the ſeveral Metals: As Gold, Silver, *&c.* Incidently, we are to enquire of the firſt Stone, or Ure, or Spar, or Marcaſite of Metals ſeverally; and what kind of Bodies they are; and of the degrees of Richneſs.

Alſo, we are to enquire of the Means of ſeparating, whether by Fire, parting Waters, or otherwiſe.

Alſo, for the manner of Refining, you are to ſee how you can multiply the Heat, or haſten the Opening; and to ſave charge in the Refining.

The means of this is in three manners, that is to ſay, In the Blaſt of the Fire: In the manner of the Furnace to multiply Heat, by Union and Reflection: And by ſome Additament or Medicines, which will help the Bodies to open them the ſooner.

Note, the quickning of the Blaſt, and the multiplying of the Heat in the Furnace, may be the ſame for all Metals; but the Additaments muſt be ſeveral according to the natures of the Metals.

Note again, That if you think the multiplying of the Additament in the ſame proportion that you multiply the Ure, the work will follow, you may be deceived: For quantity in the Paſſive will add more reſiſtance, then the ſame quantity in the Active will add force.

For Extracting, you are to enquire what Metals contain others, and likewiſe what not? As Lead Silver, Copper Silver, *&c.*

Note, although the charge of Extraction ſhould exceed the worth, yet that is not the matter; For, at leaſt, it will diſcover Nature and poſſibility, the other may be thought on afterwards.

We are likewiſe to enquire, what the differences are of thoſe Metals, which contain more or leſs, other Metals, and how that agrees with the poorneſs or richneſs of the Metals, or Ure, in themſelves: As the Lead, that contains moſt Silver, is accounted to be more brittle; and yet otherwiſe poorer in it ſelf.

For Principiation, I cannot affirm, whether there be any ſuch thing, or no. And, I think the Chymiſts make too much ado about it. But howſoever it be, whether Solution or Extraction, or a kind of Converſion by the Fire, it is diligently to be enquired, What Salts, Sulphur, Vitriol, Mercury, or the like Simple Bodies are to be found in the ſeveral Metals; and in what quantity.

The

THe third Letter of the Croſs-Row, is the variation of Metals into ſeveral Shapes, Bodies, or Natures; the particulars whereof follow,

Tincture.
Turning to Ruſt.
Calcination.
Sublimation.
Precipitation.
Amalgamatizing, or turning into a ſoft Body.
Vitrification.
Opening or diſſolving into Liquor.
Sprouting, or Branching, or Aboreſcence.
Induration and Mollification.
Making tough or brittle.
Volatility and Fixation.
Tranſmutation or Verſion.

For Tincture, it is to be enquired how Metals may be tincted, through and through; and with what, and into what colours: As Tincting-Silver yellow. Tincting-Copper white, and Tincting red, green, blew, eſpecially with keeping the luſtre.

Item, Tincture of Glaſs.
Item, Tincture of Marble, Flint, or other Stone.

For turning to Ruſt, two things are chiefly to be enquired: By What Corroſives it is done, and into what colours it turns: As Lead into white, which they call *Serus*; Iron into yellow, which they call *Crocus Martis*: Quickſilver into Vermilion, Braſs into green, which they call *Verdegraſs*, &c.

For Calcination, to enquire how every Metal is calcined? And into what kind of Body? And what is the exquiſiteſt way of Calcination?

For Sublimation, to enquire the manner of Subliming; and what Metals endure Subliming; and what Body the Sublimate makes?

For Precipitation likewiſe, By what Strong waters every Metal will precipitate? or with what Additaments? and in what time? and into what Body?

So for Amalgama, what Metals will endure it? What are the means to do it? And what is the manner of the Body?

For Vitrification likewiſe, what Metals will endure it? what are the means to do it? into what colour it turns? and further, where the whole Metal

Metal is turned into Glass? and when the Metal doth but hang in the Glassie part? also what weight the vitrified Body bears, compared with the crude Body? Also because Vitrification is accounted, a kind of death of Metals, what Vitrification will admit, of turning back again, and what not?

For Dissolution into Liquor, we are to enquire, what is the proper *Menstruum* to dissolve any Metal? And in the Negative, what will touch upon the one, and not upon the other? And what several *Menstrua* will dissolve any Metal? And which most exactly? *Item*, the process or motion of the Dissolution? The Manner of Rising, Boiling, Vaporing? More violent, or more gentle? Causing much heat, or less? *Item*, the quantity or charge the Strong-Water will bear, and then give over *Item*, the colour into which the Liquor will turn? Above all, it is to be inquired whether there be any *Menstruum* to dissolve any Metal that is not fretting and corroding; but openeth the Body by sympathy, and not by mordacity or violent penetration?

For sprouting or Branching, though it be a thing but transitory, and a kind of toy or pleasure; yet there is a more serious use of it: For that it discovers the delicate motions of spirits, when they put forth and cannot get forth, like unto that which is in vegetables.

For Induration or Mollification, it is to be enquired, what will make Metals harder and harder, and what will make them softer and softer? And this enquiry tendeth to two ends.

First, for use; As to make Iron soft by the Fire, makes it malleable.

Secondly, Because Induration is a degree towards Fixation; and Mollification towards Volatility: And therefore the inquiry of them, will give light towards the other.

For Tough and Brittle, they are much of the same kind with the two former, but yet worthy of an Inquiry apart: Especially to joyn Hardness to Toughness; as making Glass malleable, *&c.* And making Blades, strong to resist, and pierce, and yet not easie to break.

For Volatility and Fixation, it is a principal Branch to be enquired. The utmost degree of Fixation is, That whereupon no Fire will work, nor Strong-water joyned with Fire, if there be any such Fixation possible: The next is, when Fire simply will not work without Strong-waters: The next is, when it will endure Fire not blown, or such a strength of Fire: The next is, when it will not endure Fire, but yet is malleable: The next is, when it is not malleable, but yet it is not fluent, but stupified. So of Volatility, the utmost degree is, when it will flee away without returning: The next is, when it will flee up, but with easie return: The next, when it will flee upwards, over the Helm, by a kind of Exufflation, without Vaporing;

The

The next is, when it will melt, though not riſe; And the next, when it will ſoften, though not melt. Of all theſe, diligent enquiry is to be made, in ſeveral *Metals*; eſpecially of the more extream degrees.

For Tranſmutation or Verſion, if it be real and true, it is the furtheſt point of Art; and would be well diſtinguiſhed from Extraction, from Reſtitution, and from Adulteration. I hear much of turning Iron into Copper; I hear alſo of the growth of Lead in weight, which cannot be without a Converſion of ſome Body into Lead: But whatſoever is of this kind, and well approved, is diligently to be inquired, and ſet down.

THe fourth Letter of the Croſs Row, is Reſtitution. Firſt therefore, it is to be enquired in the Negative, what Bodies will never return, either by reaſon of their extream fixing, as in ſome Vitrifications, or by extream Volatility.

It is alſo to be enquired of the Two Means of Reduction; and firſt by the Fire, which is but by Congregation of Homogeneal parts.

The ſecond is, by drawing them down, by ſome Body, that hath conſent with them: As Iron draweth down Copper in Water; Gold draweth Quick-ſilver in vapor; whatſoever is of this kind, is very diligently to be enquired.

Alſo it is to be enquired, what Time or Age will reduce without the help of Fire or Body?

Alſo it is to be enquired, what gives Impediment to Union or Reſtitution, which is ſometimes called Mortification, as when Quick-ſilver is mortified with Turpentine, Spittle, or Butter.

Laſtly, it is to be enquired how the Metal reſtored, differeth in any thing from the Metal raw or crude? As whether it becometh not more churliſh, altered in colour, or the like?

THE BOOK-SELLER UNTO THE READER.

Received some Moneths since these Articles of Enquiry, touching Metals and Minerals, *from the hands of the Reverend Dr.* Rawley, *who hath published several of the Lord* Verulams *Works since his Death. (He having been his Lordships Chaplain) and who hath been careful to Correct at the Press this little Piece (an Addition to the* Natural History) *according to the Original Copy, remaining amongst his Lordships Manuscrips: Amongst which there is nothing more of that subject to be found, so as no more Additions can be expected.*

W. Lee.

FINIS