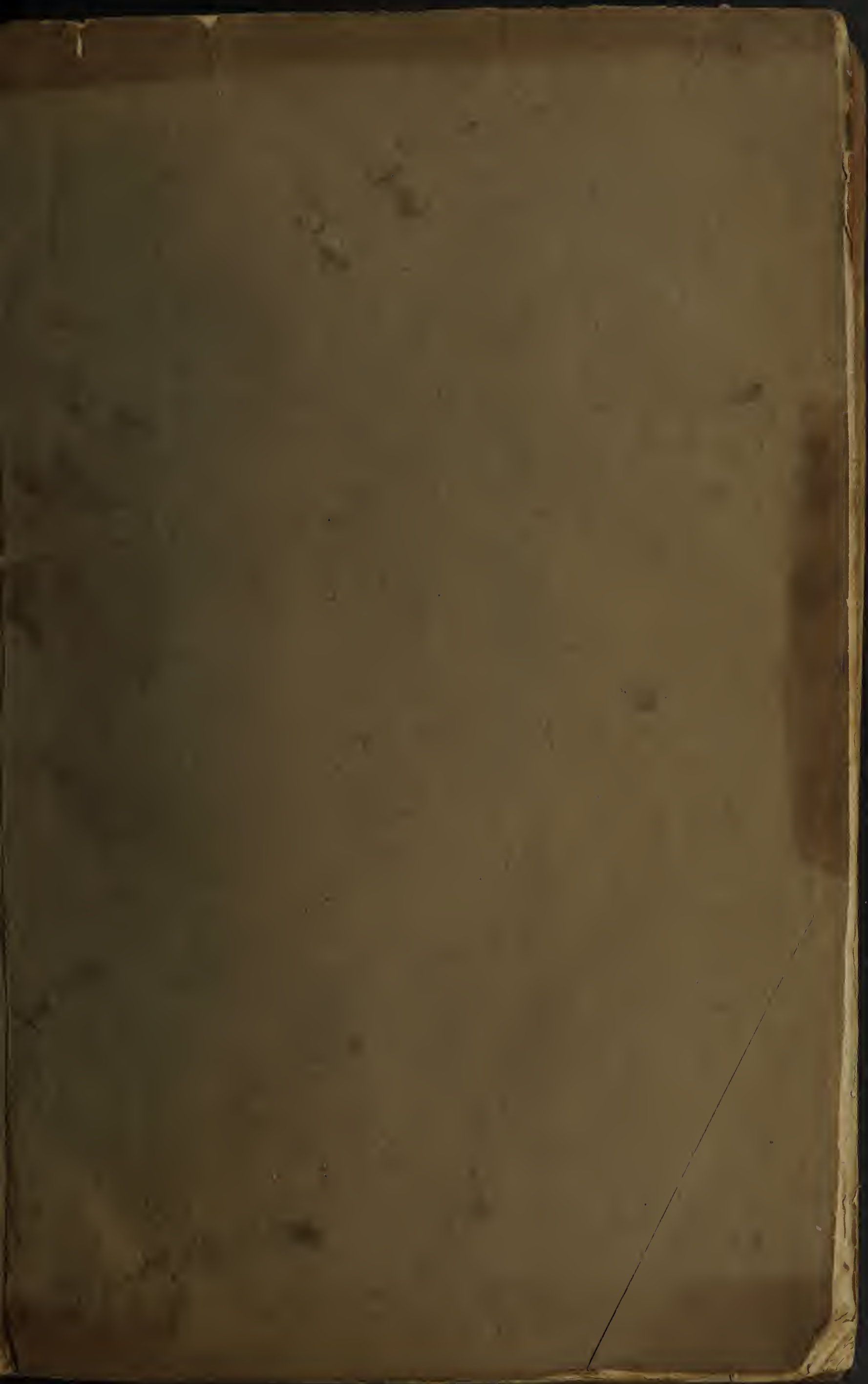




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THIRTEEN BOOKS  
OF  
NATURAL  
PHILOSOPHY:

VIZ.

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| I. <i>Of the Principles, and common Adjuncts of all Natural Bodies.</i> | } | } | V. <i>Of Minerals and Metals.</i>                           |
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PART  
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PHILOSOPHY

VIZ

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3. The Principles of Philosophy	3. The Principles of Philosophy
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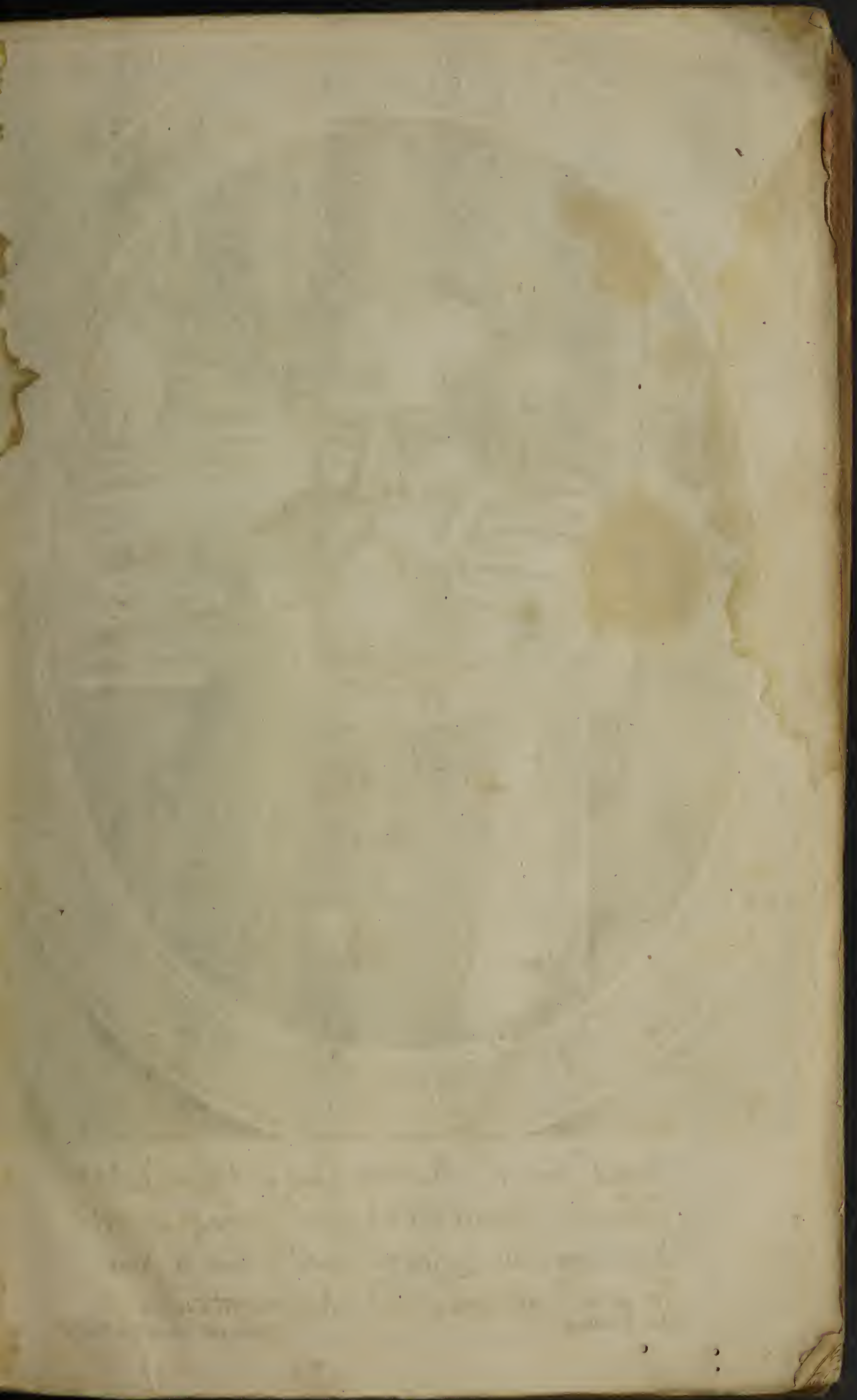
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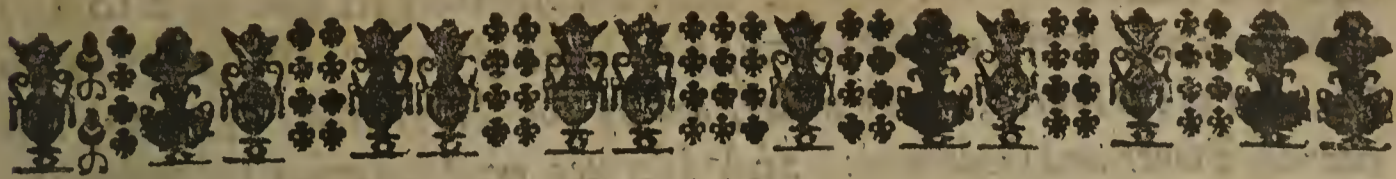




Would you the Marrow know of Physicks Art?  
Then see SENNERTVS here exprest in part:  
Such were his Lookes; who hardly had his peere  
For nimble wit and sollid Judgement cleare.

Peter Cole Printer.

Abdiah Cole Doctor of Physick.



T O

The most High and Illustrious Prince and Lord,

T H E

L O R D A U G U S T U S J U N I O R,

Duke of *Brunswick* and *Lunæburg*, &c.

*My most Gracious Lord,*



W any where in the whol World the Wisdom and Almightyness of the most good and great God does appear (most High and most Illustrious Prince, my most gracious Lord) in the Contemplation of Natural Things, it does most cleerly shine forth. For who is it that contemplates this admirable Frame of the World, and therein the Sun, Moon, and other Cœlestial Bodies, considering their most bright Light, most powerful Faculties, sundry turnings and returnings, and yet for so many Ages so certain and regular, but that he must needs acknowledg a most wise and Almighty Creator? who that views this vast Region of the Air, and the Clouds therein flying and hanging over our Heads, and the Rains, Snows, Hails, Thunders, and other Meteors? who that weighs and ponders in his mind this Globe of Earth whereon we tread, hanging by Geometry in the empty Air, and therein the high Mountains, steep Hills, low Valleys, plain Fields, and these beset with so many Trees, Shrubs, Herbs, Flowers, and Fruits, affording food to so many sorts of living things which fly in the Air, creep and walk on the surface of the Ground; so many Fountains, Brooks, Rivers, and the Seas themselves, and in them a countless crowd of Fishes? and in the Bowels of the Earth so many sorts of Minerals, Mines, and Metals, so many Fires burning for so many Ages together, and the Waters with great violence rushing and rowling through the Bowels of the Earth without destroying the same? Who I say that sees and considers all this without admiring the wisdom and almighty power of

A

God

*The Epistle Dedicatory.*

God the Maker? Of whom St. Paul himself in the first to the Romans, thus writes; *The invisible things of God are cleerly seen by the Creation of the World, being understood by the things created; namely his Eternal Power and God-head: and Hermes or Mercurius Trismegistus; Man is made to behold the Works of God, and he bath admired them, and known the Creator.* But as the works of God in Nature are most wise and wonderful; so to searh into and know the same is exceeding hard, insomuch that even the Prince of Philosophers *Aristotle* himself did not blush to confess, that the eyes of our Understanding were to the Light of Nature as the eyes of Owls to the Mid-day Sun; and the most acute *Julius Caesar Scaliger* in *Exercit. 307. Sect. 27.* complains of the scantiness of our Understanding, and confesses that it is a part of Humane wisdom to be contentedly ignorant of some things; and in *Exercit. 297.* he ingeniously writes of himself (though otherwise a most acute man) I often give my self the charge to look about, remember and consider how weak the eyes of our minds are to searh into the deep Mysteries of Nature. Yet since in great and hard matters it is a thing deserving commendation, but to endeavor to do somewhat: Rare and Heroical wits in all Ages have not suffred themselves by the difficulty of Nature to be frighted from the contemplation thereof. With whom though I cannot compare my self; yet I was unwilling to lag behind, but spent a good part of my life in these Contemplations. And though I have found that common saying (*Flattery gains Friends, but True speaking breeds Foes*) to be true, not only in civil Conversation, but also in Philosophical Disputations; while I have observed that those who meerly recite and transcribe the Inventions of our Ancestors, are not so apt to be slandered and back-bitten; but those who according to the Counsel of *Seneca*, being perswaded that though our Ancestors have done much, yet that they have not done all, and that there remains yet much work undone, have endeavored to add any thing to their Inventions, have made themselves liable to hatreds and reproaches: yet have I alwaies more valued the Truth than the Friendship or Hatred of any man whosoever. And therefore I have boldly adventured these my Meditations upon certain Heads of Natural Philosophy into the publick, and having written them a yeer or two since, now I communicate the same to others

And I was desirous (*most Illustrious Prince, and my gracious Lord*) to dedicate them to the most Honored Name of your most Illustrious



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*The Epistle Dedicatory.*

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strious Highness, not so much because I would follow the fashion of this Age; but because I know, and am certainly acquainted that your most illustrious Highness is so seasoned with good Literature, that you are also able to judg of the Labors of those that profess the same. And therefore I do most earnestly beseech your most illustrious Highness, that you would vouchsafe to receive this Work of mine, such as it is with a favorable Countenance, and by the Splendor of your illustrious Name to dispel such Mists as Malevolent Persons may chance to throw about it. The most good and great God long preserve your Highness in Health and Happiness.

*Your most illustrious Highness's*

*most Devoted Subject,*

DANIEL SENNERTUS, Doctor.

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TO THE  
INGENUOUS, and FRIENDLY  
READER,

ALL  
HEALTH and HAPPINESS.

**S**OME will perhaps wonder (ingenuous and friendly Reader) that at this Age of my Life, and exceedingly taken up with other Employments, I set my self again to write Discourses of Natural Philosophy. But those only are the men wil wonder, who having in their first Studies of Philosophy disputed of some most general Questions of Nature, think they have sufficiently studied Natural Philosophy, and laying the same aside, persuade themselves that they may now pass right on to higher Disciplines (as they cal them) and to the Art of Physick it self. But the most learned Philosophers and Physitians of al Ages, have been of a far different Opinion, who acknowledg that there are infinite Treasures of Divine Wisdom lying hid in the Nature of things; in the enquiring after and bringing whereof to light, the longer and more diligently any man hath labored, the less proud he is of his knowledg, and the more free and forward to confess his ignorance, and the more he hath learned, the more he observes there is still remaining for him to learn. And doubtless if that speech of the Conick Poet be in any thing true, it is most true as touching the Comtemplation of things Natural:

*No man was ever so resolv'd in mind,  
But Age, and Use, and things themselves might teach  
Him something better, and his Ignorance shew.  
And that Device which now seems excellent,  
When thou shalt come to put the same in ure  
May seem stark naught.*

And therefore Galen bids him that would find the Truth, to judg, try, and examine what he know's, a long time together, and to consider what is agreeable to manifest experience, and what is different therefrom, and to chuse the one, and refuse the other. And therefore, I my self though in my youth I bestowed no small pains in the knowledg of Natural things: yet I observed that there were many things remaining not sufficiently known, and Experience the Mistress  
of

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TO THE READER.

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of al Knowledg, acquainted me with many things not before observed. But this is a thing which may be yet more wondred at, that since by a certain envious and malignant person I have been so abused and ill handled, because of certain Tenets differing somewhat from the common Opinions, scattered up and down in my Writings, what should move me to propound the self same things in a peculiar Treatise, which wil the more provoke and incite his fury. But in very deed, although I foresee the Calumnies and Revilings whereunto I make my self liable by so doing; yet the study of Truth, and of the knowledg of Natural things hath so far prevailed with me as to make me contemn them al, and care no more for them than I do for the barking of a Dog; especially since I cannot see the man to produce any thing which is solid, and able to move a mind studious of truth. I hear him indeed pitifully complain; *That certain cross-grain'd Wits are arrived to so great a degree of Wantonness, and vain-glorious Boldness, that they are not ashamed to overthrow and drive out of the Schools, the Doctrine and Basis of most true Principles, celebrated and preserved by the general Consent of sincere and learned Antiquity, and rightly used to this very day, against which every sound witted and pious person makes conscience to open his mouth; and to establish their own absurd, false, stinking, HERETICAL and BLASPHEMOUS Paradoxes in their room; and by so doing, to corrupt all good Disciplines, destroy the studies of the Liberal Arts, reduce Barbarism, and in this last dreggy Age of the declining World, to take away all true knowledg of things, and the solid wisdom of the Ancients; and which vainly endeavor to deny the received and eternally true Principles of venerable Antiquity, to weaken and pluck them up by the Roots; and to establish for Principles in their room, their own Tenets and Paradoxes, foolish, colder than January, impious, false Heretical, long since condemned, or lately hatched in the Brainlets of Sycophants, and full of contradictions.* But if any man shal ask what principles those are, and upon what foundations established, for the contempt and neglect whereof he makes, he makes so grievous complaints; and sticks not to load good men with such bitter revilings, and manifest lyes, which that old Lyer and Slanderer the Devil hath suggested to him, he shall find nothing but Ignorance, both of the things themselves, and the manner of Teaching, and if he go to the quick he shal find two things chiefly objected. The first is; That Forms are drawn out of the power of the matter. The other is, That in every Mixture there is a new form brought out, and the degrees of the former alwaies remaining that others do come, and that together with these new Qualities are emergent; and that Nature does assume, first universal forms, and by their means particular ones, til at last she come to the forms of Individuals; and that so she induces forms, first into the Essence, and afterwards into the existence, and the first for the last's sake. Or that Nature first induces the forms of the Essence, then of the Existence, or that the first educes the Universal forms, and by their help the particulars, until she comes unto the Individual form and existence. That those first forms are for the last, and that their Essences do not perish, nor are abolished, but that there might be a more noble form for a more noble subject, laying aside their rigor, and taking upon themselves the office of matter as it were, they submit themselves to the power thereof; and out of this mixture of qualities arising from divers forms, and the mixture of bodies the forms being preserved, and putting on the Nature of matter as it were, and power, that there arises a certain unspeakable propriety of temperament, which may rightly after a sort deserve the name of an occult Quality. You shal find withal, that there are no reasons brought to prove these  
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TO THE READER.

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these things; but that this manner of the generation of Natural things which never was in Nature, nor ever will be, is obtruded upon us like an Oracle, so that he which does not admit and reverence the same, he must be said to overthrow the Principles of Nature, to be an Inventer of new Paradoxes, absurd; and that there may be no want of Calumnies and lyes, he must be a Blasphemer and an Heretick: If moreover you shall demand what is that same venerable Antiquity, of the contempt whereof he so complains; the greatest Aristoteleans wil ingenuously confess, that they have never as yet been able to find those Principles, and such an Education of forms out of the aptitude of the matter; and therefore some wil answer that they must be ascribed to *Averroes*, others not to him neither, since places contrary thereto are found in him, but to the School-men. These (forsooth) are the eternally true Principles of reverend Antiquity; this the Consent of venerable Antiquity. But let us (truly) suppose that *Aristotle* either invented or published them; yet is not *Aristotle* (let me say with his good leave whom I admire and reverence as a great Philosopher) the most ancient, but there was a time when he was but a new Writer; for which nevertheless his Writings could not be blamed: nor was *Aristotle* all Antiquity, but there were before *Aristotle*, *Pythagoras*, *Anaxagoras*, *Democritus*, *Empedocles*, *Leucippus*, *Melissus*, *Parmenides*, *Xenophanes*, *Socrates*, *Plato*, all most learned and renowned men. And though *Aristotle* were the most ancient of all Philosophers; yet he cannot therefore be taken for the Rule of Truth. For Truth is the squaring of the Notions which are in the Understanding, not with the Notions of another man, but with the things themselves. All which things when I had weighed I would not suffer my self to be frightened from the study of searching out the truth. This also hath moved me to publish such things as I thought to have suppressed, because I observed that mine Enemies did wrest my Opinions into a strange sense which nere came into my mind, and charge me with Opinions that I never held. I thought it therefore more convenient (Friendly Reader) that you should know my mind from this Writing of mine own, rather than from those of other men. Out of which also thou shalt understand, That I was not the first that spread abroad these Opinions, which the envious and malignant Adversary does so bitterly inveigh against, and load with all the Calumnies he is able to invent: but that there have been great Philosophers, and such as have been more vers'd in *Aristotle* than this Detractor, both in former Ages, and at this day; and as in other places, so in the most renowned Universities of *Europe* the chief Professors, who have nothing to do with *Paracelsus*, who hold the same Opinions in these Points with me; and that I alone am unjustly chastised by this Detractor, and undeservedly traduced as the Setter up of a new Sect.

Accept therefore (Ingenuous Reader) with a friendly mind these second Thoughts and Meditations of mine concerning certain wonderful Works of God, wherein my only endeavor hath been to present *Nature* unto thee, which is the ordinary Power of God, such as the most Wise God hath framed her. For I am not ignorant that it is an ungodly thing stubbornly to think and hold concerning Natural things, otherwise than God hath created them. If I have attained the Truth, I have reason to rejoyce: but if in this darkness of Mans Understanding I have somtimes erred; I hope mine honest and not unprofitable endeavor wil merit pardon; Once according to *Aristotle*, those that are minded certainly to know, must of necessity learn well

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TO THE READER.

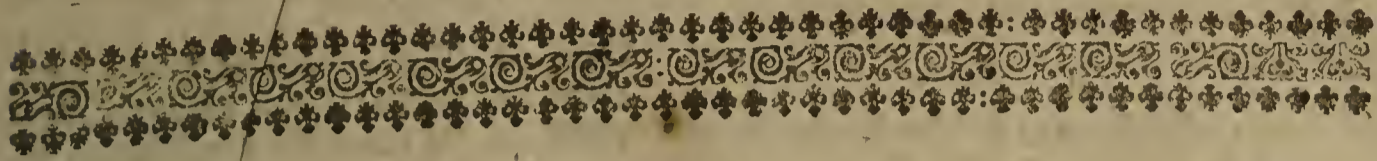
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well to doubt. I freely offer my Opinion to be considered of; and let every other man (as is in a free Common-wealth fitting) freely offer his; he shall not offend me. I have never railed against any man differing from me in Opinion, nor being provoked with railings will I return railing for railing, and reproach for reproach. For we are not only Philosophers, but also Christians, whose Duty it is not to return evil for evil, but patiently and contentedly to bear injuries.

*To profit all, hurt none, it is my Will,  
To love good Men, and to endure the ill,*

DANIEL SENNERTUS.

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is plainly set forth, *The Nature, Cause, Differences, and several sorts of Signs*; Together with the Cure of all Diseases in the Body of Man. Being a Translation of the Works of that Learned and Renowned Doctor, *Lazarus Riverius*, now living; Counsellor and Physician to the present King of France. Above fifteen thousand of the said Books in Latin have been sold in a very few years, having been eight times printed, though all the former Impressions wanted the Nature, Causes, Signs, and Differences of the Diseases, and had only the Medicines for the cure of them: as plainly appears by the Authors Epistle.

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1. *Christ's call to all those that are weary and heavy Laden, to come to him for rest, on Matth. 11. 28.*

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1 The Burden of Sin. 2. the Burden of the Law. 3. The Burden of Legal performances with the Misery of those that are under them. 4. The Burden of Corruption. 5. The Burden of Outward Affliction.

Secondly, Christ Graciously offers to them that come to him, **REST** from all those Burdens.

Wherein is shewed,

1. What it is to come to Christ. 2. That Christ requires nothing but to come to him. 3. Several rules to be observed in right coming to Christ. 4. Means to draw souls to Christ. 5. That in coming to Christ God would have us have respect to our selves. 6 That there is **NO REST** for souls out of Christ; and the Reasons thereof, with some conclusions from it.

Thirdly, There is shewed

1. The Rest Believers have from sin. 2. The deliverance from the Law by Christ is, 1 Privatively, 2 Positively. 3. The Rest Believers have from the Burden of the Law by coming to Christ. 4. How Christ gives Rest from the burden of Legal performances. 5 How Christ gives Rest from the Burden of Corruption, wherein is shewed how Sanctification and Holiness comes from Christ only. And encouragements to come to Christ for holiness. 6 How Christ gives Rest from outward affliction. 7 Some Directions how to get Rest from Christ in spiritual desertions.

2. *Christ the great Teacher of souls that come to him, on Matth. 11. 29.*

Wherein is shewed,

1. What Christs Yoke is. 2 That Believers must take Christs Yoke on them. 3 The more we are under the Yoke of Christ, the more **REST** we have. 4 Christ is the great Teacher of his Church and People. 5 In what manner Christ Teacheth, 1 He is a Meek Teacher. 2 An Humble Teacher. 6 The Learners of Christ must be **MEEK**. 7 The Learners of Christ must be humble. 8 Christ

Teacheth by his **EXAMPLE**. 9 Wherein Christs **EXAMPLE** is to be followed. 10 What kind of Pattern Christ is. 11 We must not follow the Example of the World.

We must imitate Christ in **MEEKNESS**.

1. What meekness is. 2. Learn of Christ to be meek towards God; and the Reasons thereof. 3. the Dreadful Evil of Anger and frowardness towards God. 4 Meekness towards God exemplified from Scripture examples. 5 Meekness towards Men, which consists in ordering Anger. 1. To the right Object. 2. To the right Time. 3. To the right measure. 4. To the right end &c. 5. The sad effects of Anger. 6. the Excellency of Meekness. 7. Promises made to meekness. 8. Many vain Reasons and Pleas for Anger answered. 9. Exhortations to Meekness. 10. Means to get and keep Meekness.

3. *Christ the humble Teacher of those that come to him. on Matth. 11. 29.*

Wherein is shewed,

1. What Humility or Lowliness is Not. 2. What that Lowliness of Heart is that Christ would have us to Learn of him. 3. Arguments from the Lowliness of Christ to work Lowliness of spirit in us. 4. The properties of an humble heart towards God, 5. The Properties of an humble and Lowly heart in respect of Our selves. 6. The Properties of humility in respect of others. 1. It is fearful of giving or taking offence. 2 It gives due honor to all. 3. It is tender to others. 4. It's not needlessly singular from them. 7. The Excellencies of Humility. 8. Humility brings **REST** unto the soul, 9. Means to get Humility.

4. *The only Easie way to Heaven. on Matth. 11. 30.*

Wherein is shewed,

1. The way to Heaven that Jesus Christ teacheth, is an Easie way. Six Evidences thereof. 2. The Difference between the **EASE** a carnal heart hath, and the **EASE** a gracious soul hath in Religion. 3. The Reason why some gracious souls complain of difficulty in Gods waies. 4. What it is that makes the waies of God so Easie. 5. Consequences from the easiness of Gods waies. 6. Directions how we may make the waies of God Easie.

5. *Gospel Reconciliation, Or Christs Trumpet of Peace to the World. Wherein is Opened, Gods exceeding willingness to be Reconciled to Man; And Gods sending his Embassadors to that End. From 2 Cor. 5. 19, 20, 21.*

6. *The Rare Jewel of Christian Contentment, on Phil. 4. 11. Wherein is shewed, 1 what Contentment is. 2 It is an Holy art and mystery. 3 The Excellencies*

cellencies of it. 4 The evil of the contrary sin of Murmuring, and the Aggravations of it.

7. *Gospel-worship*, on *Levit. 10. 3.* Wherein is shewed, 1 The Right Manner of the Worship of God in General; And particularly, In hearing the Word, Receiving the Lords Supper, and Prayer.

8. *Gospel-Conversation*, on *Phil. 1. 17.* Wherein is shewed, 1 That the Conversations of Beleevers must be above what could be by the Light of Nature. 2 Beyond those that lived under the Law. 3 And suitable to what Truths the Gospel holds forth. To which is added, *The Misery of those Men that have their Portion in this life only*, on *Psal. 17. 14*

9. *A Treatise of Earthly mindedness* Wherein is shewed, 1 What Earthly-mindedness is. 2 The great Evil thereof, on *Phil. 3. part of the 19. vers.* Also to the same Book is ioyned, *A Treatise of Heavenly-mindedness, and walking with God*, on *Gen. 5. 24,* and on *Phil. 3. 20.*

10 *An Exposition* on the fourth, fifth, sixth, and seventh Chapters of the Prophecie of *Hosea.*

11 *An Exposition* on the eighth, ninth, and tenth Chapters of *Hosea.*

12 *An Exposition* on the eleventh, twelfth, and thirteenth Chapters of *Hosea.* being now compleat.

13 *The Evil of Evils*, or the exceeding sinfulness of sin, on *Jab. 16. 21.*

14 *Precious Faith*, on *2 Pet. 1. 1.*

15 *Of Hope*, on *1 John, 3. 3.*

16 *Of walking by Faith*, on *2 Cor. 5. 7.*

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- 1 What Unbelief it is that is here spoken of.
- 2 The best way to deal with Unbelief.
- 3 That Unbelief is a sin against al the Attributes of God.
- 4 That Christ wil not bear with this Sin of Unbelief.
- 5 That we should be quick and ready to believe.

6 Motives to endeavour for readines to believe.

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- 2 Several Arguments provoking us to Believe the greatness of the sin of Unbelief.
- 3 Many Objections answered.
- 4 Several sorts of this sin of Unbelief.
- 5 Means to convince us that Unbelief is so great a sin.
- 6 Though the sin of Unbelief be very great, yet it's pardonable.
- 7 God hath pardoned Unbelief, and wil pardon it.

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- 1 That Persons that are Believers are Receivers.
- 2 That to Receive is the Principal use of Faith.
- 3 That nothing should hinder our Receiving. 1 Not our sins. 2 Nor Gods delays. 3 Nor the smalness of our receipts. 4 Nor the greatness of our wants
- 4 How Faith Receives.
- 5 That Faith Receives Christ. 1 In the Understanding. 2 In the wil.
- 6 The temper of a man that hath faith.
- 7 The necessity of Faith.
- 8 Though Faith be smal, yet it makes us the Sons of God.
- 9 The Nature of true Faith.
- 10 There are but few that Receive Christ.
- 11 Three sorts that come not to Christ. 1 Such as Receive him not as he is. 2 Such as delay their coming to him. 3 Such as give not that place to Christ in their hearts that is fitting for him.

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- 1 It is the Duty of al as they would obtain Eternal Life to beware of Covetousness.
- 2 The Reasons of the Doctrine. 1 It is a spiritual sin. 2 It overspreads the whol man. 3 It's opposite to the Nature of Godliness and Religion. 4 It's the womb and seed of al sin. 5 It's a base sin.
- 3 The dangerousness of Coverousness 1 It is hardly avoided. 2 It is difficultly cured.
- 4 You shal have al things needful for this life if you wil look after Grace.
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4 That the happinels of our being in Heaven, is to see Christs Glory.

5 That there is much wanting in the knowledg of Gods Love, in the most able Saints.

6 That the Lord Christ lends dayly direction, according to the dayly need of his Servants.

7 That it is the desire and endeavor of our Savior, that the dearest of Gods Love, which was bestowed on himself, should be given to his faithful servants.

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4 The work of God is free: And the day of Salvation, is while this Life lasts, and the Gospel continues.

5 God calls His Elect at any Age, but the most before old Age.

6 The soul is naturally setled in a sinful security.

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- 2 Stubborn and Bloody Sinners, may be made broken-hearted.
- 3 There must be true sight of sin, before the heart can be broken for it.
- 4 Application of special sins by the Ministry, is a means to bring men to sight of, and sorrow for them.
- 5 Meditation of sin, a special means to break the heart.
- 6 The same Word is profitable to some, not to others.
- 7 The Lord sometimes makes the Word prevail most, when it is most opposed.
- 8 Sins unrepented of, makes way for piercing Terrors.
- 9 The Truth terrible to a guilty conscience.
- 10 Gross and Scandalous Sinners, God usually exerciseth with heavy breakings of heart, before they be brought to Christ.
- 11 Sorrow for sin rightly set on, pierceth the heart of the sinner throughly.
- 12 They whose hearts are pierced by the Word, are carried with love and respect to the Ministers of it: and are busie to enquire, and ready to submit to the mind of God.
- 13 Sinners in distress of Conscience, are ignorant What they should do.
- 14 A contrite Sinner sees a necessity of coming out of his sinful condition.
- 15 There is a secret hope wherewith the Lord supports the hearts of contrite sinners.
- 16 They who are truly pierced for their sins, do prize and cover deliverance from their sins.
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# THE FIRST BOOK.

## Chap. 1. Of Philosophy in General.

**T**He words *Sophia* and *Philosophia*, are of kin one to another; the former being of more Ancient use then the latter. For those Men who were by the French termed *Druider*; by the *Ægyptians*, *Priests*; by the *Persians*, *Magi*; by the *Indians*, *Gymnosophists*, *Brachmans* and *Samanei*; being persons wholly employed in the Inquisition of Truth, and reputed to excell all others in the knowledg of great and excellent things: they, by the Ancient Greeks were termed *Sophoi* and *Sophistai*, that is to say Wise-men or Sages.

And, Because this Title, seemed in it self, too much favoring of Arrogance; and many men void of all true Wisdome, did for gaine or honors sake, make profession thereof, terming themselves *Sophous* and *Sophistas*, that is to say, Wise Men or Sages: *Pythagoras*, both to avoid the Arrogance of that Title (for God alone is truly wise) and to distinguish himself from such men as were wise only in Name, also to declare that Wisdom is no common thing, nor within the reach of every Man; was the first that changed this Name, refusing to be called *Sophos*, that is to say a Wiseman or Sage, and choosing in stead thereof the Title of *Phylosophos*, a Phylosopher, or Lover of Wisedom; as we find it recorded by *Cicero* in the first Book of his *Tusculans* Questions, and by *Plutarch* in his Third Book of the Opinions of Phylosophers, Chap. 3.

The Novelty of this modest Title was so pleasing to learned Men of all Sects, that they chose all by common consent to be called Phylosophers, Lovers of Wisedom, rather then *Sophoi* or *Sophistai*, Wisemen or Sages. So that, if we consider the Original of the word, *Sapientia* and *Philosophia*, Wisedom and Phylosophy, are of one and the same import.

Howbeit, The Word *Sapientia*, is commonly taken in a more strickt sence, so as to signifie the Metaphysicks, as being reputed the most sublime and excellent of all Theoretick Sciences and consequently termed *Prote Sophia*, the principal part of Wisedom, and *Prote Philosophia*, the most excellent Phylosophy. Whereas on the contrary side, the same word *Sapientia* or Wisedom is used in a larger sence by *Aristotle* in the sixth Book of his *Ethicks* written to *Nichomachus*, Chapter, 7. where it is attributed unto Artificers and *Phydias* a carver in stone and *Polycletus* a maker of Statues; are termed *Sapientes* or wise Men.

But as the word Phylosophy is sufficiently known to all men; so are there very few that understand the true definition of the thing it self. For those main Definitions thereof, which go up and down among learned Men, are rather descriptions and *Encomiums*, then right Definitions. *Plato* describing the same in his *Dialogue* termed *Phædo*, calls it *The contemplation of Death*. For, there being a twofold kind of Death, the one natural, which is a Separation of the Soul and Body; and the other such a Death as whereby the Soul continuing in the Body, is weaned from Earthly things, abandons vicious desires; and gives it self wholly up to the Contemplation of the most Excellent Objects: and seeing Phylosophy teacheth, this same Abstraction and Separation of the Soul from the Body, which is as it were the Prison thereof, and the Garment of Ignorance, whereby it is clouded; therefore *Plato*

(though Metaphorically and therefore not so fitly) defines it to be, *The Meditation of Death*. In the same sence, it is said to be *The Separation of the soul from the Body*, *An Affectation of Death*, and a *Customary course of Dying daily*. And the same *Plato* in his Dialogue termed *Theaterus* saies that *Phylosophy, is to study as much as may be to be like God*. For the Operations of God being of two kinds, *Viz.* The knowledg of all things, and that Action whereby he Rules and Disposes all: *Phylosophy* makes a man capable of both thete, as far as human Nature is capable. For she both teaches us to contemplate all things, and to guide our Actions by the Rules of Honor and Honesty.

*Cicero his Definition.* That also is a common Definition of Philosophy which was used by the *Stoicks* and by *Tully* in the Second Book of his offices, *Viz.* That *Philosophy is the knowledg of all things divine and human*. By human things understanding all things corporeal and subject to our senses; and by things divine, meaning all such things as being incorporeal are not subject to our senses, but perceptible only by the understanding. Or by the term human, such things may be understood, as tend to the Preservation and Proagation of this mortal life and civil society of mankind; and by the term divine such sublime matters as transcend vulgar Capacities.

*Aristotles Definition.* There are also certain definitions of Philosophy extant in the writings of *Aristotle*, as where in the first Book of his *Metaphysicks*, Chap. 1. he saies, it is the *Science of Truth*; and in another place (though this seems to be intended by him, as a definition of *Metaphysicks* only) he saies that, *Phylosophy is the knowledg of all things that are, not particularly, but generally considered*.

*Phylosophy cannot be exactly defined.* Nevertheless, as we said before, these are not right definitions, but either *Encomiums* and *Laudatory Elogies*, or Tolerable descriptions, not containing the true kind nor the difference of the thing defined. Yea and the very truth is *Phylosophy* cannot be exactly defined because it is not *Genus Univocum*, and has a nature distinct from its parts. Neither is it *Homonymal* (for the parts thereof agree more then barely in name) but such an one as they term *Ab uno ad unum*. For we must not think that *Phylosophy* is some one science conversant about some peculiar sort of being: but that it is the totall kind, comprehending all the Sciences in the world: For all things cannot be known by one habit of the mind, but by divers: which when they are all conjoyned, they make that perfection of knowledg, which is called *Phylosophy*. And therefore all the definitions of *Phylosophy* which are usually brought, do swerve from the perfect Law of a Definition.

*Its Definition.* Howbeit from what has been already said, we may collect this following description: *Phylosophy is an Habit of the Understanding, consisting in Wisdom and Prudence, as that which contemplates all things, and so guides the actions of a Man, as that he may attain the Summum bonum, or cheif Felicity of which he is in this Life capable*. For seeing a Man is perfected by *Phylosophy*, and thereby qualified, it must needs be a certain quality or accidental form, by which a man is made fit to perform all the actions and Duties belonging to the human Nature. And it is such a kind of quality as is not born with us (for no man is borne a *Phylosopher*) but attained, being no other then an habitual ability, not of the body (for it is not the body of a man but his mind which wants perfection) but of the understanding. And therefore *Phylosophy* is defined to be a twofold Habit of the understanding, *viz.* *Wisdom and Prudence*, under which terms *Intellection and science* are comprehended.

*The Division of Phylosophy according to the Stoicks.* We are now to consider how *Phylosophy* ought to be divided into its parts; which is a thing wherein Authors are not agreed. The *Stoicks* have divided *Phylosophy*, into natural, moral and rational; under natural *Phylosophy*, taking the phrase in a large sence, they comprehend not only *Physica* or the Doctrine of Nature, properly so called, but also *Metaphysicks* and *Mathematicks*: by moral *Phylosophy* they understand that Doctrine which regulates the manners and actions of men; and by rational *Phylosophy* or *Logick* that which teaches us how to reason, argue, and find out the truth. And the truth of this division, they thus endeavor to prove. Seeing the happiness of a man, which *Phylosophy* aims at, does consist partly in the actions of virtue, and partly in the contemplation of truth, hence two parts of *Phylosophy* arise; the one of which instructs our Manners and actions according to the Rules of virtue, and is termed *Moral Phylosophy*; the other is busied in the inquisition of truth and hunting out the secret mysteries of Nature, and is termed *Physica*, or natural *Phylosophy*. And because in the search of Truth, we are very apt to mistake, a third part is necessary, to teach us the way and method of reasoning; which from *Logos*, reason, is called *Logica*, *Logick*, or the Art of Reasoning.

But

But this Division of Phylosophy, is by very many and those very learned interpreters of the peripaterick Phylosophy, rejected, both because the word *Physica* is therein improperly used, <sup>The same refused.</sup> and because it makes *Logick* a part of Phylosophy. For the intent of Phylosophers was, to include in this division such disciplines, as treat about some real kind of being, the knowledg whereof denominates a man to be wise or a Phylosopher, and *Logick* is no such Discipline. <sup>whether Logick is a part of Phylosophy</sup> For the Reasons of things are not the subject thereof, because compared to that which truly is, they have some sort of being; for in this respect they belong to *Metaphysicks*; nor because, or in as much as they are framed by the mind of man, for so they belong to natural Phylosophy; but only as instruments, profitable to denote our first conceptions, and such things as truly are. And therefore *Logick* is not a part of Phylosophy, but the instrument of a Phylosopher, to guide his understanding, being invented not for its own sake, but for the better understanding of all other sciences. Which *Aristotle* confirms in the first Book of his *Topicks* Chap. 9. Where he calls it the Handmaid of Phylosophy, yet my intent is not contentiously to wrangle with any man that shall be of the opinion of *Pererius* in the second Book of his *Natural Phylosophy*, Chap. 18. viz. That when it is disputed whether *Logick* be a Science or a part of Phylosophy, the Controversie is rather touching words and the manner of Expression, then the thing it self; some taking the words *Phylosophy* and *Science*, in a larger, others in a more press and proper signification.

*Toletus* divided Phylosophy into three parts. *Speculative*, *Active* and *Factive*: taking the ground of his division from that Ignorance which Phylosophy cures in us, which is threefold, <sup>The division of Tolet.</sup> either of the Truth, and that part which heales this, teaching us to find out the truth, is called *Speculative* or contemplative Phylosophy; or it is Ignorance how to act and play our parts upon the stage of this world, and that which cures this, teaching us to conform our Actions to the Rule of right Reason, is called *Active* Phylosophy; or finally it is the Ignorance of things necessary to maintain and preserve our Lives, and that is healed by the *Factive* part of Phylosophy, under which is comprehended all curious mechanical Artifices. But, though <sup>The said division refused.</sup> this division be true in respect of the principal disciplines: yet is it no good division of Phylosophy. For, the *Factive* Disciplines are not to be reckoned as a part of Phylosophy; For, they do neither contemplate things divine; nor do they regulate these actions which are proper to a Man; nor is honesty the thing they aime at, but Profit, nor does the chief good and Felicity of a man consist in them. And who is there that dares reckon *Smiths*, *Carpenters*, *Joyners*, *Weavers* and such like Artificers, amongst Phylosophers? For they are only the Servants of civil Policy. And therefore *Lucian* justly derides those, which reckon Arts mechanical as a part of Phylosophy, when speaking of one that was about to dig up a Feild, he saies, that with his Spade he would play the Phylosopher.

It is therefore to be observed, that the name of discipline is of larger Extent then that of Phylosophy, and that all Disciplines are not comprehended under the Notion of Phylosophy. <sup>The name of discipline larger then of Phylosophy</sup> Yet has Phylosophy obtained this peculiar dignity, that all disciplines are either a part thereof, or fruits growing and resulting there from; or an instrument provided and fitted for its Service.

I, for my part, take that to be the truest division of Phylosophy, which is delivered by *Aristotle* in the Second Book of his *Metaphysicks*, Chap. 1. and retained by all sorts of interpreters, viz. into *Speculative* and *Practical*. The *Speculative* part, is that which contemplates all beings or things, with their Principles and Affections or Qualifications, only for knowledg and truths sake: But the *practical* part of Phylosophy is that whose subject is the Actions of Men, which it regulates according to the Rule of right reason and Honesty; and does therefore teach us not only to know but to do also. For seeing the mind which Phylosophy is to inform and frame, has two parts, the *Intellective* or understanding part, and the *Appetitive* or desiring part, they make a double end, and it makes two parts of Phylosophy; <sup>The same confirmed first from the subject</sup> the *Speculative*, which perfects the knowing or *Intellective* part of the Soul or mind, and the *practical*, which moderates the *Appetitive* part of the mind, and regulates our affections. So that the Duties of a wise man are two, to contemplate all things that are, and to performe such actions as are best, and most suitable to the Life of a man. Or more briefly, to contemplate things divine and regulate human affairs. For, after that (to use the words of *Marsilius Ficinus* in the fourth Book of his *Epistles*) the Mind of a Phylosopher, has contemplated what is the first good or goodness it self, judging in human affaires, what things are good & what bad what filthy and unseemly, and what honest & comely; what profitable, and what unprofitable: according to the pattern thereof he disposes the affairs of men; draws them from that which

is evil, and by this prudence of governing, he rules his own private Family, and the common-wealth, and teaches the lawes and waies of the Administration thereof. Nor was this division unknown to the Platonicks, For these are the two wings wherewith the mind of man flies up to Heaven, from whence being weighed down with Earthly Cogitations, it had before fallen: concerning which see *Plato* in his Dialogues cald *Phædo* and *Phædrus*, and *Marsilius Ficinus* in the first Book of his Epistles Page, 612.

*Secondly* The Verity of the said division is further demonstrated, from the end and Object. *the from* But most immediatly from its end: howbeit distinct Objects do produce distinct *Object.* ends. For seeing every discipline is conversant about some one thing or other: and there are two kinds of things, as is apparent in *Aristotle* his sixth Book of *Ethicks* to *Two kinds* *Nicomachus*, Chap. 3. Some things being necessary, others contingent, and of those *of things.* which are necessary, some are simply eternal, ungenerated and uncorrupted; others necessarily made, which though they are not alwaies but are made; yet are they not produced by us; but by nature, working by certaine causes: Now the contingent are such things as may or may not be, and whose principle is in the doer and not in the thing done, which depend upon our will, in the power whereof it is, to effect them or not. Hence we gather, there are two parts of Phylosophy, one which is busied about the things necessary, and the other about things contingent. *Thirdly* And this distinction of things, does also produce divers Ends. For either we han- *from the* *end.* dle a matter, only that we may know it, or that besides the knowledg we may effect the same: a third cannot be assigned. For the things which alwaies are or which are made, but by Nature and not by our selves, we therefore handle, that we may know their nature. For what was ever so made, as to endeavor to effect such things as are only possible for Nature, but impossible for all the Men in the world to effect? But those things which are not alwaies, and may be effected by us, we do not handle only to know them, but that their Nature being discovered we may learn to effect them. And therefore those former disciplines, which are conversant about things, not for any operation, but for knowledg sake alone, are rightly termed speculative sciences, or sciences absolutely and properly so called. But the other disciplines, which are versed in contingent things, or such things as are subject to our will, are called disciplines or sciences (the word science improperly taken) practical and operative.

*Object, 1.* Nor let any Man here object, that al Sciences and all arts do contemplate and speculate one thing or another, and direct us to the effecting somewhat or other, as Natural Phylosophy leads us to natural magick, the Art of healing Diseases &c. And in Geometry there are many Theorems which teach us to do somewhat, as to Raise a perpendicular upon a right line given. For al Sciences, absolutely, and in respect *Answer.* to their end are contemplative, and respect no action: but the other disciplines, though they are busied also in the knowledg of things: yet they do not subsist therein, but such as are active do thereby govern their actions, and the Factive have only their work made, for their end. Nor does Geometry consider those Theoremes that it may effect any thing, but only that it may contemplate the affections of its subject, and find out the Truth: But the disciplines subject thereunto, do afterwards make use of the said Theoremes, to effect somewhat, Which when they do, they pass the bounds of the higher sciences, as may be seen in Agriculture or Husbandry, and others.

*Object, 2.* Nor let that trouble us which some say, viz. That Contemplation and Action are so nearly combined, that one cannot be separated from the other. And that therefore no true difference can be assigned in this respect, seeing Contemplation it self is an action, and that therefore the sciences while they teach us to speculate, teach us

*Answer to Act.* For every energy or Operation of a Man is not termed Praxis in this Case, *what Pra-* but such as is subject to the command of the will, and seeing many Errors may hap- *xis is.* pen thereabouts, it needs a certain habit, which being inherent in the practical understanding, should be its rule as it were in acting. Now those Actions which are subject to the will are threefold. One proceeds from the will it self, as Election or *Three sorts* choice; a second proceeds indeed from another power, yet is under the command *of actions* of the will as the Operations of the wrathful and lustful faculties of the Soul: and *subject to* and touching this we chiefly speak in this place. The third of it self, is not subject *the will.* to the will, but in some respect, as the operations of the speculative understanding, are



are so far subject to the will, as they are performed at this time, and so long or so long, or according to other Circumstances. These therefore, as the former, seeing they are not simply subject to our will, do also not pertain to this place. We may therefore well grant, that contemplation is an action, that is an act according to the inward energy or operation of the Mind: but no external act, such as that is, in respect whereto, one part of Phylosophy is said to speculate, another to act. For this internal action is no way different from the knowledge of the truth, as in practical Disciplines whose action differs from the knowledge of Truth, and whose end does not rest in the truth known, but besides that, proceeds to work somewhat.

And seeing as has been said before that Phylosophy has more then one single signification; it is to be marked, that this name is attributed principally and primarily to the Speculative part, and consequently and in the second place to the Practical. For they are commonly termed Phylosophers, who apply themselves to the Sciences; and who profess themselves skilful to govern the life of man.

And this is the general division of Phylosophy: afterwards each part is subdivided. *Aristotle* in the sixth Book of his *Metaphysics* Chap. 1. Divides the speculative part of Phylosophy into *Physica*, *Mathematica*, and *Metaphysica*. Which division truly, was both received by the Ancients, and is this day in use, and has its reasons to support it. For since the diversity of Objects breeds a Distinction of sciences, it is manifest that there are no more nor fewer sciences, then the three aforesaid. For a being is considered two waies, Universally and Particularly. That Science which considers the whole and Universal state of Beings as beings, is *Metaphysica*. The other Sciences consider a being in Particular, and some sort of being. And these are two, as there is a twofold sort of beings. The one is in matter and cannot be known without matter, and this *Physica* considers: The other is indeed in matter, but it may be separated therefrom by our thought, and may be known distinct from the matter, which is handled by *Mathematica*. And therefore *Metaphysica* considers a being, only as it is a being: *Physica*, considers it as it is moveable or natural: *Mathematica* as it is abstracted from Matter. But, as *Pererius* in the first Book of his *Physica*, Chap. 7. Rightly saies it would not be absurd, if a Man should add a fourth Science, which should treat of spirits and substances separated from matter, which some at this day term *Pneumatica*. Yea it were no Absurdity to add a fifth, which should treat of such things as might be naturally known concerning God.

Again there are several sorts of Mathematical disciplines. For their subject is Quantity; which being double continual and discrete, there wil also be two Sciences purely Mathematical, Arithmetick and Geometry. Musick is subordinate to Arithmetick, from whence it borrows its principles, and considers Number as it is joyned with sound. This according to *Aristotle* in his first *Posteriora* is twofold, Mathematical and aconstick; but the former is truly and properly a Science; the Latter is rather to be termed an Art. *Stereometria* which considers the Doctrine of solid bodies is a part of Geometry. Nor is it subordinat to Geometry, because it does not consider Quantity with any Contraction, and addition of matter and sensible quality; nor is it of a middle Nature between *Physica* and *Geometria*: but purely Mathematical; seeing it quite separates its subject from sensible matter. To Geometry, *Perspectiva* is subalternate or subordinate, which considers a line as it is visible: Now Geometry and *Stereometria* do bring forth Sundry disciplines, which are in some sort of a middle Nature betwixt Mathematical and Physical: yet are they called Mathematical, because they use Mathematical principles, and considers all their subjects in relation to quantity. Such are: The Doctrine of the Raine-bowe, Astronomy, Cosmography, Geography, Chorography, Topography. Thence also afterward sundry Mechanical Arts do arise.

The other part of Phylosophy was the Practical. But *Praxis* taken in a large sense, comprehends under it *Poiesis* and *Praxis*, properly so called. Now *Praxis* or Action differs from *Poiesis* or working, according to *Aristotle* in the sixth of his *Ethicks* to *Nicomachus* Chap. 4. and the first Book of his *Magna Moralia* Chap. 35. In that Action does leave no Work behind it: but Working or *Poiesis* is such an Operation as leaves a work behind it. From this twofold signification of the word Practice, two kinds of disciplines arise, Active disciplines, and Factive disciplines. The factive are the Arts, as was said before, and do not belong to Phylosophy. But the

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the active part of Phylosophy is divided into *Ethica*, *Politica* and *Oeconomica*.

*The utility and necessity of Phylosophy.* As to the Utility of Phylosophy, though that be chiefly to be regarded in the Practical part: yet has the speculative also its profit, of which we read much every where in Authors. Two Testimonies shall suffice in this place. The first is that of *Hermes Trismegistus* in his Book Entitled, *Of Piety and Phylosophy*. He that is pious and Godly is an exact Phylosopher. For without Phylosophy it is impossible to be perfectly religious. But he which knowes the things that are, and how they are ordered, and by whom, and for whom: he will give thanks to the cheife workmaster, as to a good Father, a loving Nurse and a faithful Steward: And he that gives thanks is Godly; and he that is Godly and Pious, shall know, both where the truth is, and what it is, and the more he learns, the more godly will he grow. The Second is that of *Scaliger*, in his 307. Exercitation Sect. 3. The Searching into these subtilties, although it be not profitable to make Windmills or watermills to grind Corn; Yet it scoureth off the rust of Ignorance from our Minds and whets and prepares it to the knowledg of other things; in a word fills it with so much splendor, that it can light it self to gain the similitude of the first workmaster: who as he is fully and perfectly all things, and besides and above all things: so he will have those to be his, that are studious of the Sciences; and has made their understanding, Lord of all things.

*The pleasure of Phylosophy* Finally, How great the pleasure is which arises from the knowledg of Phylosophy and chiefly the Speculative part thereof, *Aristotle* teaches in his first Book de Partib. Animal. Chap. 5. I shall here set down what *Cebius Rhodiginus*, in the seventh Book and Chap. 30. of his *Antiquæ Lætionæ*, Cites out of *Maximus Tyrius*. You know, saith he, what it is that I think the Speculation of a Phylosopher does most resemble? Viz. A manifest, clear and flying dream. For his Body remaining safe and sound, his mind runs al the world over; it is carryed from Earth to Heaven; it passes over the whole Ocean Sea; it flies through the whole Aire; with the Sun it compasses the Earth, with the Moon it walkes the round; it joynes it self to the dance of the other stars, and comes little short of bearing a share with Jove himself, in the Mannagement of all things: O Happy Pilgrimage! O Beautiful shewes! O most true and real Dreams!

## Chap. 2. Of the Nature of Physica, or Natural Phylosophy.

SEing we are to treat of Natural things, it is altogether requisite, that we declare in the first place what Discipline that is which treats of Natural things, which we cannot do more conveniently then by enquiring into the kind and subject (from whence the difference in definition of Sciences is taken) of *Physica*, or Natural Phylosophy.

*The Genus or kind of Natural Phylosophy* As to its kind, though some do ill in confounding Art and Science; yet all true Phylosophers and Peripateticks are agreed, that *Physica* or Phylosophy natural, is a Science: since the definition of a science does properly agree thereto. For it demonstrates in a necessary subject the proper affections by the proper Causes: as very many demonstrations touching things natural, do witness. And so also it is called by *Aristotle*, in the Third of his *Physicks*, Chap. 4. Text, 24. and the Second of his *Metaphysicks*, Chap. 3. Text the Third, and the same is by him plainly proved, in the Fourth of his *Metaphysicks*, Chap. 5. Text the 23. And although it be reported that of old, *Heraditus*, *Cratylus*, and *Pythagoras*, held there was no knowledg of natural things, but only opinion; and *Socrates* being discouraged by the Mutability of natural things, and because he thought he had no certain knowledg of them, leaving the same, gave himself wholly to moral Phylosophy; Also *Democritus* complained of the deep pit of truth which had no bottom, and *Empedocles* of the narrow passages of the senses: yet it seemes most probable that these Phylosophers did not deny all knowledg, but rather modestly dissembled their own knowledg, then confessed their Ignorance; seeing what we know in comparison to what we know not, is little more then nothing; and taxed their Arrogance who did vainly boast of their own Wisdome. And as for the new Sect of *Academicks* who did not only deny that there was any knowledg of things natural, but that there was any knowledg of any thing, they are else where refuted. Nor let that trouble us, because in natural Phylosophy many times probable Reasons are invented. For these take not away

*whether it be the knowledg of Natural things.*

away from the necessity of the Sciences truth, but do often prepare and fence the way to following demonstrations, or are used to declare the principles.

We must therefore hold that *Physica* or Natural Philosophy is a science and that properly so called, viz. A speculative science, as appears out of *the sixth of Aristotles Metaphysicks Chap. 4.* And out of *the first of Metaphysicks Chap. 6.* Although it be in a manner superfluous to ad the term speculative, seeing if we take the word Science properly, all Sciences are speculative: now words are not to be improperly used in Definitions.

Now as concerning the necessary truth of *Physica* or Natural Philosophy, we must observe, that there are in this Science two sorts of Propositions; some are alwaies and simply necessary, as the fire burnes: the knowledg whereof is most properly called Science: others are necessary for the most part, concerning such things, as are in their subject, only in a certaine state, or for the most part, and when all impediments are removed; as a Man is born in the ninth Month, with two hands, two Eyes, two Kidneys. For these dispositions are of a middle Nature betwixt contingent and necessary, and therefore some do call them necessary, by a Physical or natural Necessity.

Now before we speak of the subject of *Physick* or Natural Philosophy, some things are to be premised concerning the word subject. For this word has sundry significations. 1. A subject is that wherein there are accidents. 2. A subject is that part of a proposition of which somewhat is affirmed. 3. The matter is termed a subject in respect of its forme. 4. A thing is said to be a subject in respect of some Action and Operation; and it is that about which the Artist or workman is employed and whereupon he exercises his Labor. 5. That is termed a subject, which is handled in any Science. Now it is so called, because it is subjected to such accidents and affections as are demonstrated therein, as also because our knowledg is conversant thereabout. And in this last acceptation, we do here take the word subject: in which sence nevertheless, it is taken divers waies. For first in a more large signification, all that is termed subject, whereof we treat in any Science, whether it be a principle, an affection and accident, or any other thing. But properly that thing or matter which is therein considered is called the subject of a Science, which subject has these Properties. First, That we know that it is in Nature alwaies and necessarily, and what the name thereof signifies. And therefore the subject is never demonstrated in its proper Science. For seeing it is the Basis and Foundation of all things delivered in the Science, if that shal be called into Question, denied, and taken away, all things that are said thereof, are denied and taken away. The Second condition is, that it have proper affections or dispositions, and proper principles, of all which it is the Basis and Foundation. And therefore a subject, in that Science wherein it is a subject, is not considered as inherent in any other thing; and every thing that is considered in any Science, as being inherent in some other thing, is not the subject of that Science. The third is, that it be adæquate or commensurate to the whole Science, and not wider or narrower then it, and that all things which are delivered in the Science, do pertain to the Explication thereof. Of a subject thus considered there are two parts: one is as it were the matter, and is termed the thing considered; the other is in stead of the form, and is termed the manner of considering. The thing considered, may be common to many disciplines; but the manner of considering, which contracts the thing to a certain and peculiar way of consideration, is proper to every Science, and thereupon properly depends the distinction of Sciences.

Touching this Adæquate subject of Natural Philosophy, there is some difference amongst authors, most of the Greek Interpreters of *Aristotle*, do make the subject of this Science to be *Corpus Naturale*, a Natural Body; *Thomas Aquinas* saies it is *Ens Mobile*, a Moveable being; *Albertus* and *Ægidius* say it is *Corpus Mobile*, a moveable Body; *Scotus*, wil have it to be, a Natural substance; *Tolet* makes it, a Natural Being; others say it is Nature, by nature understanding God and Angels and al Bodies, others again wil have it to be nature, meaning thereby al things pertaining to natural Bodies such as are not only the compound bodies themselves, but also their principles and affections or dispositions: others say it is *Ens Mobile*, a moveable being, not only, as *Thomas Aquinas*, understanding thereby, a moveable Body, but also the matter

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and forme: others will have it to be *Corpus Naturale Mixtum*, a mixt natural Body: others, a Body subject to generation and corruption.

*The true opinion.* It is not worth the while to produce in this place, all the Arguments that are brought to justify these several opinions. I approve only of the first opinion, which saies the subject of this Science, is a natural Body. To this opinion (as shall be said hereafter) I conceive the four following may be reduced; and most learned men conceive that the strife is more about words then the thing it self, and that herein lies the controversie, how the subject of this Science, the thing it self being agreed upon, should be called: whether a Natural Body, a moveable being, a Natural substance, a Natural being: and therefore these other opinions are to be reduced to the first, or are simply to be rejected, as the latter five.

*The adequate subject of Physick. Natural, how many waies understood?* The adequate subject therefore of Natural Philosophy is a natural Body, in as much as it has in it Nature, that is to say a principle of motion and rest. For Natural is taken three waies. First, For that which is essential to any thing, and belongs to the very essence or being thereof: Secondly, For every thing which concerns the knowledg of Nature; in which sense, both the first matter and form and accidents of a Natural Body, are termed Natural: Thirdly, And properly it is taken for that which has Nature in it, that is to say, a certain internal principle of motion and rest; and so neither motion, nor matter is termed Natural, but only Bodies compounded of matter and forme. And seeing the Adequate subject of a Science, as was said before, consists in the thing considered, and the manner of considering the same: the thing considered in this Science, is a body, and the manner of considering is, in as much as it has Nature in it, that is to say. A principle of motion and Rest. For although every Body has in it a principle of motion, and that which has in it a principle of motion is a body; yet in as much as a body may be considered, not only as it has in it a principle of motion, but in divers other respects: by this consideration, Natural Philosophy is distinguished from other disciplines, which do also treat of a Body.

*Confirmation of the Opinion propounded.* And that what has been said touching the subject of this Science, is true, may hence appear: in that all the proprieties of the subject of a Science do agree hereunto. For it is fore known what it is, and what the name thereof signifies, it has its proper principles matter and form; its proper affections as motion, place, time &c. nor is it in this Science, inhærent in any other thing, and it is Adequate or commensurate to the whole Science. For all things delivered in Natural Philosophy, are either the principles of a natural Body, or its affections, or its kinds and sorts. The same also is apparent from *Aristotle*. For as to the thing considered in this Science, that it is truly said to be a Body, appears from the *Beginning of his Second Book of Physicks, and his 3. de Cælo Chap. 1. and his first de Cælo*: Where he tels us that the Science of Nature is conversant about Bodies, and that it considers their principles and affections.

And that the manner of considering is, in as much as the same Body has nature in it, is apparent from the beginning of his Second Book of Physicks. For seeing all things are distinguished from other, by their form; and things natural differ from artificial and non-natural things, because they have the principle of their motion in themselves, but the other only by accident: doubtless, to have in it self a principle of motion, is in stead of the form, and the formal reason of the subject, whereby a Body, the thing considered in Natural Philosophy, is differenced from all other things. The same is confirmed by *Aristotle*, in the Second Book of his Physicks, *Chap. 7. Text 70. or 71.* Where he saies: *What ever things move being themselves moved, do belong to the consideration of Natural Philosophy &c.* For he teaches, that those things only are considered by a Natural Philosopher, as his subject, which have in themselves a principle of motion. Howbeit, other things may also be considered in natural Philosophy, which have not in them a principle of motion, but it is as they are principles or Accidents to bodies Natural, but not as the proper subject of the Science of Nature. Which is manifest from the 73. of the same Book, where he saies, that there are some principles Physically moving, but not Physical; that is to say not considered as the subject of *Physica* or natural Philosophy, because they have not in themselves a principle of motion. And this is the true Opinion concerning the subject of this Science, to which, as was said, the following four

*The Differing opinions Reconciled.*

Opinions

Opinions must be reduced, or rejected. For seeing these Opinions contain two manner of considering the subject, the one, as it is moveable; the other, as it is Natural: both of them do signifie, indeed, nothing else, but Nature having in it a principle of motion. For since moveable, may be taken two waies, as for that which hath an aptitude to motion, which is a certain affection of a natural thing; or for that which hath Nature in it, that is matter and forme, or the Principle from whence such aptitude arises: moveable cannot be taken here in the former sense, but only in the latter. Because the passion of a subject cannot be its *Ratio Formalis*, or formal Constitutive consideration; and with its subject it makes a thing which is accidentally one, and is later then its subject, of which it may also be demonstrated. Hence therefore would follow this Absurdity, that the subject, *viz.* A thing moveable, should in its proper Science, be demonstrated by its proper Cause, *viz.* Nature. And therefore, *Moveable* cannot be taken for a passion, but for the reason and essential degree of a Body, from which of it self motion arises. In sense it denotes nothing else, but natural, or that which hath Nature in it. Howbeit, if we shall accurately weigh the matter, the manner of considering is better and righter described by the term Natural, or that which hath Nature, then by the word Moveable. For seeing *Natural* includes both motion and rest, and *Moveable* only motion; the former is commensurate, the latter not. And therefore either we must take *Moveable* for Natural, and that which hath Nature, or we must reject it as less Proper and not commensurate. Since from all which hath been said it appears, that *Natural*, or in as much as it hath Nature in it, is the true manner of considering the subject of this Science, therefore by all means we must make the thing considered to be equal therunto. But if we shall consider all things which are placed in the Predicament of substance, we shall find nothing but *Body* equal therunto. For what ever hath in it a principle of motion is a Body, And therefore it must needs be, that both Ends of Being, and substance, are taken for a Body, But a Body in as much as it hath Nature in it, is more properly said to be the subject of natural Philosophy, because to have Nature is accidental to *Substance*, and to *Being*, unless they be taken in a prick sense for a Body. Nor is there such a proportion betwixt *Substance*, *Being*, and *Natural*, as ought of necessity to be, betwixt the thing considered and the manner of consideration. For *A Being* is not said to be *Moveable*, as it is a *Being*; for to every *Being* should be *Moveable*.

And if there be any that will not allow their opinion to be thus corrected, and will endeavor to obtrude upon us, somewhat more common, or more narrow, for the subject of natural Philosophy, they are justly to be reproved. For those that will have God himself, the Intelligences, and Angels, to be handled in Natural Philosophy, as the subject thereof: truly they do absurdly and unskillfully confound things abstract and simple with bodily things and such as are overwhelmed in matter. For seeing these things are exceedingly different, how can any man assign to them one manner of consideration, which is the thing which makes a Science to be one?

Nor do those men think aright, who make Nature the subject of natural Philosophy; understanding, thereby, both the principles, and affections, and Compounds. For they do not rightly use, neither the word *Subject* nor the word *Nature*. For a subject properly so called, whereof we discourse in this place, is not taken for every thing that is handled in a Science, but for that whose conditions are such, as have been set down before, and which is distinguished from the Principles and Affections. Again, they do ill in confounding *Nature* and a thing *Natural*; which they might easily learn, out of *Aristotles* second Book of *Physicks* Chap. 1. where the Philosopher shews us, how *Nature*, *Natural* and *according to Nature*, differ one from another.

Also we approve not their opinion, who conceive that *Ens Mobile* a *Moveable Being* is to be counted the subject of this Science; and by *Mobile* they understand also the matter and the form. For nothing is called moveable, but that which is the subject of motion: and nothing hath in it a principle of motion but a Body. For matter is not moved of it self, but by accident, *viz.* In as much as, it is a part of that Body which is moved. But if to be whatever hath any relation to motion, should be called moveable all things explained in this Science, will be several sorts of its subject, and therefore there will be no Principles, no Affections or adjuncts, different therefrom.

And as we have rejected their opinion, who make somewhat more common then a Natural Body, to be the subject of this Science, so can we not agree to them, who will have the subject thereof, to be somewhat more narrow. For some make the *thing considered* to be, a Natural Body transitory, or subject to mutation: others, a Natural Body mixt. Yet they agree in the manner of consideration, which both make to be *in as much as it is Movable*. But they both are in an Error. As to the thing Considered; because the former reject the Heavens; the latter both the Heaven and Elements, from being sorts of the subject; and will allow them to be only Principles thereof. For things must be so handled and considered, as they are constituted by Nature. Seeing therefore the Heaven and Elements are so produced by Nature, as not only that they should be the Principles of other things, but also, that as peculiar sorts of Bodies, they might compleat the Universe: they are to be known and handled both waies. As we see *Aristotle* hath also done; who explained them after the former manner in his Book of Generation and corruption; after the latter in his Books touching the Heavens: in which Books, what ever is said of the Heaven and Elements, is said without any respect to mixt Bodies. As to the manner of considering, they are both out, in that they make it more large then the thing considered. For not only, things mixt and subject to mutation, but the Elements also are Movable, or have in themselves a Principle of motion.

The definition of Natural Philosophy.

From all the Premises, let us at last infer; that, *Physica* or *Natural Philosophy*, is the Science of Natural Bodies, or of such as have Nature in them. Whereof being now to treat, I shall chiefly follow that same Eagle-Ey'd Philosopher *Aristotle*. For he did so excel in this part of Philosophy, that, though some do make him inferior to *Plato* in matters divine, (which *Scaliger* nevertheless denies again and again in the 365. of his *Exercitations*, Sect. 3. Yet in this Science he will easily bear away the Bell. I will say nothing of the *Platonists*, I shall only relate what is reported of *Plato*. For he coming upon a time into his School, and *Aristotle* being not there, he cried out, *The Philosopher of Truth is absent*. And another time when he was absent, he said, *The Mind is not come*. And amongst the *Peripateticks* innumerable company of most Famous Men and every way most learned, Greeks, Arabians, and Latines have handed this Philosophy to Posterity, and spent all their lives in explaining the same, and acknowledged it alone for the true Philosophy, and have judged it worthy of so much honor, as never any other Philosophers Physicks were thought worthy of. In the mean time, I would not detract from the diligence and Industry of others, nor would I call any man from making a more diligent search into the secrets of Nature. Those who have gone before us (saith *Seneca*) have done much, but they have not done all. There is much work yet remains, and much there will remain, and he that shall be born a thousand Ages hence wil not want occasion to add somewhat or other. But that Man will do it more easily, who, hath known these things aforehand: and it is easie to add to things invented.

Natural Philosophy divided into a common and proper part.

A Natural body how many waies understood?

And that I may propound a Summarie of al Natural Philosophy, as in a table before your Eyes; you must know, that *Aristotles* Interpreters have fitly divided all this Science into two parts; the former they call *common*, the latter *Proper*. In the first we are to treat of the kind it self, *viz.* A Body Natural commonly taken. And of all things appertaining to a Natural Body so generally considered; which *Aristotle* handles in his 8. Books of Natural Philosophy cal'd *Peri Physices Acroasews*. In the other, we are to treat of all the sorts of Natural Bodies; which *Aristotle* does in all his other Books of Natural Philosophy. Nor is this division without Reason. For, A Natural Body is taken three manner of waies. 1. Only for the common kind, in it self considered, without any consideration of the sorts. 2. For a Collection only of the sorts. 3. For both together. *viz.* Both for the common kind, and the Collection of al the species or sorts. Nor are Natural Bodies only to be considered, according to the Proper affections, but also according to the common. Nor must the common affections, of the kind be attributed to the sorts, nor must such things as are proper to the sorts, be demonstrated of the kind. A Body Natural therefore taken in the first sense, is the subject of the common part; taken in the second sense, of the proper; and in the third, of the whol Science.

We must therefore in Natural Philosophy, treat in the first place of a Body Natural in general, and consider its principles and common affections, which agree to al Natural Bodies, considered as such. And seeing a Natural Body is twofold, Simple and

and compound: we must first discourse of a simple natural Body, and its sorts, the Heaven and Elements, or of the world as it is a mass of all simples. After the explication of simple bodies, must follow the Doctrine of a mixt body; and first in general, where its principles, viz. The four Elements and its general affections or adjuncts are to be explained. Here therefore we must treat of the Elements, and of their qualities, of Action, Mixture, Generation and corruption. Mixt bodies, seeing they are twofold, perfectly and imperfectly mixed: in the first place we consider things imperfectly mixed; and then such as are perfectly mixed. And seeing things perfectly mixed are either similar or dissimilar: first we must treat of a body Homogeneous, perfectly mixed; which is handled by *Aristotle* in the fourth of his *Meteors*. Afterwards the several sorts hereof are to be explained, as things dug out of the Ground, Metals, and all the similiary parts which constitute Animals and plants. Here therefore we must treat of things dug out of the Earth and of Metals. For other similar mixt things, because they exist not by themselves in nature, but are therefore only, that they may constitute Animals and Plants, we must not treat of them in any other place, save where we discourse of Plants and Living Creatures. And thus far may that part of Natural philosophy be extended, which treats of those things which are common to things living, and things liveless. And the last place we must treat of such things as concern only things living: and so the whole doctrine of natural Philosophy, shall end in the Explication of plants and Animals.

Chap. 3. Of the Principles of Natural things.

Although these two words *Principle* and *Cause*, are oftentimes confounded, yet they are found somewhat to differ amongst Philosophers. For a principle is commonly of a larger extent than a cause. For all that is termed a Principle out of or from which at first any thing is, or is made or known; but that a thing may be a cause it is necessary that it receive its Essence therefrom, and depend thereupon. And thus every cause indeed, is a principle, but every Principle is not a cause. For the term from whence any man sets upon the way, & the point whence a line flowes, are the Beginnings of a way and a Line, but not the cause. But passing over the sundry significations of a principle, let us now treat thereof, as it concurs to the constitution and generation of things Natural. In which sense, Principles are by *Aristotle* thus defined: *Principles are such things, as are neither made of other things, nor one of another, but all things are made of them.* And so there are three conditions of Physical Principles. *First*, that they be not made of other things. For if they were made of others, they should receive their Essence, from the principles of another Nature, and so themselves should not be principles. *The Second*, That they be not one made of another. For if one of them did constitute another and were a part of the same Essence, they should neither be *First* nor *Simple*. *The Third*, that all Natural things be made of them and receive their Essence from them.

Now as concerning the number of Principles there were sundry not only Opinions but Dreams also of the Ancients, which because they are largely confuted by *Aristotle* in the first of his *Physicks*, and the most of them are now vanished: Yea and some of them are not sufficiently understood: I shall here pass over all those Opinions, and only undertake to explain that of *Aristotle*, as most agreeable to truth, who asserted only three principles of Natural things, viz. *Matter, Forme, and Privation.*

Yet this one thing I must premise, That while I establish these three principles, I do not exclude that only first Principle of all things, *God*, eternal, immortal, only one and indivisible, from whom and in whom are all things, but my enquiry is only after the first Natural principles of all things. For neither does *Aristotle* deny that all things have their dependance upon the most good and great *God*; as appears in the first Book of his *Metaphysicks*, Chap. 2. Where thus he writes: *For God seems to be the Cause and principle as it were of all things.* And in the fifth Probleme of the thirtieth Section. *God hath given us two Organs within us, wherewith we make use of the Organs that are without: viz. To our Body the Hand, to our Soul, the Mind.*

Now being to search out the number of Natural principles; we will rake our

whether a  
Principle  
and Cause  
do differ  
and how?

The num-  
ber of  
principles  
is three.

beginning from hence, that the principles of things are contrary one unto another: which both all the ancients do seem to grant, and the thing it self argues as much. For those are called principles, which are neither made one of another, nor of any other thing, but all things are made of them. Now such things are prime contraries. For seeing they are first, they are not made of any other: and because they are contraries they are not made one of another, for one contrary cannot change into the substance of another thing which is contrary to it. Moreover experience it self does witness; that of all things that are, every thing does not act upon every thing, nor suffer from every thing, nor is every thing made of every thing, unless accidentally; but every thing acts upon its contrary, and suffers from its contrary, is made of its contrary, and dissolved into its contrary; or as Galen speaks in his first Book of Temperaments, Chap. 2. Every mutation is made by a contrary, and of a contrary, and into a contrary.

Seeing therefore the Principles of things are contrary, they must needs be more than one: for contraries are not one, nor can one thing be contrary to it self. *1 Phys. Chap. 6. Text, 50.* Nor yet can they be infinite. For so should there be no knowledg of Natural things, which depends upon the knowledg of their Principles, and Nature it self abhors infinity. Moreover, since in every kind, there is one first contrariety; and of one contrariety, two extrems: consequently in a substance there are not infinite contrarieties, but those two first and extrem are to be held for principles.

Wherefore two first contrary Principles are sufficient: one from which the departure is made, and which is the term from which the other, to which the Progress is made, or the term to which. Howbeit these contraries are not alone sufficient for the constitution of a thing. For as a contrary doth not make its contrary; so they alone of themselves cannot constitute a substance. For that contrary which is induced, cannot be received into that which is expelled; seeing contraries do mutually resist one another; and at the end of the motion, that contrary which is expelled, ceases to be. A third principle therefore of things must be added, which is contrary to neither of the other two, and which one while with one, may constitute one natural thing, another while with the other may constitute another, and which may be the subject of those contraries, by turnes. For seeing in every mutation a subject is required (for an accident cannot be without a subject) as Aristotle in the first of his Physicks Chap. 7. Proves by Induction; and which in the mutation of accidents, is most of all apparent, wherein we see there is a common subject of the accidental form abolished, and of that which is bred a new: and it is manifest that there is no progress from contrary to contrary, without some subject matter: the same is to be concluded touching that substantial mutation, which happens in a natural body.

And these three principles do suffice. For both one subject is enough to suffer: and two contraries to act. For one contrary can corrupt its contrary. The principles therefore are Partly contrary, which are called Form and Privation: and partly not contrary. For the subject which we call Matter, is apt to receive all forms. And they are all three necessary to Generation, which is nothing but a progress from the privation of one form in the matter, to the acquisition of a new form: yet every one after a peculiar manner, viz. The form as the *terminus ad quem*, the terme to which the motion is made; Privation, as the terme from which: the Matter, as the subject of the Mutation. Howbeit to the Constitution of a thing, two principles are only necessary viz. Matter and Form. For privation, besides that it is no substance seeing it is contrary to the form, it cannot consist therewith. Hence Simplicius upon the first of Aristotles Physicks, saies, To enquire after the Principles of natural things, is one thing, to enquire into the principles of mutation, is another; for of things natural Privation is an accidental Cause; but of Mutation it is a direct cause, or a cause by it self.

These things being thus generally spoken touching the principles of natural things, whether there be a *Materia prima, or first matter* let us proceed to handle them in particular. And as to the first Matter, although that there is such a thing in Nature, was before proved: yet let us prove it again, after this manner. Whatsoever is made, is either made simply of nothing, or of something. Not of nothing, for that is creation and not Generation; and therefore of something, now that of which a thing is generated, is either only form, or the whole compound,



compound, or somewhat besides these. Not the two former. For in the Generation of a new thing the former form perishes. There is therefore somewhat else remaining besides the form in that thing, out of which a new substance is generated, *viz* the matter, which hath a privation of the thing to be generated, and which is apt to receive as well that form which it now actually possesses, as that which, the former being abolished is introduced into its place. Now that this is the first subject and depends upon no other, is thus proved. Whatever things are changed, have a common subject. All these sublunary things are changed one into another; if not all immediately, yet mediately. For things mutually fight one against another, with contrary qualities, alter one another, and throw one another from their natural state and condition. Therefore they have all a common subject. For if it were of some other thing, it would not be subject to all mutations: and if it were not common, all things could not be changed.

But what is the Essence of Matter is exceeding hard to find out, and can hardly be discerned by a direct knowledg. For as essential mutation, by which it is demonstrated, that there is matter, was known by way of analogy from accidental mutation; even so by analogy, and a certaine bastard kind of knowledg and inspection (as *Plato* saies) we come to the knowledg of matter. For from the knowledg of sensible matter, we are led to the knowledg of insensible: and so is matter related to form Natural. as Brass or Wood to the Form or Figure of Mercury. For even as Brass or wood, does in it self actually possess no artificial form; yet is it furnished with a power to receive all formes: even so the first matter, hath in it self, no determinate specifick natural forme; yet is it apt to receive all formes, howbeit herein they differ, in that the artificial matter is a body of it self existing and perfect: but the Natural matter doth not exist by it self without the form.

Now matter is considered *Two manner of waies*, one absolutely, as it is a being or a certain substance: the other, repectively, as it is a principle of natural things. In the first manner of consideration, we say it is void of all formes and Qualities, Dimensions and Quantities, and we allow it a power of receiving indifferently all formes; in which respect *Aristotle* in the sixth of his *Metaphysicks*, Chap. 3. Text. 8. Describes it by the negation of all things. In the second notion we attribute unto it a power of receiving particular formes, and privation; in which signification *Aristotle* in the first of his *Physicks* Chap. 9. Text. 82. Defines it, that it is *The first subject of every thing, of which e verything is made, being not accidentally inherant, and into which it returnes when it is corrupted.*

And although in its first notion, it can very hardly be known, because of its weak and obscure Entitie, by which it comes near to a Non-being, and is the lowest of all beings: yet must we not think that it is a meer fiction of our Brains. For it is undoubtedly a real being, and indeed a substance, as appears in the I. Of *Aristotles Physicks* Chap. 6. Text. 52. Chap. 9. Text, 79. In the *Second de Anima*, Chap. 1. Text. 7. In the *Seventh of Metaphysicks*, Chap. 2. Text 7. For of it, and form all natural substances are compounded; and it is the subject of Generation. and receives the formes; and it self is in no other thing or subject. Now by substance, we do not here understand a compound substance, which is properly called substance, but a being as it is distinguished from an accident, and opposed thereunto: which is twofold: One in act, as the forme: the Other in power, as is the matter. Nor is it an incorporeal but a corporeal substance. For seeing of it and Form all compound bodies do consist if both were incorporeal, there would then arise from incorporeals a corporeal compound which is absurd. Moreover seeing a body of the predicament of quantity doth alwaies presuppose a body of the predicament of substance; nor can a body of the predicament of quantity exist without a body of the predicament of substance, nor this without that: and that a body of the Predicament of substance, as shall be said, doth immediately inhere in the first matter, and altogether depend thereupon: it must therefore needs be a body pertaining to the predicament of substance. And the first matter hath this its essence of it self, and as *Scaliger* saies in his 5. *Exercitation*, the matter by that essence which is proper to it self, is that which it is; and in his 17. *Exercitation*. The matter hath its quiddity or Somewhatness, whereby it is somewhat, and differs from other things.

And although the matter hath an essence and entity proper to it self, whereby it is somewhat different from the form: yet hath it of and by it self no existency, which

The D<sup>o</sup>s  
E<sup>o</sup> of  
the first  
matter is  
obscure &  
exceeding  
hard to be  
known.

Matter is  
considered  
two man-  
ner of  
waies.

The defini-  
tion of  
matter.

The first  
matter is  
no notion  
of the  
brain.

The first  
matter  
hath no  
existency of  
it self.

is proper only to a compound, which hath it from the forme: which seeing the matter hath not (which its indetermination that I may so speak witnesses) it cannot be said of it self to have actual existence, which is an effect of the forme, but only by the forme, which determines it, perfects it, and makes it to be this or that. The matter therefore is altogether a meer possibility, that is to say, a certain imperfect indeterminate substance, and a rudiment of all sorts of natural things, and which receives all its perfection and all its qualities from the form.

Yet this is thus to be understood, not that the matter is only a possibility to its own being, which it hath of it self by its own Essence; but to this or that sort of Being, as *Scaliger* saies in his 17. Exercitation. Nor is it said to be *Apoios* because it hath no quality, but because every forme and quality which is therein, is without and besides its Essence. For, as *Scaliger* saies, in his 61. Exercitation. The first matter, is one *Individuum* or particular being, like a lump of wax, one part whereof bears the form of a Candle, another the forme of an Image; another of a Ball, another of a Die: and the said mass may have as well this form as that, and challenges none as properly belonging to it self, yet must it of necessity have alwaies some forme or other. Nor was the matter created by God as a certain distinct sort of a natural thing, but it is rather concreate or created together with natural things, and as was said it is as it were a rudiment, Beginning and part of all natural things, nor did it ever exist without any form but only with and under the same.

The first matter is unlimited.

*Quantity* doth properly follow the Nature of Matter, and is as old as it, nor can be separated therefrom, in deed or in thought. But it is only untermiated quantity I speak of, For terminated quantity doth neither follow the forme alone nor the matter alone, but both of them. For quantity of it self flows from Matter (for, by means thereof all things are termed so great or so great; and it also is the subject of all mutations. Now every thing which is changed, is divisible. *Phys.* 6. Chap. 3. 36.) But not from the forme; for it of it self hath no muchity, is not divisible, only it is extended, and is said to be so great or so great according to the extension and quantity of the Matter. But certaine bounds both external as the Figure, and internal as certaine sorts of Quantity, do proceed from the Forme. For as it streightens the Nature of the matter, and limits it to some peculiar and determinate sort of natural thing: so it limits the Quantity thereof, and imprints thereon, this or that sort and Figure of Quantity. And when we say the Matter, is unbounded, let not any one so understand us, as that the matter either is or hath ever been without certain limits. Nor is it said in respect of the forme to be introduced, in which respect the seed of an Oxe, if you regard the bounds it shal receive from the form of an Oxe may be called a certain unlimited thing; but in respect of all limits, which either it hath or may have from any form whatsoever. For as the matter considered in it self, is altogether without form; yet receives all forms, nor is ever without form: even so Quantity and Dimension of matter which follows the essence thereof, hath of and by its self no certain and determinate bound and Figure; yet is it fit to receive all, nor is it ever found without some Figure and determinate dimension. And thus unbounded and potential dimensions, are in a substance corporeal, unlimited and potential, such as is the Matter: but actual and determined, in a determined and perfect Body.

There is a two fold potentiality of the matter.  
2.  
universal.

Out of the same Nature of the Matter, flowes *Possibility*, or *Potentiality*, which is an aptitude or fitness to receive all Forms, and it is two fold, *Univesal* and *Particular*. *Univesal* is the Aptitude and propensivity of the matter to receive all forms without distinction, and equally respects the two opposite principles, form and Privation, that is to say all forms alike. For matter, to speak properly, hath no appetite to Privation, as Privation, but as another form, and privation is not desired but another form annexed thereto. And this is termed *the first and indeterminate Potentiality*, and the Appetite of the matter, which is nothing else, but the inclination of the said matter to receive any forme. For it is not rightly said, that the matter while it is furnished with this form, does covet another; nor do the changes which happen, by reason of the matter, but by reason of contrary forms, nor is there in the matter any appetite of change, but only of perfection. And every part is perfected under every form, and all the matter by all the forms; As *Sealiger* hath it in his 61. Exercitation.

Now

Now this universal Possibility, or Potentiality is not the very essence of the first matter taken in the first sense; but only a certain accident and Natural Propriety, following the Essence thereof. Now no accident is essential to a substance. And though the matter be sometimes termed a Possibility: yet by this word, is not understood a Quality, but its substance, which is imperfect, and as it were incomplete, having only a weak kind of Being: or it may be termed a potentiality, meaning a substance in *Posse*, and after this manner of speaking, Potentiality or Possibility is used in stead of a difference, to declare its obscure Essence, and which cannot be easily understood. And although also the matter in its first Notion is termed *Apoios* without Quality: yet may we allow some quality therein; but it must be such as makes no Restriction or Determination of the matter, and does not restrain it to a certain and specifick Nature, such as is an universal Potentiality. For seeing the matter is therefore said to be free from all Qualities and Forms, that it may receive all: and this universal *Potentia* or Aptitude, does not only not hinder but further the Reception of all Forms and Qualities; it is not to be taken from the matter. And this aptitude is as old as the matter and inseparable therefrom. For seeing the matter by reason of its universal potentiality, hath an aptitude to receive all forms; and every day by Reason of contrary Agents, some forms do perish: therefore this Appetite thereof can never be satisfied, and one form going away, it desires to be perfected by another. But this self same universal power or potentiality, is as it were of the Essence of matter, according to the second acceptation. For in as much as the matter is a passive principle; this Potentiality, is as it were its form and constitutes the same. For therefore matter is termed a material principle, because it hath an aptitude to suffer, But a *Particular Potentiality*, is that whereby the matter respects one determinate form: and this does not follow the Essence of the Matter, but is communicated thereto by the Agent, or the form and Qualities, which fit and determine the same, to receive this or that form. So the first matter, being furnished with the form of a Dog's Seed, hath no other Particular Aptitude save that of receiving the form of a Dog. This Aptitude is accidental to the matter, whether taken in the first or second sense, and separable therefrom. For when the *Act* comes, it perishes; and therefore neither does constitute its Essence, nor yet follow the same as an essential Accident. For the Matter, both as it is a being, and as it is a principle of things, subsists without it. For before it received, for examples sake, this Particular Form of a Lyon, the Matter was actually in being, and when it shall have laid it down, it will remain in actual being. Seeing therefore this Determinate and Particular power or Potentiality, is not one alone, but many according to the variety of Forms, and the matter may exist without any one of them: none of them constitutes its Essence, or properly follows the same: moreover nothing Definite or Determinate does constitute its Essence; or can depend thereon. Possibility indeed or potentiality as such does immediately depend upon the Essence of the Matter, and is an essential accident or adjunct thereof: but in as much as it is definite, and respects this peculiar Form, it is not from the Matter, but from the the Agent and present Form, which is a privation of the Form to be introduced. And therefore it is not as old as the matter, but is separate therefrom (as hath been said) when the *Act* comes, it is separated. This Particular power or possibility, is only opposed to the *Act*, as Privation is to the Habit: the universal is not opposed thereunto. For *that* does not respect any peculiar Form: but an infinite multitude of them.

And this is the Doctrine of the Peripateticks concerning the first matter: yet not different from the Tenets of the Platonists, as we may see in *Alcinous* in his Book de *Doctrina Platonis* Chap. 8. in these words. He (viz. Plato) calls the Matter, the *Receptacle*, *Nurse*, *Mother*, *Place*, and *Subject* of all things; and he saies that it is felt without sense, and comprehended by a bastard kind of reasoning. He wil have it to be the property of matter, to receive all Generations, and like a Nurse to cherish them also to receive all formes, seeing it self of its own nature is void of all Quality, Form, and Figure. Also he saies that it is sprinkled and figured with shapes, like a Picture, having of it self no Figure or Quality. Nor were it a subject fitly prepared for sundry impressions of forms, unless it were quite void of all those Qualities, which it is to receive. For we see those that would make sweet ointments of Oyl, do seek for Oyl infected with no smel at all: and those who would print forms upon Wax, or Clay, do first work it smooth & polish the matter.

matter, till the old figures are quite blotted out. For it is fit that the universal matter, if it be to receive all forms, should not have in it self the nature of any of them, but that without all Quality and Figure, it must be the subject of several sorts of things. And being such as is said, it is neither a Body, nor yet incorporeal, but potentially a Body, even as Brass is potentially a Statue, because receiving the figure it may become a Statue.

Privation  
and Negation  
how  
they differ.

The other Principle of Generation is Privation. That we may understand what that is, we must see how it differs from negation. For Negation is of larger extent than Privation, and is attributed to matter taken in the first sense, and denotes an universal Absence of all forms and Qualities in the matter. But such is not privation: (for one Privation is not opposed to all forms, but to every one a proper) but it agrees to matter taken in the second sense, and alwaies presupposes other Qualities, and is necessarily conjoynd with some form, which goes next before the Form to be introduced. For the Privation of the form of Wheat, is not an universal negation of all formes in the first Matter, nor yet every other absence thereof, as for example sake, that which is in Iron: for Wheat is not generated of Iron: but that which accompanies some definite and determinate form, viz. that of the grain of Wheat. Hence *Themistius* upon *Aristotles Posteriora*, writes thus; Privation is a Negation in a determined subject, and *Alexander de Ales* upon the *Metaphisicks*; Privation essentially requires the Negation of a form with an aptitude to receive the same. And the very same *Scaliger* affirms in his 18. *Exercitation*. Privation (saies he) seems to have the Nature of a certain Being. For it is the same after a sort with that Habit, which is contrary to the Habit, whereof it is a privation. And therefore as *Zabar. Us* saies; Privation is in its own nature, the absence of a form, and it is nothing, and is opposed to a form only Privatively, but inasmuch as another form alwaies accompanies the same, in which respect the privation of that thing is properly said to be some positive thing having contraryety thereunto. We gather therefore from the Premises; that Privation is the Absence of a form in that Matter which is immediately disposed to receive the same. Now Privation is not of the Essence of Matter, but an accident thereof being taken in the second sense, being necessary, not simply, but in respect of Generation. For it concurs with other Principles to the Generation of a thing; and it is in Generation as it were the term from which the motion is made. For that which is generated, was not before; yet it was possible, and in generation not being goes before Being; and therefore it is called a third Principle essentially distinct from matter: and matter concurs one way to Generation: Privation another.

What Privation is?

It is not of the Essence of Matter.

The Form

The third Principle of natural things we make to be the Form, which because it is the most excellent of all, it requires more diligent consideration. That there is somewhat in things besides the Matter, called Form, all in a manner do grant: but what that is, whether a Substance or an Accident, all are not agreed. For there were both Philosophers of old, and some there are at this day, who conceive there is no substantial form in the matter. Yet verily, that is the truer opinion which saies that there is in every natural thing, besides the matter, some substantial form, which is naturally before all the accidents or adjuncts, both common and proper. For the Parts of a Substance, are themselves also substances. And if things did consist only of matter, the Essence and operation of all things, would be one and the same, and there would be no true distinction betwixt them. For from accidents a true diversity and distinction of Essence and Operations cannot be drawn. For the Act and essential perfection of a thing, whence its difference is taken, does belong to the same kind, wherein the thing is placed: or as *Tolens* saies, No imperfect thing in any kind is perfected in that kind, save by somewhat of that kind. Since therefore Matter is an imperfect Substance, and is perfected in the compound; it must be perfected by another Substance, viz. The Form. Moreover, the diversity of Accidents and Operations, whence proceeds it? Why is the fire not cold, but hot? not by reason of the matter: for that operates nothing, makes no distinction, but is void of all Quality. Therefore we must presuppose something more noble than an accident. Finally, if the Form were an Accident, there would be no Generation of any thing, but only an alteration.

The form is of its self an incorporeal Substance

The Form therefore is a Substance of it self; and indeed incorporeal; of it self void of all Quantity, Demension and Division. But it participates of Quantity by Accident,

Accident, *viz.* inasmuch as it is inherent in the Matter, according to the extension and division whereof, it is extended and becomes divisible. For as the matter is not, so neither is the form perfect of it self, nor constitutes any sort of natural things; but it concurs together with the matter, to make up the compound. And therefore neither the matter nor the form, hath of it self all things requisite to make the compound; but each wants the others help, and they mutually assist one another. The form wants the matter to sustain it; and therefore some call the Matter *Principium Subiectivum formæ*, the Principle of the form, or that Principle wherein the form resides; upon which the form depends in its making and conservation. But the matter is perfected by the form and from it receives its actual being and perfection, and therefore some call the form, the formal Principle of the matter; not because it gives it its Essence, but because it perfects the same. The whole nature therefore of the Form consists herein, that by a real conjunction with the matter, it may give it that perfection which is proper thereunto, and so with it constitute the compound. And therefore it is by *Aristotle* in the second of his *Physicks* Chap. 3. Text 8. defined to be, *That which makes a thing to be what it is*, and in his 6. Book of *Metaphysicks* Chap. 8. I call the form that which makes a thing to be what it is, and the first Essence of a thing; and in the 6. of his *Metaphysicks* Chap. 11. *For the form is the inward substance of a thing, from which also the whole matter is called a Substance.* For the form is a simple substantial Act, with the matter making one entire compound. For this is the end of Generation; by it the matter is perfected; it is coveted by the matter; herein the matter finds it self contented; from it all accidents and actions flow.

But, Concerning the original of Forms, there is a very great controversie amongst Philosophers, which hath exercised the Brains of the most able amongst them; nor seems it as yet sufficiently determined whence the forms have their Original; For though *Aristotle* and his Expositors do say, That neither the matter is generated, nor the form, but the compound yet their Intent is not, that both the matter and the form are generated at one and the same time (for the matter is not generated, nor can be) or that some third thing different from these is produced; but this they would signifie: that the form is not produced by it self apart from the matter and without it, and afterward joyned thereto; but that it is produced in the matter and joyned therewith. For the compound is nothing but the matter and form joyned. Therefore we must grant that in some sort the form is made, inasmuch as it is the Butt and End of Generation.

This being granted we must see *Whence the forms have their original.* If you shall ask a Peripatetick or follower of *Aristotle* (setting aside at this time the Opinions of *Anaxagoras*, *Plato*, and *Avicenna*) He wil tel you they are drawn out of the Aptitude or Potentiality of the matter. I hear indeed (to use the words of *Scaliger* in his 61. exercitation) the sound of words; but I desire something to satisfie my mind: but I hear nothing. For though this expression be worn thredbare by many yet few do sufficiently explain what we are to understand thereby. But this seems to be the opinion of those who do think most rightly: for forms (excepting the humane Soul) to be drawn out of the power of the matter, is nothing else, but for them to be so made in a subject having a natural aptitude unto them, and existing before them both in time and nature, as that both in respect of their conservation and operation, they do so depend thereupon, that out of it they neither can be made, nor preserved, nor operate. For the form which is educed, is not at first produced apart from the matter, and out of it, and afterwards externally adjoyned to the matter; but it is produced in the matter. And so two things are required to the education of forms: *First*, That the Subject have a natural aptitude to the form: *Secondly*, That the form which is drawn forth, depend upon the matter both in their making and conservation; that is to say, that without the help of the subject, and out of it, it can neither be produced, nor preserved, nor operate. And consequently all natural forms, except the humane, do so depend upon the matter, that out of it, and without the assistance thereof, they cannot be.

But if any man, not content with what hath been said, shall further urge, and say, that he acknowledges what hath been said to be true, *viz.* that for a form to be drawn out of the aptitude of the matter, is nothing else, but for a form to be made in the matter, and not out of the same: but shall yet enquire; whether in the matter, the

The Origin of Forms.

Whence the forms proceed?

What it is for forms to be drawn out of the power of the matter.

Whether the Form be made of nothing in the matter.

Form is made absolutely of nothing. Which *Picolominus* seems to conceive in his 1. *Book of Creation Chap. 7.* So that the Agent affords nothing of its own Essence thereunto, but action only; or so as that the Agent does not communicate the Forme it self, but brings the Aptitude of the matter to such a Form into Act, causing the Potentiality of the matter to break out into a formal Act. But whether a new Form comes out of the Essence of the old Form, is an hard question to answer.

The Original of the forms from whence it is?

For seeing naturally, nothing is made of nothing, and a Form is now in the matter which was not there before, the Question will be, whence is its Original? How the Interpreters of *Aristotle* do torment themselves, about this point is every where to be seen, and among the rest out of *Toletus* in his Comments upon the 1. of *Physics* Chap. 9. quest. 19. and upon the first *de Generat. and Corrup.* Chap. 3. Quest. 2. where he reckons sundry opinions of the Peripetaticks in this point. For in the first place, some mentioned by *Du-Rand* in his 2. *B.* upon the Sentences D. 18. did hold, that there did precede in the matter certain Entities, out of which afterward the Forms were made, *viz.* several forms out of the several Entities, and these Entities or Beings, they called Possibilities of Forms. Secondly, Others think, that the parts of the forms precede in the matter, but very remiss, and that afterward they are in Generation vigorated and that so every form is precedent in the matter, in a weak manner of Being. Thirdly, *Albertus Magnus* held, that all forms did essentially precede in the matter, so that Matter is a kind of habit prepossessing all forms essentially.

But *Toletus* acknowledges the Absurdity of these opinions, and therefore he determines, that there was nothing of the form in the matter, which did precede the introduction thereof; and this he proves by firm reasons which you may see in the forecited place.

Others that they may avoid these absurdities, do attribute this power to the Efficient, and some with *Plato* make the Ideas to be the efficient Causes of the Forms: and others since have brought in the Soul of the world to that intent: *Avicenna* hath invented a tenth Intelligence, whom in his own language he calls *Cholchodea*, & gives him this office of making forms. *Fernelius* with some others makes the Heaven to be the efficient cause of forms. But if that were so, Generation would not be univocal, and the form not having been in the matter, must be held to be created. Howbeit that does not please other peripetaticks. Wherefore *Picolominus* in his 2. *B.* of the Principles of Natural things, although he grant, that the form is in part made out of nothing, because nothing of it was before in the matter; yet he denies that it is created, because it presupposes a Subject, out of which it is educed. But *Tolet.* in his 1. *de Gener. & Cor.* sees that this answer, which was also *Marsilius Ficinus* his answer, will not hold, and therefore he writes: This Doctrine does not please me. For verily if the production be of the form it self, seeing no part thereof was precedent in the matter, it must be called a Creation. And the truth is, whether the form be produced in the matter or out of it. if there were nothing thereof precedent, it must be a Creation; which himself acknowledges ought not to be attributed to natural agents.

He therefore, to free himself from this difficulty, determines: that what is first generated and corrupted is the compound; and that the form is not produced by it self, but comproduced and made together with the production of the compound, and that the Action is first terminated upon the compound it self, and consequently and as it were by accident upon the form.

But in very deed, whether the Form be made in the first or second place, or consequently, whether alone or with the compound, the Question remains just as it was; *viz.* Whence the form, which now is in the matter and before was not, hath its Essence; whether it did præexist in the matter, or was made by conversion of matter into form, or of nothing. For it does not follow that if the finger be made with the hand it is therefore made of nothing. Yea the compound should rather be said to be made consequently and in the second place, than the form. For as whiles Wood, Bricks, Morter and other things are made and compounded, an House is consequently made: even so a natural compound, which is nothing else but matter and form, is made, when the Matter and Form is made. And seeing the matter is not made, what else shall we say is made except the Form. And therefore when he observed, that he neither satisfied himself nor others; and saw that no part of the form did

did preexist in the matter, nor could a power of creating be attributed to Natural Agents; at length in his 1. *de Gener. and Cor. Chap. 3. Quest. 2.* He concludes: I confess this is an admirable power and Virtue, which partakes somewhat of a creating power: but it is no such creating power: seeing it hath alwaies subjects to work upon. Also the Virtue of the matter is wonderful, out of the Aptitude whereof things are produced, which actually are not there. But in very truth, that virtue is not wonderful, because there is none such, but their wilfulness is wonderful, who will have that to be drawn out of the matter, which is impossible, as not being in the power either of the matter or of the Agent. For many men had rather rest upon certain principles, which cannot satisfie minds covetous of the truth, then make profession of that which is the manifest and solid truth. Which they perhaps therefore do that they may be thought good Phylosophers: whereas, doubtless, *Aristotle* if he had known the first and true Original of Forms, and the Creation of the world, as we do, he would have left us, a Natural Phylosophy better and more compleat then he hath done.

Let us therefore to whom these things are made known out of the holy Scriptures, omitting those opinions, which endeavour to bring the Forms out of the matter, or from Heaven, or from elsewhere, determine that the Forms themselves, as also the matter, were at the beginning of the world created with the things themselves, that of them all Natural things might consist: And that the first matter cannot indeed be generated, but that by means of the Forms, all changes of generation do happen, and that the Forms are the second principle of Natural things, by which they are that which they are, and do that which they are commanded to do; that according to the Forms all Natural things do not only act, according to their Nature, that is to say, as the Creator hath commanded them to act, but thereby they are governed, preserved and propagated. For God commanded, that natural things should not only exist by their Forms, but propagate themselves thereby, and as he commanded it, so he gave every of them a power to do so as he commanded, and forthwith to encrease and multiply which command of God (that no man may bring the Forms out of Heaven) appears to have been given out before the Heaven was created. *Genesis*, 1. verse, 11 and 12. *And God said let the Earth bring forth Grass, the Herb yeilding Seed, and the Fruit-tree yeilding Fruit after his kind whose Seed is in it self upon the Earth: and it was so. For the Earth brought forth Grass, and the Herb yeilding Seed after his kind and the Tree yeilding Fruit, whose Seed was in it self, after his kind: and God saw that it was good.* All Natural things do therefore obey the command of the Creator, and all Forms, as in the first creation by a power put into them, do beget by promotion and propagation of themselves; they remaining nevertheless in the mean while entire; which also we see in Plants and Animals, which generate by Seed. For they when they afford Seed do afford somewhat of their matter and somewhat of their form. For the Seed of a plant while it is in the plant, is animated with the Soul of the plant. But when it is separated therefrom, that portion of the Form, which is Inherent in the Seed, and together with the matter, of the Seed is separate from the Plant, grows into a plant like to that from whence it came. And the same holds in Animals. And therefore the Form is Potentially in the Seed; because as *Scaligar* saies in his 6. *Exercitation, Sect. 5.* The Seed is able to give the Form: it is therefore drawn out of a remote possibility, which is the first act, to a near possibility, which is the Second Act. So that the Form is in the same matter, after the same manner as, to need no helps, but to enjoy its End and to which the whol compound is ordained: which is then brought to pass, when the Form does constitute its own matter, and Alter, Labor and dispose it as if it were its House. And therefore when a living Creature is made of the Seed, the Form is not then first induced thereinto, but exists therein already being communicated by the Ingenderer, and it does only by assistance of the wombs Heat display it self; which is rather a certain arising or springing out, then a drawing out. To be short: This is common to all Forms (though to some in a more noble, others in a more inferior degree) that they can multiply themselves, are incorporeal, have of themselves no dimension or Quantity, nor do of their own Nature take up, but do fill. And if we suppose the Body of any Animal or Plant to grow never so big, yet the same Form without any Addition will fill it all: and though it be never so much lessened, the Form is no waies lessened

ned or impaired. But let us conclude this discourse with the words of Scaliger in his 307 Exercitation, Sect. 29. *The matter is a possibility, apt to be perfected: the Form is an Act, fit to perfect. And thus we see the shallowness of mans understanding, who is so bold as to say he knows the Forms of substances. But this exquisite knowledge is hid from our Eyes: viz How of two things, one is made. How the Form is totally in the whol and in every part of the compound. So divine a thing is the Form, that being a substance, it fills another substance so full of it self, that of both one is made. Wherefore to search further, is the part of an overcurious and busie mind. For it is a part of Mans Wisdom, to be willingly ignorant of some things. Yet we must not reject as false, such things as are hard to be known. For (as Plato saies in his Dialogue called Theætetus) they are profane who think there is nothing, but what they can feel and handle.*

### Chap. 4. Of Nature and the Causes.

*Divers significati-  
ons of the  
Term Nature.*

There are sundry Significations of the word Nature, which you may see in Aristotle, in the 5. of his *Metaphysicks*, Chap. 4. And in Pererius, in the 7. of his *Physick*, Chap. 1. In Piccolomineus, in the 2. of his *Physicks*, p. 249. In Fonseca, in the 5. of his *Metaphysicks*, Chap. 4. I shall cite only some which are most suitable to our present matter in hand. And in the first place, some call God himself by the name of Nature. Again, others take Nature for the second Causes; in which sense Scaliger, in his 188. *Exercit. and 359. Sect. 11.* seems to define it to be the ordinary power of God. Thirdly, Nature signifies the whol Universe of things. Fourthly, Nature is taken for the Essence of every thing; in which sense we say that things separate from matter, as God and Angels have a Nature, that is to say an Essence. Fifthly, Natural is opposed to voluntary, so that a thing which acts without deliberation is called Natural; and that which acts with Deliberation, Voluntary. And yet more strictly, Natural is opposed to Animate, and Nature is taken for a Faculty opposite to the knowing Faculty. For seeing the knowing Faculty respects both parts of the opposition, and is apt to do as well this as that contrary: Nature, contrariwise, is said to be that which respects but one contrary, and is only determined thereunto. Finally, in a certain middle way, betwixt these last significations, Nature is said to be the internal principle of motion; and every thing is said to be Natural which is mutable and variable. And in this place we treat of it, in this last signification: and that we may the better find out what it is, let us see how Natural things differ from things Artificial.

*Things  
Natural  
and Arti-  
ficial how  
they differ*

All things in the whol Universe are of two kinds: some are from Nature, as the Elements, Living-Creatures and their Parts, Plants, &c. And some again are from other Causes, as Art, Counsel, Fortune, Chance. And although things Natural differ from Artificial many waies, as may be seen in Pererius, *Lib. 7. Phys. Chap. 2.* Yet this difference shall serve our turn: that Natural things have an inward Principle of their motion and rest: But Artificial things, as such, and of themselves, have no such principle. For whereas a Statue or Image tends downwards, it does it not as a Statue: But as consisting of Stone or Wood. Since therefore Natural things are hereby differenced from Artificial, Nature is not unfitly defined to be the Principle of Motion and rest in that thing wherein it is primarily, of it self, and not by accident.

*The defini-  
tion of  
Nature.*

But before we pass to other things, that this definition may be rightly understood, some things are to be hinted. And in the first place you must observe, how Nature is said to be the principle of Motion and Rest. For it is not so to be understood, as if Nature did effect both these together: but one after another. Nor as if there were the cause of both in every Natural thing. For every nature is not the principle of Motion and Rest. But it is thus to be understood, that all things which naturally move and rest, have this motion and rest from nature. For there are some things that alwaies rest; some which are alwaies moved; some which both rest and are moved, and yet nature is the Cause of all these. Moreover, this is not to be forgot; that every nature is not the principle of every motion, but this of that, and another of another; nor is every natural body moved with all motions.

And



And by Rest we do not understand every Cessation from motion, and every privation thereof: but to rest, is to remain in its Natural place. So Earth, when it comes to its place, it hath a Principle whereby it Naturally rests therein, and removes not therefrom unless by violence forced. And whereas in the Definition it is said, that Nature is a principle of motion and rest, in that wherein it is; thereby, Nature is separated from Art and from an external Agent, which are the Causes of a Transient operation only. Yet, I deny not but that Nature is the cause of a Transient Action. For Fire heates also other things. Howbeit, *Aristotle* would define Nature, only by an immanent Action, because thereby it is manifestly distinguished from Art. And if the definition of *Aristotle* be so explained, that Nature is the internal principle, from which every thing hath a power of acting and suffering, and ceasing from both; all seeming difficulties will be cleared up.

And because the principle of Motion is twofold, one Active, by which the motion is effected, another passive, Wherein hereupon arises a double controversie amongst Authors. First what we are to understand by a passive Principle: Secondly, whether Nature be both these Principles or only one of them. As to the First, a passive Principle may be understood two manner of waies, First for the passive Aptitude of things opposite which is free, and not more apt to receive of it self, one motion more then another, but is equally propense to both: Secondly, For a power already restrained, and limited, to one only of the Opposites, and Determined to one Motion, which is said to be the Natural motion of the thing. I am of the latter opinion: for from the former, this absurdity seems to follow, that all violent and Artificial motions, may be called Natural; seeing the first matter is of it self alike disposed to receive all Motions.

As to the other Controversie: although some have said that Nature is only an active principle, others that it is only a passive; Yet I conceive, both may well be affirmed of Nature. For to things having Nature in them, it is no less Natural to move themselves, then to be moved by themselves.

And from what hath been said it is now apparent what is Nature in things, *viz.* The principle of motion and rest, both active and passive. It remains that we now declare, what that is, and to what things the name of Nature is due. *Aristotle* gives the name of Nature both to the matter and the Form: and that not amiss, provided he be rightly understood. For the Form alone primarily and of it self deserves to be called Nature: and it is a Principle of motion as well active as passive. But because the matter is indifferent and doubtful, disposed to receive contrary motions, respecting no determinate motion, but all indifferently: it cannot primarily and properly be called nature. For so, as all natural things have one matter, so should there be of all but one Nature: whereas nevertheless every thing hath its own peculiar Nature. Yea, if so be the matter as well as the Form were Nature, every thing should have two Natures, Nor is it absurd to call the Form a passive principle. For seeing, as hath been said; a passive principle, is not so called, in respect of every indeterminate motion; but only of that determinat and certain motion, which is peculiar and natural to every thing: by very good right, the Form also is called a passive principle; since from it proceeds all determination and restraint of matter to the reception of certaine determinate Motions. Now the Form is termed a passive principle, in as much as it is in the matter (for in respect of the matter every thing is said to suffer) and determinates the Nature thereof: and in as much as it is the Form, it is also termed an active principle. The matter, notwithstanding as hath been said is also called nature: not because it is nature of it self; but only potentially: or because it hath an aptitude to receive the Form, which of it self is Nature. Actually therefore the Form is nature; potentially the matter.

The whol Sum therefore of this discourse is this: One thing hath one nature, which properly and primarily is called the Form. For this of its self is the active principle in things, and in as much as it is the Form: and also the passive, in as much as it determines the doubtful nature of the matter. And therefore to be a passive principle, is in divers respects attributed both to the matter and the Form. For the matter is the Passive principle, not as it is barely the matter but in as much as it is furnished with some Form, whereby it is determined to receive some particular motion. The Form is a passive principle, not as it is the Form, but as it determines

A twofold principle of motion active and passive. I be passive what?

Nature is a principle as well active as passive.

To what things the term Nature may be applied.

The Form is chiefly Nature.

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the doubtful nature of the Matter. And thus neither of them without the others assistance, can be called a passive principle.

Whether every Form informing be Nature

From what hath been said, it may easily be collected, what may be determined in reference to that controversie, Whether every Form informing, is to be counted Nature, or not. The Definition, truly, of Nature doth evince: that every form informing, inasmuch as it is inherent in the matter, and informs the same, may rightly be called Nature.

Things natural & according to nature, how they differ.

It is now manifest what and what kind of thing Nature is. One thing must yet be added: What that thing is which hath Nature, and what that is which is according to Nature. Natural things are Substances which have nature in them, viz. A principle of motion and of rest. Such are only natural Bodies. For that thing is not called natural, which produces any thing that is natural; for so God himself should be reckoned amongst natural things. Nor is that said to be natural, which is produced by natural motion; for so the first Man and this whole world should not be natural. But that thing is properly natural, which hath an implanted Principle of its motion and rest. And such a definition of a natural Body, does comprehend all bodies both Celestial and sublunary. But according to nature, is of larger extent, than having Nature, or Natural; for according to nature, are not only the Substances, but also their properties, and their affections or adjuncts which follow their Nature. *And so much of Nature may suffice to be said.*

But inasmuch as nature is chiefly considered in this place, as it is referred to motion, or, as they say, it hath a peculiar Causality over the motion and rest of that thing wherein it is: the Causes are now to be explained, viz. inasmuch as they have respect to motion; and we are to consider what kinds of Causes have place in things natural. They define a Cause to be that by the virtue or efficacy whereof any thing is made: or by which any thing is of it self produced. Now they are four: The Matter, of which a thing is made and subsists: The Form, by which a thing is that which it is, and nothing else: The Efficient, whence proceeds the Beginning of Mutation or Rest: The End, for the sake whereof a thing is. Nor is there need to invent more Causes; seeing by these we can sufficiently Answer any Question, why a thing is, and whereby the cause thereof is demanded. Yet there are more Modes or manners of Causes. For a Cause is neer or remote: of it self or by accident; in act or in aptitude, simple or conjunct, of which see *Aristotle* in his 3. of *Physicks* Chap. 3.

Fortune & Chance, how they differ?

To Causes by Accident, Fortune and Chance are referred. For seeing some things are made alwaies or for the most part, others seldom; again some are made for some ends sake, others for none: and those which are made for an end, are made either by Election or without Election: Fortune and Chance are said to be the Causes of such things as happen seldom & without an end propounded. And herein Fortune and Chance agree, that they are both the Cause of such things, which are not alwaies or for the most part, but seldom effected, and which are undertaken for some Ends sake. Yet herein they differ, that Fortune is of things done with Election, and Chance of things done without Election.

What Fortune is, and what Chance?

Fortune therefore is the Cause by accident of these things, which among things done by Election and for some end, do not alwaies nor frequently but seldom happen. And in such a sense we may grant, that there is both Fortune and Chance in things. But in respect of the most great and good God, nothing happens by chance or by fortune.

Whether it belong to a natural Philosopher to consider the Causes?

But it is the part of a natural Philosopher to consider all the four kinds of Causes, and by all four answer may be made to that question why or how a thing comes to be, and that physically. For it is the part of a Physician or natural philosopher, to consider the Parts and Principles of a body natural. And to him it belongs, to explain the mutation and generation of things and their causes; and to see for what things sake, the Efficient acts, or to enquire into the end: moreover to weigh and consider what is made, or what form is introduced afterwards, to know what that is which suffers and receives the form, viz. the matter, finally to search out the efficient which introduces the form.

Howbeit we are to know, that the three Causes, Efficient, Form, and End, are in natural things many times united together, and grow into one Cause: so that the form and end, though they differ in definition, yet in number and

and subject they are one Cause: but the formal and efficient cannot be one in number, yet one in kind. For the same form of an animal, is at the same time both the form and end: the form in respect of the thing Generated, inasmuch as it is an act perfecting the matter, and therewith making up the compound: but an end in respect of the Generation. For it is the Butt to which nature tends, and wherein she rests contented after it is attained. Moreover the same form is also the Efficient, inasmuch as the thing generated, is of the same species or sort with the, Generator.

This thing also is to be noted, after what manner every cause, does concur to the Production of the Effect. The End concurs to the production of the Effect no otherwise than as it moves the Efficient to produce the same, and after the thing is effected, all the causality thereof ceases. The Efficient concurs sometimes only to the production of the Effect; and sometimes also to the conservation or preservation thereof; which latter efficiency does chiefly belong to the universal Causes, which Scaliger does excellently shew, in his 28. Exercitation. *It is not (saith he) necessary, that the particular efficient Causes should be perpetuated together with their Effects: but then only to stick to them when they work. For it is enough that they give them their form, whereby not only they are, but are preserved: since out of their matter the qualities being driven by their contrary, the form also is forced away. Only the first Efficient, because he is Lord of Eternity and the world, accompanies his effects: there is no necessity that other Efficients shou'd do so: no not the Heavens themselves, otherwise than by his favor and Indulgence. So far Scaliger.*

But the Matter and Form are necessary both for the Production, Constitution and Conservation of the thing.

And although there were anciently, some who thought all things were made at random and by hap hazard: yet we avouch that God and Nature do nothing in Vain. Yet we do not here introduce a simple Necessity, but only a conditional, and therefore we do not deny all Contingency in natural things.

Many things might be added touching the Causes; but all that may be said of them, belongs not to our present Purpose, also I endeavor to be as brief as may be. Only one Question we shall here discuss, viz. Whether an accident can produce a Substance. There are about this Point Three Opinions. The first is of some late Writers who aver, that an accident by its own proper Virtue can produce a Substance? so that when Fire produces fire, that whol production intrinsically and effectively proceeds from Heat, nor does the substantial form which is in the fire concur to the effect. The second, is the Opinion of Scotus, Ockham, and Du-Rand, who teach, that Accidents can neither by their own proper Virtue, nor the power of substantial forms, produce a substance: but that a substance is immediately produced by a Substance. The third is the opinion of Thomas Aquinas, who avers: That accidents do not produce a substance by their own proper force, but by the power & virtue of the substantial forms, whose virtues and Instruments they are. This last opinion seems to me most probable. For that substances act mediately, any body may hereby learn, inasmuch as the things between which there is action and passion, are many times, we see, in several places: whereas, nevertheless a mutual contract betwixt the Agent and Patient is necessary, and the Agent and Patient ought to be together: And that Accidents cannot of themselves produce a substance, does hence appear; in that whatsoever is in the effect, does præexist in the efficient cause. For nothing gives that which it self hath not, either formally or eminently, as they say.

whether  
an acci-  
dent can  
produce a  
Substance?

### Chap. 5. Of that which is continued, and of that which is infinite.

Nothing is more intimately inherent in a natural Body than Quantity; as being of equal durance with the first Matter, and altogether inseperable therefrom, and by help whereof, all the remaining Accidents do adhere to the Matter. Yea and by a Body in the predicament of Quantity, we come to the knowldg of a substantial Body, which is nothing but a substance that hath three dimensions of Length, Breadth, and Thicknes. For these differ one from another, like Substance and Accident. In Subject they are one. For that Body which consists of Quanti-  
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ty, is not without a substantial Body : but they differ essentially, having different essences, when no man thinks of them.

what continued Quantity is & how many fold.

A Line.

A Surface

A Body.

Things possess a place only in regard of their being bodily.

To take up and fill do differ.

Why two bodies cannot be in one place?

God is present repletively

Now continued Quantity is that whereof we chiefly treat in this place ; whose bounds are one ; or whose parts are coupled with a common boundary. And there are three sorts thereof ; a Line, a Surface, and a Body, each of which hath its peculiar Office and Peculiar bounds. For a Line is a Longitude without Latitude, the bounds of a Surface. The bounds of a Line is a point : whose Nature is to continue touch, terminate. For it begins, continues and ends a Line. The Nature also of a Line is to continue, Touch, Terminate, and also to divide. For by a Line a Surface is continued, and Terminated, and by the same, two Surfaces, do mutually touch one another : Finally by means of a Line, every thing is divisible according to one dimension, viz. Longitude. A Surface is a Quantity long and broad ; by means whereof Bodies are continued, do mutually touch one another, and are divided. For by means of the Surface, a thing may be divided according to a twofold dimension, viz. Longitude and Latitude. Finally, a Body is a Quantity, Long, broad and deep. And its Office is not to continue, terminate or touch ; but to fill and possess, and to be apt to be divided according to its threefold dimensions, Length, Breadth and Depth.

Thus therefore, in respect of all dimensions things are said to have Quantity and to be divisible : but in respect of a body only they possess and fill. For that two bodies cannot be together in one place, is not because they are substances : For divers incorporeal substances, may be together in one and the same place : but because they have matter furnished with a threefold dimension, the Penetration whereof is impossible.

Here I must take leave to digress a little, and propound some things not much from our purpose, To possess or Occupy, and to fill, is for a body to be so in a place, as that another cannot be in the same place with it : and it is proper to such things as have matter of a threefold dimension. For such things do so take up the whole place, that another Body at the same time cannot be therein. But those things are said to fill, which may either many of them together, or with other bodies, be in a certain place, so that the Presence of one shall not hinder the presence of another. And therefore two bodies can never be together, nor can two hold the same place : and as the common expression is, Penetration of Dimensions is impossible. For Naturally it cannot be, that into that place which any of us fills, another Man, or any other Body, should be admitted, til we leave the same. But it is otherwise in things free from dimension and Matter, and in all Forms, substantial and accidental, which is manifestly apparent in the light of the Stars, for the lights of infinite Stars, are every where shed and spread about under the Concave of the Moon, nor do the Elements at all hinder them, by whom this space is before possessed, nor does the presence of the one hinder the presence of the other, nor though they are all of them in all places, are they confounded or jumbled together. The same we see in other things which give light. For if you place Looking-Glasses upon the walls of a chamber round about, and set candles in the midst of the said Chamber. They will all send their image and light into all parts of the Chamber, already full of Aire, nor will the presence of one hinder the other, nor will they be mixed or jumbled together : but they will all appear distinctly, in all the Glasses. So in Honey, in all parts thereof there is yellowness, and sweetness, and smell and moisture. And the same happens in substantial Forms. For both our Soul and the Soul of all living Creatures, does fill all the Body, which it informs, nor though a Body have before taken up the place, is it hindered from being in all parts of the Body. It is therefore the Property of things which have dimensions and are corporeal, to possess and take up : but of things free from dimensions and matter, to fill : and by how much a thing is more free, from dimensions, Matter, and bodily bulk, by so much the more it fills. Hence we see a sound fills a greater space, then a smell, and colors greater then sound ; and the light of fire yet a greater, and the light of the Heavenly bodies, a greater then that. Finally the most good and great God being infinitely free from all dimensions and from all matter, does infinitely fill all things, yea is himself an infinite fullness, absent from nothing, included in nothing, nor mixt with any thing ; but is totally all the world over, and totally every where without this world. For though he is present with all things, yet is not

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some part of his plenitude present with one thing, another with another, but he is wholly present with all things. Finally this world is made in the Atome, indivisible point or Centre of his fulness. And therefore, all things void of matter, and all forms, of themselves, have neither Quantity, nor can be divided, unless by accident, in as much as they are inherent in a body by whose dimensions they are bounded, and may be many of them together. For dimensions being taken away, the Form of any of us, may be with the Form of another, in the same place, and fill the said place, nor should the presence of one hinder the presence of another. And we see the same Form, which at first fits the Body of an infant, fill the said body without encreasing it self, when the infant is grown to a tall Person.

Forms of themselves are without Quantity and indivisible

But let us return to Quantity: where we are fallen into that most noble question which hath exercised the wits of so many renowned Men: *viz.* Whether a continued Body is made up of indivisible parts, or of parts divisible? And whether that which is continued may be divided infinitely? There were anciently some that held, that a continued Body was compounded of indivisible parts, as *Pythagoras*, *Democritus*, *Leucippus*, and the greatest part of those who flourished in *Aristotles* time, and the Stoicks themselves who in this point followed their Ringleader *Zeno*. But *Aristotle* undertakes their refutation, in the Sixth Book of his *Physicks*. Also they are opposed in that which is called, *Of Indivisible Lines*, which goes up and down under *Aristotles* Name, which some deny to be *Aristotles* Book, though according to his judgment, and collected from his publick discourses. And in this point the most excellent Philosophers and Mathematicians do follow *Aristotle*. And though weighty Reasons be alledged on both sides yet shall I side with *Aristotle*, and that for these Reasons following.

Whether that which is continued be made of indivisible or of divisible parts?

In the first place, if that which is continued be compounded of indivisibles, as for examples sake, a Line of Points, one indivisible with another, will either make a thing continued; or a thing contiguous, or a thing whose parts are ranked one after another. But none of these can be. And therefore that which is continued is not compounded of indivisibles. Indivisibles are not continued. For continued things are those whose outmost bounds are one and the same. But the outmost bound of Indivisibles is not: for every extrem is distinct from that thing whose extrem it is. And therefore indivisibles are not continued. And for the same reason likewise they cannot be contiguous. For those things are contiguous whose extremes are together. The same is also thus proved. What ever touches another thing, touches it either as an whole touches an whole, so that all its parts are together with the parts of the other, or as a part touches a whole, or as a part touches a part. After these latter manners, things indivisible cannot touch one another: for that which is indivisible hath not parts, nor can it be parted. Nor yet after the former manner. For every thing continued, hath parts without parts, so that one part is seated here, another there. If therefore in the making of a Line, the points should totally touch one another, and in making a surface, the Lines should totally touch one another; Finally in making a Body, the surfaces should wholly touch one another: from all the points would spring one point, and from all the lines one line, and from all the surfaces one surface only. And so a thing indivisible, added to what is indivisible, makes it no greater then it was; nor does it constitute a thing continued, which consists of many parts, each of which is without the rest. Nor do indivisible parts in a thing continued, follow one another as in rank or row: for so there should come nothing of the same kind between: but between any indivisibles, there comes somewhat else of the same kind: for betwixt two points there is a line, in which there must needs be points.

Secondly, If a Line were made of Points, or a Surface of Lines, or a Body of Surfaces; a Line which did consist of ten points, would be longer then that which consists only of nine; and a Surface compounded of ten Lines should be broader then that which does consist of only nine; and a Body made up of ten Surfaces should be deeper then that which is made only of nine. But these should not so happen save for a point, a Line, a Surface. Therefore that point must have Longitude, that line Latitude, that Surface Crassitude or Depth. For in respect of that which is not long, another thing cannot be said to be longer; nor in respect of that which neither is broad nor hath breadth, can another thing be said to become broader; nor in respect of that which hath neither depth nor thickness, can a thing be said to be thicker

thicker then another thing. All which things notwithstanding are manifestly false. *Thirdly* it would follow, that there are very many magnitudes, which cannot be divided into two equal portions; which is false: seeing, it is by the Mathematicians demonstrated that every continued thing, may be divided into two equal halves, to which it hath a double proportion. For things consisting of unequal indivisibles, cannot be divided into equal parts.

*Fourthly*, It would then follow, that the Diameter of a Quadrate were equal to its side, and a greater circle equal to a less, which has the same centre: which is absurd. For if you draw lines from every point of one side of the Quadrate, as many as you can possibly, to the opposite side, they will all pass through every point of the Diameter, nor will there be any point therein, through which they will not pass. For those lines fill all the space of the Quadrate. So if from the Centre you draw lines to all the parts of the greater Circle, they will all likewise pass through the lesser Circle, and therefore the less will have as many points as the greater, and so they will be equal. And from these instances it appears, that a continued thing does not consist of indivisibles, and therefore that it may be divided into parts perpetually divisible. For seeing it consists of such into such it must needs be resolved.

Yet we are here to observe, that a thing may be said to be indivisible two manner of waies: for a thing is either simply such as having no parts: or respectively, which cannot be actually divided into such parts, though it contain them, such as are the smallest things Natural. And touching the former, is our Question; *viz.* Whether a line, consist of points; a Surface, of Lines; a Body, of Surfaces. Moreover we must know, that when it is said a continued magnitude may be infinitely divided we are not to understand, that it has infinite parts actually or potentially, so as by continual dividing they may at length become infinite: but thus we must hold, that so many parts cannot be taken from a continued magnitude but more will remain. For we must not here admit of a real division. For since all Quantity adheres in some Natural Body, and there are Natural Bodies of the smallest size imaginable, there will be found a quantity actually the smallest possible. But we must thus understand it; that there cannot so small a Quantity be assigned, but that our understanding can conceive it divisible into two parts, and again each of these into two, and so continually descending lower and lower. Again, this is to be observed, that it is rightly said, that a continued Quantity may be infinitely divided: but it cannot rightly be said that it may be divided into infinite parts. For if we say into infinite parts, we say not true: for as the continued Quantity is actually finite: so also its parts are actually finite: and are terminated by the bounds of the whol. But this is true, that a continued magnitude is apt to be divided infinitely, that is to say, in dividing you cannot come to any thing but what may be divided again. And hence it does not follow, that what is continued in magnitude has infinite parts. For every whol is estimated by such parts, as have a certain magnitude: and such in every continued thing are finite: but those parts in respect of which a continued Quantity is said to be infinitely divisible are not actually of any determinate magnitude.

Hitherto has been shewed that a continued Quantity in a Body Natural, is not compounded of indivisible parts, and therefore is infinitely divisible, although it be never actually divided into infinite parts; seeing Natural things have determinate bounds of their greatness or smallness. Touching which, seeing there is some controversie amongst Authors, I shal ad somewhat to what has been said, and make inquisition into the greatest and smallest Natural things. Wherein that I may proceed the better, I must premise some things.

In the *First place*, Although the notions of *Greatest* and *Smallest*, are transferred from Quantity to other things, as also Qualities and motions are; yet that in this place we speak properly of Natural substances. For touching them the Question is, whether they certain bounds and limits set to their Quantity. *Secondly*, That this Question may have a manifold sense: as a man may ask both whether there be in Nature a greatest and smallest substance, then which now can be greater or smaller: and whether Nature have set bounds of Quantity, so that she hath not of her self power, to make things bigger or lesser? Moreover, it may be further question'd, *First* whether there be absolutely the greatest and smallest thing possible,

in the Universe? Secondly, whether in every sort of Natural Bodies both simple and compound, and of Homogeneous mixt Bodies as well as Heterogeneous, and of animate as well as inanimate, there are certain and set bounds of Greatness and smallness? Thirdly we are to observe that the terms or bounds of greatness and smallness are twofold; some intrinsic which things receive from their own Nature: others extrinsic, which are by others externally prescribed to things. Fourthly, That the greatest and least are so termed Positively or Negatively. Positively that is the greatest thing, which is greater than all others, and to which nothing is equal: and the least contrarily Negatively, that is greatest, than which nothing is greater, though there be somewhat equal. And that is Negatively the least, than the which nothing is lesser, though there may be somewhat as little.

These things being premised, thus we conclude. I. In the whole Universe, and in every sort of Natural things, there is actually something which is greatest and something which is least. For unless there were somewhat greatest and somewhat least, in the whole world, and in every sort of things, either positively or Negatively: there might be a greater than any that is never so great, and a less than any that is never so small, and so there should be actually in Nature an infinite multitude of things. But that that cannot be, shall be hereafter demonstrated. The same does also hereby appear; Seeing all accidents do follow the substantial Form: and every Natural Body, hath a Form actually determined: therefore every Natural Body must also have accidents determined and a limited Quantity. And, indeed, of all Bodies Heaven is the greatest, because it contains all things: but what the smallest thing is, we cannot peradventure determine. Howbeit Aristotle in his 5. Book of the History of living Creatures Chap. 32. Writes that in old Wax, as in wood, a white living Creature is bred, which of all Live-wights may be, counted the least, the name whereof is *Acari*.

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II. In every sort of Live-things, there are intrinsic bounds of greatness and smallness, without which Nature cannot produce nor conserve Living things: so that no Individual or Particular Creature of that sort, may be produced and conserved, which either exceeds that term of Magnitude, or falls short thereof. For examples sake, in case the greatest Height of a Man be four Cubits, the smallest one Cubit: there can no man be generated that shall prove higher than four Cubits, or lower than one Cubit: but all shall be either of four, or of three, or of two, or of one Cubit, or of some other measure betwixt four and one. And thus does Aristotle determine in his 1. of Physicks, Chap. 4. Text 36. in the 2. de Anima, Chap. 4. Text 41. in the 4. de Gener. Animal, Chap. 4. in the 7. of Politicks, Chap. 4. And Reason perswades the same. For since augmentation or growth is determinate: and quantity is acquired by augmentation, it self must therefore be determinate. And that Augmentation is definite, does hereby appear, because it is an action of the Augmenting faculty, which is determinate as all other faculties of the Form are: the instruments also are definite or determined. For the very Natural Heat is limited, and becomes every day more remiss, Yea, and is at last extinguished. Yea, and all the other. Instruments are also limited. Nor is experience against it. For we never heard of a Dog born as big as an Elephant, nor grown to that greatness, nor of an Elephant born no greater than a Puppy-Dog. Howbeit, hard it is to set down and observe the terms, in every species. For they have sundry variations, and more in one sort, than in another. Amongst Men there is a great diversity of Magnitude; a greater amongst Dogs; but not so great amongst Cats, and Birds and other Animals.

III. But the Elements have no determinate magnitude of themselves and intrinsically, but from without. For the Elements of themselves, if they had matter enough; and there were no outward obstacle might be augmented indefinitely. For look how much greater Bulk the fire gains, by so much the more efficacy it has, the more it resists contraries, and turns them into its own Nature. But their magnitude is limited by the things which contain them, and in respect of the *Materia Prima*, or first matter. For seeing the bulk of the first matter is finite, the Elements cannot be infinitely augmented.

IV. And Because the Elements do likewise change their Quantity, by Rarefaction and condensation; touching that, we are likewise to know: that of their own

Nature,

nature, they are in this point limited. For they cannot be condensed or rarefied, after every sort and manner, without being corrupted. And experience does witness, that the earth is never so rarefied as the fire, nor the fire so condensed as the Earth. Yea and when the Air is too much condensed it is turn'd into water; and the water being too much rarefied is changed into Air.

V. Touching mixt things without life, which exist by themselves, and are homogeneous, we are to judg the same in this point, as of Elements: and of things Heterogeneous the same as of living things.

VI. Finally, as concerning the Parts which are in the whol, thus we are to hold. If they are heterogeneous, they have determinate Limits of their greatness and smallness, inasmuch as they are parts and Instruments of living things, which have a certain magnitude. But if they be homogeneous, there cannot be assigned a smallest, nor are they contained in any set limit of smallness. For seeing the Form of Fire, has the same respect in all its parts, and that it is extended according to the extension of the matter: after the same manner as there cannot be assigned the smallest inexistent Quantity; seeing every continued thing is infinitely divisible: so there cannot be assigned any portion of fire, than which there is not a smaller in the same fire.

\* Whether  
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And so much may suffice to have been said of Quantity; we are now to treat *de finito et infinito*: touching that which is finite, and that which is infinite. For these are proper adjuncts of Quantity: and they are likewise adjuncts of motion and time; seeing any and every of these is either finite or infinite. And in the first place, let us consider whether there be any thing infinite in nature. And although there be sundry significations of this term Infinite: yet the chief speech in this place, is concerning that which is Infinite in Quantity, and indeed of that which is actually infinite; and the Question is, whether there be actually in nature any thing, which is infinite, either in magnitude or in number: or whether there be any natural thing, whereof when you have taken never so much in Quantity, you may stil take more, which is the definition of that which infinite. Now it is by the Philosopher rightly affirmed, that there is no such thing in nature, for these Reasons. For that, in general there can be nothing infinite, is from hence aparent; inasmuch as all things produced by and depending upon another, are defined and circumscribed by their own bounds and limits, nor can they by any means possible be infinite. But of the sorts of things, it may also easily be proved, that there is no infinite multitude. For seeing one sort does alwaies exceed another in perfection, if the sorts of things were infinite, the world would be infinitely perfect, and would have in it infinite degrees of perfection: which is a thing Impossible. For every thing produced by another, and depending upon another, has a participated and therefore a finite perfection. But the world is produced by God and depends upon him. Therefore it has a participated and finite perfection, and is sepatated from God in perfection, from whom it has received its perfection; and therefore, it is neither infinite, nor does it contain infinite sorts of things.

Nor is there any thing infinite in Magnitude. For, in the first place, if there were a Body infinite in magnitude, there could be no other in the world but that; for seeing it would require an infinite place and would fil the Universe, it would leave no room for any other body. Moreover, every thing that hath quantity, hath necessarily figure. But that which is infinite can have no figure. Moreover it must consist of all its parts either finite, or infinite, or of one infinite and the rest finite. But none of these is possible. For that which is infinite cannot arise out of finite parts. Nor can the second or third hold, for one infinite would fil all place and dimension, and would leave no place for the rest of the parts: and if it should have a Quality contrary to the rest, it would turn all the rest into its own nature.

And as we deny that there is any thing actually infinite, so we grant there is somewhat potentially infinite. And first in the continued Quantity, which is in a possibility of infinite division, as was said before: and secondly in number, which may be infinitely augmented. For there cannot be imagined so great a number, but that more may be added thereunto. Finally in time and motion, which are successively infinite. But concerning that which is Infinite, I shal say no more, only conclude with that saying of *Piccolliminius* in his 1 *Book of common Affections of natural*



*natural Bodies, Chap. 3. That which is Infinite, as Infinite is unknown, and whilest we know that which is infinite, we know that which cannot be known.*

Chap. 6. *Of the Qualities in general.*

**A**fter Quantity *Quality* ought of right to follow, and we must say somewhat of the Physical Qualities in General. For as all natural Bodies have Quantity <sup>*Quality*</sup> by reason of their matter: so in regard of their Forms they have Qualities. <sup>*what?*</sup> Now Quality thus considered in general, and as it belongs to all natural Bodies, is an adjunct of a natural Body, flowing from the form thereof, by which the form is efficacious, and a natural Body apt to do or suffer. For the forms of natural Bodies do not act nor work immediately, like God, but by the Mediation of Accidents and Qualities. And though the form be the primary Principle of Operations, and the Qualities are the immediate and next principle of the Operations, yet are they less principal, and only Instrumental. And the forms in their actions do use the Qualities as Instruments: but the Operation of the Qualities springs from the virtue of the Forms. And so because nothing is idle in nature; but every natural Body acts, therefore every natural Body must also be furnished with its Qualities,

Now these Qualities are divided in respect of our knowledge into *Manifest* and *Occult*. <sup>*Qualities*</sup> The manifest are those, which easily evidently and immediately, are known <sup>*divided.*</sup> to, and judged by the Senses. So light in the Stars, and Heaviness and Lightness, being first Qualities, are manifestly obvious to the Sences. But occult or hidden Qualities are those, which are not immediately known to the Sences, but their force is perceived mediately by the Effect, but their power of acting is unknown. So we see the Load-stone draw the Iron, but that power of drawing is to us hidden and not perceived by the Sences.

So there are many Influences of the Heavens which we know by their Effects upon these lower Bodies, but cannot by our Sences perceive them.

Now from the Qualities of natural things arise their consent and dissent, and things like have a mutual appetite one to another, contraries have an averfness one from another. Hence fire is easily united to fire, fat things to fat things; but fire shuns water, and fat things shun fire. And this is the manifest consent and dissent of Natural things.

But from the hidden qualities there arise Sympathy and Antipathy so called; when natural things are carried one to another by an hidden Love; or have a natural abhorrency one from another, as some cannot endure a Cat to be present, no not so much as to look upon the Cat, and others have the like abhorrency from other things. And because this same hidden action is most conspicuous in a Load-stone, other such like Actions are therefore termed magnetical.

But of the several sorts of Qualities, we shall hereafter treat in their proper places.

Chap. 7. *Touching Place.*

**T**Hat which is commonly said of Time; *We live in time and yet we know not what time is*, may be as truly said of Place: we are in Place, yet are ignorant what Place is. For the Question about the nature of Place is so intricate, that the most acute Phylosophers are herein at a stand, while the Question is, Whether Place be the surface or outmost bounds of the Body containing: or a space equal to the Body placed,

Both Opinions have patrons and defeuders of no mean rank. For the first is the opinion of *Aristotle* himself, and the most of his Interpreters: the latter was famous in *Aristotles* time and was maintained by the Stoicks, the Academicks and by *Galen*; and by *Phyloponus* amongst the ancient Periperaticks; and amongst late Writers, by *Julius Caesar Scaliger* and other renowned Men.

And though I do not take upon me to compose so great a controversie betwixt such famous men, nor think that it is fitting to desert the Prince of Phylosophers, unless <sup>*whether*</sup> <sup>*Place be a*</sup> <sup>*Surface?*</sup>

unless upon a very weighty occasion: yet seeing the opinion of *Aristotle* is laden with very great difficulties, in the mean while, til some body shal answer what is brought against his opinion ( for I believe no man has yet given a solid answer thereto ) I must take the adverse side : especially since it is wel known that the very Interpreters of *Aristotle* have confessed, that the other opinion is not improbable, nor has been by any sufficiently confuted, and that there is no demonstrative Argument to the contrary ; and that the opinion of *Aristotle*, is only probable, but not necessary : and it is very wel known, that most men have been moved by Authority rather than Reason to defend the opinion of *Aristotle* : which one man, viz. *Didacus Masius* does plainly confess, when in his Commentaries upon the 5. Chap. of the 4. Book of *Physicks*, he thus writes : *But I ( saies he ) unless I were hindered by the Authority of Aristotle and Thomas Aquinas, should most willing'y imbrace that opinion concerning Space, which we may easily perceive, if diligently we shal weigh the foregoing Arguments and what has been said touching the Nature thereof, that it is both more easie to be understood, and has fewer objections against it. But because we must submit our understandings to Aristotle and St. Thomas, we are forced to confess, that Place is a Surface and not a Space, because these most grave Philosophers, have so determined*

The Properties of Place.

But that I may not seem to have done any thing without reason, wherein I imitate *Aristotle*, I shal propound the chief proprieties of Place, and examine which do truly and properly belong thereto ; that from thence it may appear, which of these opinions is most probable. *Aristotle* in the 4. Book of his *Physicks* Chap. 4. Text 30. tells us, That these are the properties of Place. 1. To contain the thing placed, or whose place it is. 2. To be no part of the thing contained, which property some joyn with the foregoing, thus : a place does so contain the thing placed, as to be no part thereof. 3. That the place be neither greater nor lesser, than the thing placed. 4. That the place is separable from the thing placed ; or as some read it, that the place cannot be without some body, but may be without this body or that. 5. That all place is upwards or downwards. 6. That every body is naturally carried to its own place, and is disposed to rest therein. Howbeit, some joyn this with the fift. From other places, Authors gather more properties : for they ad, 7. That it is a property of Place to draw to it self the thing placed : which they would draw out of the 4. of his *Physicks*, Chap. 1. Text 4. 8. That the place has a faculty of generating, conserving, and perfecting the thing placed : which they draw from the 4. of his *Physicks* ch. 1. Text 4. Chap. 5. Text 48. 49. from the 4. de *Celo* Chap. 3. Text 23, 24. from his 8. de *Historia Animalium* Chap. 28, 29. 9. That the place gives distinction and unity to local motion. 10. That Place is immovable, 4. *Phys.* Chap. 4. Text 41. 11. Out of *Psellus* they draw this property : that a Place is neither abolished, nor does perish, though the things which are therein, may be abolished.

And these are the chief Properties of Place which we meet with in Authors : betwixt which we must nevertheless distinguish. For, as to the first, second, third, fourth, ninth, tenth, eleventh, they are simply necessary to a place, nor is there much doubt concerning them. As for the rest, we must see in what sence they may be admitted, and we must enquire, what agrees with a place in it self and as it is a place, and what by accident : in which point there is no small confusion in Authors. In the first place, that is to be noted, which *Scaliger* does hint, in his 3. Book de re Poetica especially in the 120. Chap. nor has it been omitted by others ; that we must distinguish betwixt a place simply so called, & as it is an affection of a Body natural in general ; and between *Ubi* and *Situs*, which is not any place, but one affected with certain conditions, which they are nevertheless frequently accustomed to call Place. Hence 'tis a common saying, that the place of light things is above, and of heavy things beneath : because in the middle of the world there are qualities by which heavy things are amicably cherished ; and about Heaven there are qualities that cherish light things : which Qualities nevertheless do not necessarily belong unto the essence of place. For even the fire in the Bowels of the Earth is in a Place, though not favorable thereunto. Hence also *Aristotle* in his 8. B. de *Historia Animalium*, Chap. 19. 28, 29. Probleme 15. Section 14. and *Pliny* every where, saies that the natures of plants and Animals are divers according to the variety of places wherein they are

How place and Situation differ?

and

and that some places are convenient and others inconvenient.

Since therefore these are reckoned amongst the proprieties of place: that every thing is carried to its place; that the place does allure and draw to it self the thing placed; that the place has a power to generate, conserve and perfect the thing placed therein: we must know, that all these properties do not agree to a place, as it is a place. For seeing a place as *Toletus* saies, is formally Quantity: it is not of the Essence thereof to be a Cause. For Magnitude as they say, is not the efficient of an accident; which *Scaliger* also intimates in his 5. *Exercitation*, *It is not true* (saies he) *that bodies are preserved by their place, but by their form.* And if a Place as a Place, and therefore not a proper one, should conserve: the Elements would not seek to get out of that place into their proper place. The Elements therefore are not preserved by their place; but by their *Ubi.* *Scaliger* in the same *Exercitation*, *Section 5.* But so far the Place is said to preserve the thing placed, inasmuch as the body there placed, does conveniently receive the Qualities of the Heavens and Elements which are most agreeable thereunto: and inasmuch as Qualities friendly to the thing placed, are in the Subject which is about the place.

And therefore, seeing in the searching out of the nature of things, that which is by it self, must be carefully distinguished from that which is by accident: we do here understand the term Place, not in the latter, but in the former Sense: Nor do we allow of that saying, that only the Elements are in a Place. For we do not here seek after the Adjunct of some sort of natural Bodies; but our Enquiry is, what Place is in it self considered, and as it agrees to all natural bodies in general, and to all their sorts as a proper adjunct.

We are now in the next place to consider, whether the genuine Properties of place do best agree to the Surface of a body containing, or to the Space commensurate with the thing placed. And that we may begin with immobility; that is a most true propriety of Place, and by *Pererius* his confession, though it make against himself, it is an essential Propriety thereof, even as risibility or a disposition to Laughter is an essential propriety of Mankind; and as *Ægidius Romanus* saies *Lib. 4. Phys. 1. 41. Sect. 7.* the very formal being of a place. To the asserting whereof, though there were no other Reason, this might suffice, that all Men whatsoever their opinion is concerning Place, do herein agree, that a Place must be immovable, and every one endeavors to accommodate this propriety to his Place. And verily he that takes away the immobility of Place, he takes away local motion and the distinction thereof. For that which is moved, of necessity leaves one place and goes into another: which could not be, if the place were moved with the thing.

From this Propriety therefore we conclude: seeing place is necessarily immovable, and the surface of a body containing is not immovable: that it is no Place. For suppose a Tower or a Pillar erected, or a Tree growing up in the Air, or suppose an Hill in a River, or in the Air, at every moment as the Wind blows and the River runs, their place will be changed, which is against the Nature of Place. Yea and this great Absurdity will hence follow: that one and the same body, fixed in one and the same space, quiet and without motion, shall have every moment a new place, and so be in an innumerable company of places.

In this Argument the maintainers of a Surface to be Place, are variously perplexed, as we may see in *Pererius* Book 11. *Phys. Chap. 2, 3.* and *Tolet.* Book 4. *Phys. Quest. 5.* And *Pererius* himself demonstrates that the answers carefully sought out by *Scotus* and *Aquinas* are not satisfactory. And it will be worth our while to consider whether he brings any thing more to the purpose, seeing many affirm that he has answered all Objections. Now this is the judgment of *Pererius*: First, he saies the word Place is used in common and vulgar acceptation for scituation and position; and 'tis commonly said a thing has this or that place, meaning that it is so or so scituated; and, therefore a thing may change its place two waies, either actively or passively: Actively, when it passes out of one place into another, leaving the place wherein it was before: Passively, when the thing remains immovable, but the place about it is changed. He supposes therefore, that a Tower, a Pillar, or Mountain, about which ever and anon the surface of the Air or Water is changed, are not properly in the same place: yet they remain in the same place, by place intending scituation: or they remain in the same place actively; because

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because these bodies themselves do not pass from place to place : yet they remain not in the same place passively ; because the Surface of the Air and water compassing the said bodies, does not remain the same in number, but is ever and anon changed. This is *Pererius* his defence, which whether it be not contrary to all Reason and sense, let himself judge. But I would first have *Pererius* reconcile this proposition which is in his 11. B. ch. 3. p. 615. The Surface of the Body containing, which is of the Essence of place, is not alwaies the same in number about the same thing placed but is ever and anon varied ; with that, in his 1. ch. p. 607. immobility is essential to place, because it is an essential property thereof, as risibility is of a Man, and because immobility is used in the definition of Place, instead of an essential difference. Can Surface be of the essence of place, and yet not be immoveable which is an essential propriety of place ? Again I grant, that the term place is frequently used for the Scituation and Position of a Natural Body, and allow such a speech be proper enough : Yea, and if so be a thing remains in the same Scituation, I aver against *Pererius*, that it remains in the same place ; for Scituation alwaies presupposes place, and it signifies the relation of the thing placed to the place. And therefore Natural bodies when they change their place, do also change their Scituation. And it is, doubtles, a great Absurdity to say, that a thing not moved with any local motion should change its place. For a new place is gained only by local motion : and that which changes place, is locally moved, and by local motion, we are brought to the knowledg of place, as may be seen in *Aristotle* 4. *Physic. Chap. 4. Text 32.* And therefore *Tolet* rightly saies : If I stir not, and the Surface about me be changed, it may not be granted that I am not still in the same place. That is therefore a weak defence, which is made by distinguishing betwixt active mutation of place and passive. For seeing to change place actively, is for a body to be transferred out of one place into another ; to change place passively must be, for the Place to come unto and be moved to the thing placed : then which, what is more absurd ? Nor is *Ant. Ruvius* more happy in his solution, Book, 4. *Phys. Quest. 3.* who confessing, that this Argument is so difficult, that in regard of the difficulty thereof, Authors have been divided, as to the manner of attributing Immobility to place ; and examining and rejecting the opinions of others, he is at last forced to confess ingenuously ; that it is impossible that the whol Nature of Place, should consist in a Surface, and that Place should be immoveable ; since 'tis evident, that the ambient Surface is frequently varied, and that therefore place requires somewhat, in respect of which it may be immoveable. And at length he is fain to fly to this, that Particular places, are therefore immoveable, because they are parts of total place, or parts of that whol space, real or imaginary, which is comprehended under the compass of the Skies. Whereby to say the truth, he so leaves *Aristotle*, as to joyn with them that say place is that space, which every Body fills.

Another propriety of place, is to be equal to the thing placed. But the Surface is not equal the to thing placed, and therefore it is not the place. For a Surface hath only two dimensions, but a Body three. Nor does *Pererius* his answer remove the difficulty : viz. That the place is equal to the thing placed, because the convex Surface of the thing placed, and the hollow Surface of the thing containing are equal. For the Question is not about the Quality of the Surfaces of a thing containing and a thing contained : but touching place and the thing placed. Now Bodies are placed, and not Surfaces. And therefore it is necessary, that a place, be not only equal to the Surface of the thing placed, but to all the dimensions thereof : for otherwise the place should not be equal to the thing placed. For a Line is not said to be equal to a Surface, nor a surface to a Body ; but a Line to a Line, a Surface to a Surface, and a Body to a Body.

I shall not compare any more proprieties of a place with a Surface. For what hath been already said, is more then those can answer, who wil have place to be a Surface. Yet one thing I wil add. Place is a common Adjunct of all Natural Bodies, and ought to agree to all. But the Surface of a Body containing, does not agree to all Bodies. Therefore it is no place. For the Highest Heaven, hath no Surface of any Body to compass the same about : whereas it is nevertheless a Body ; and is locally moved ; and therefore requires a place. For whereas some think it is no absurdity to say, that the highest Heaven is in no place, nor that every Natural Body hath a place : this seems unreasonable. For that every Body

A surface  
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The high-  
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is in a place, and that a Body cannot be without a place nor a place without a Body, is the Assertion of the gravest Phylosophers *Avenroes, Johannes Grammaticus, Porphyrius, Marsilius Ficinus*, and very many more both antient and late Authors. Nor does *Aristotle* seem to dissent in this point, in the 4. *Phys. C.* 1 Text 6. and 1. *de Celo, Cb. 7.* T. 69. And that assertion is not void of reason in the 4. *Phys. C.* 7. T. 1. *Everything that is, is somewhere, and that which is not, is nowhere, and that which is nowhere, is not.* Natural Bodies, are real beings, and therefore they are somewhere. Now there are three manner of waies, whereby a thing may be somewhere, Repletively, Definitively, Circumscriptively, or Locally. But Natural Bodies cannot Naturally be said to be any where in the two first manners. For it belongs only to God to be Repletively any where: who as *Damaschin* truly writes in Book 1 Ch. 16. *God is present repletively. is totally every where, totally in all things, and totally above all things.* Or as *Scaliger* in his 1. *de Plantis*; *who is by all things, above all things, in all things, before all things, after all things, High, Glorious, Immense, Incomparable, Incomprehensible.* And to be any where definitively, is said of Angels. And therefore Naturally bodies as *Angels definitively* such, where ever they are said to be, they are said to be there Locally: and by Reason of their Circumscrip and Determinate dimensions, they are in a Circumscribed and Determinate space. Hence *Du-Rand* saies wel in 4. *Seet. Distinct. 44. Quest. 6.* *In this respect only a place is possesed by the thing placed; because the thing placed hath within the place, the distention of its parts. Since therefore this is essential to the thing placed, as it has Quantity, it is impossible the thing placed should be in the place, and not take the place up.* And a little after: *If a Body be locally in a place, it cannot be, but it must take the place up: because to take a place up, is to have in the place parts distant in position one from another and from all other Quantity: and that is nothing else, but to have Quantity.* Also there is a most elegant place to be seen in *Scaligers* 56. *Exercitation, Seet. 6.* wherein he shews, how the place is necessary to the thing placed. And in very deed, motion does sufficiently teach, that the Heaven is in a place. For seeing every thing that is moved, is moved in its place, by local motion: and the Heaven is moved with local motion; we must by no means deny that it is in a place. Nor can local motion be imagined without a place. Yea verily, though the Heaven were without motion; yet the Heaven of its own Nature is in a place. For seeing place belongs to bodies not only because of their motion, but that Natural Bodies are in place when they stir not; what ever you will assigne to be the cause why Natural Bodies are in place, it wil be found also in the Heaven: seeing it is a Natural Body.

And whereas the Authority of *Aristotle* is objected, who in the 5. of his *Physicks* Chap. 5, Text 43. delivers this rule of knowing what Bodies are in a place and what not; *viz.* That Body is in a place. without which there is another Body that contains it: but that is not, without which there is none: this Authority does not hinder us at al. For *Aristotle* did build this rule upon his presupposed definition of place; which definition falling, this rule fals: and withal the argument drawn therefrom. *viz.* That the Heaven is not in a place; because place is the Surface of a Body containing: but without the Heavens there is no Body. For here the question is beg'd: and it is more doubted whether place be a Surface, then whether the Heaven be in a place.

Seeing therefore, for these and many other Reasons, that Opinion which makes place to be the Surface of a Body containing, cannot possibly stand: and by confession of all Peripateticks, such a thing as place there is, and it is distinct from the thing placed; I do aver, that a place is all that place long, broad, and deep, which the Body placed does Occupy and this space is a thing different from the Bodies themselves. For though you should imagine al the Bodies in the universe to be removed, there would remaine a space, long, broad, and deep; which nevertheless, is not at any time actually without Bodies: but the whol Universe fills this whol space, and every part of the Universe challenges a part of the whol space, equal to it self.

Now that there is such a space is apparent out of the 4. of *Physicks*, Text 5. and the change of things out of one place into another shews as much. For there where Water now is, *viz.* In the Vessel, when that is powred out there will be Air, or some other Body of equal dimensions wil possess the same place. Nor does this happen only in respect of Surface. For unless a Vessel be emptied according to all dimensions;

dimensions; another body cannot go into it; and the thing placed fills its place according to the three dimensions. Let there be two Vessels of equal Magnitude and Capacity, in respect of their concave surface; and fill the one which shall have nothing in it but Air, with Water: and afterward pour the same water into the other, in the midst whereof a stone shall hang by a thread; the water will not all be contained, by a vessel of the same capacity and surface. What is the cause hereof? If a surface be place, what is the reason, that, seeing there are in these two Vessels equal surfaces, and consequently equal places, they do not receive a Body placed of the same size? Namely, because a place is to be defined and estimated not according to the surface, but the whole space and profundity, according to which the thing is placed. And that two bodies cannot be together, is not therefore, because of the surface of the Body containing, but because each body requires a peculiar space for it self to exist in.

The proprieties of place agree with space

The Heaven is in its space.

What this space is?

And that this space is place, does hereby also appear, in that all the genuine proprieties of place do agree thereunto; and by this opinion, those great difficulties are avoided, which vex other opinions. For the space contains the thing placed therein, and is equal thereunto: and is never without one body or other; but it may be without this Body or that: it is immovable, nor when any Body is removed, does the space wherein it was move with it: but the Body passes out of one part of this space into another. Also by this opinion, that most difficult Question, in the answering whereof, one side is much puzzled as may be seen in *Pererius B. 11. Ch. 8. Tolet B. 4. Phys. Quest. 7. Colleg. Conimbr. Book, 4. Phys. Ch. 5. Qu. 2. Art. 12. viz.* How the uppermost Heaven is in place, may easily be answered. For it is in its space which it occupies, as *Scaliger* rightly saies in his 5. *Exercitation, Sect. 7.* Now what for a thing this space is, is not very easie to determine. Yet we must not therefore deny that there is such a thing. For these are distinct Questions, whether a thing be and what it is, And if we should deny there were any thing but that the Nature whereof is perfectly known to us: we must deny against manifest reason the beings of many things, because their Essence is hid from us. Howbeit, when they who deny the uppermost Heaven to be in a place, shall explain what that same *Ubi* is, in which the upmost Heaven exists and is moved: it will be easie to explain what this space is. Or let them tel us, what is the Essence of the first matter; and we shall with the same ease unfold the Nature of space. For if from a Natural Body I remove in my thoughts all the form, and all the adjuncts proceeding therefrom, as *Aristotle* himself in the 7. of his *Metaphysics, Ch. 3. Text 7.* Describes it by the negation of all things: what I pray you will there remain? And shall we therefore, because we cannot sufficiently understand the Essence thereof, and can only comprehend it by a bastard kind of reasoning, call it only an imaginary kind of thing? By no means. Even so, though our mind cannot conceive space, save by the denial of all Bodies: it does not therefore follow that it is nothing, or nothing different from the Body. For if this and this and that and that Body, may be removed from this space; doubtless all these Bodies, will be different from this space, and the Space from the Bodies.

Yet I shall produce what Authors think thereof. *Proclus* held this space to be a body animate, indivisible, immovable, immaterial. Others will have this space to be nothing real, but of it self an emptyness, or privation of a Body, which yet it can receive. Others say, this space is an accident, *viz.* A Quantity, long broad and deep: not as *Epicurus*, existing by it self without any Body, but alwaies conjoynd with some Body. *Jordanus Brunus Nolanus*, takes it to be a fifth kind of Cause. Which seems to have been an old opinion. For they relate from *Albertus Magnus*, that the Peripateticks did reckon place amongst the Principles of Nature: from whose opinion, *Franciscus Patricius*, seems not to differ, in his *Book de Spatio Physico*.

Among these opinions, because the three last have renowned Men for their Authors, I am minded to propound them according to their Authors intents. Not but that I know the Objections which those opinions also are liable unto; seeing it is much easier to overthrow *Aristotles* opinion of place, then to tel what space is: but to the intent that the diligent searchers of Nature, may have hereby an occasion to think of the matter. For as *Aristotle* wisely writes in the 2. of his *Metaphysics Ch. 1.* For we are not only bound to thank them that have so writ as to satisfy us with their opinions, but them also who have spoken but superficially, for even these men also advantage

tage us by affording matter to exercise our wits. And as Scaliger saies well, in his first Book of Plants, A studious Person should pass nothing over, which may offer it self as an occasion of fuller contemplation.

Julius Caesar Scaliger therefore, in his 5. Exercitation Sect. 9. saies, that this Space is a Vacuity filled with Bodies, or a Vacuum wherein is a Body, whose Nature is such, that when one Body gives place to another, there is a Vacuum or Empty space made, that the other Body may come in as Privation is a Vacuity of the Form to be introduced: and nevertheless is by Aristotle placed amongst the Principles of Nature. For as Epicurus, in his Epistle to Herodorus in Diogenes Laertius, writes; If that were not, which we call emptynesse or space, Natural Bodies would not have where to be, nor would any thing be moved, as now we see things are moved.

Now the last opinion save one Philoponus did long ago stiffly maintain, and some even in this Age do account it no absurdity. Nor do they conceive, that which is objected against this opinion, much to hinder the same: viz. if space it self be long, broad and deep, and another body should be placed therein, there would be penetration of dimensions. For two Bodies are not hindered to be in one place, in respect of Quantity alone; for so a Body of the Predicament of substance could not be with a Body of the Predicament of Quantity; whereas nevertheless these two are one and the same in number and subject; but because of the corporeal matter. And we must difference a Body extended and measured out, from the extension and measurement it self: whereof the former is a corporeal substance, the latter an accident: both which are nevertheless termed a body, by reason of that penury of words in this Case. Hence Johannes Grammaticus himself saies, that a Body is not a threefold dimension, but that substance to which the said dimension is inherent as in a subject. Nor does any remarkable absurdity follow from this opinion, viz. that an accident should pass out of one subject into another. For that passage only of a Form or adjunct out of one subject into another is impossible, whereby an accident or Form being one in number, does leave its whole subject, and pass into another: but if a substantial or accidental Form, does not go out of its whole subject, but remain therein, it is not absurd that it should go out of one part into another. Therefore every dimension may receive any Body, as one part of the dimension of the whole Universe, may contain also some part of the Universe in it.

what a  
Body is?

Finally, Neither does that follow from this opinion, that there can be places actually infinite, or that a place can have a place, or that a place, can change its place, as it is in the 4. of Physicks Chap. 4. Text 37. For the parts of water are in water, as in their whole, and in space as in their place: which if they are finite, they have finite Spaces answerable, if infinite, they have infinite. Moreover since all the water changes place, the parts also of the water change place: yet place does not change place, nor is there a place of place. But as the whole and parts are transferred: so also the whole and parts change place: but the space which is part of the Universal space, remains immovable. For neither a River, or Heaven, or a Vessel, or any such thing is a place, but that space wherein a River, Heaven or a Vessel or any other thing is contained.

Didacus Masius out of Philoponus and other Defenders of Space, does thus describe the nature thereof. The nature thereof is a body: for it consists of three dimensions, Longitude, Latitude, and Profundity: yet is it immaterial; because it has no matter nor form. For it ought to penetrate the thing placed, according to all its dimensions: but if it were material it could not penetrate. And therefore it is also indivisible; because from it no parts can be taken away. For division can only have place in such things as consist of matter: and moreover it is separated from the Bodies placed therein. For the same space in number which contains the Wine in the Flagon, the same receives Air, and when that is gone Water or some other Liquor. And therefore it receives not its individual nature from the Bodies, but of the bodies within whose sides it is contained, as the space in the Flagon from the Flagon; that in the Air from the Air. Moreover it is affected with no qualities; because it is neither white, nor black, nor hot, nor cold. And therefore it seems rather a Mathematical Body, separate from all sensible matter, than a Physical and natural body. Also it penetrates all bodies which it embraces in its Lap, yet without division, as sweetness penetrates through the whole Body of the Milk

without dividing the same. For so it penetrates all bodies which it contains, as to fill them according to all their parts and dimensions, but not so as to divide them. Finally, there is one space in the whole universe and world, equal thereunto, which in divers parts receives divers Bodies. Nor when a Body is moved from place to place, does it carry its Space with it, but it passes out of one part of the Space into another, the space it self remaining wholly unmovable.

Now *Franciscus Petricus* does thus conceive of Place. First, He saies it is a common Notion of all men; both that there is space, and that it is somewhat, seeing they have coyned these Terms, Dimension, Distance, Interval, Space: and that this content arose from their Sences. For all men do see that the Heaven is distant from the Earth, the East from the West, the Head from the Feet: and local motion and the migration of bodies out of one place into another, do teach the same thing. For where there was Water before, the water being poured forth, Air enters into its place, and water again fills the place of Air.

Now he saies this Space was before all other things produced by God the great Work-master, inasmuch as all other things stood in need thereof, and without it they could not be. And whereas it is hard to know what Space is; he saies it is no wonder: for all the Qualities of Bodies whereby they incur into our senses, are later than the Bodies themselves: but Space is different from Bodies, yea and is before Bodies. For he makes Space the first of all worldly things, yea before the world it self. For if the world (saies he) should be destroyed, and reduced to nothing that space in which the world is now, as in its place would remain quite empty. But if so I will again make new Heavens and a new Earth, there is space beforehand, which can contain new Heavens and a new Earth. For its being now full does not belong to the Essence of Space (no more than the form belongs to the Essence of *materia prima*, though it be never without some form) but a penitide accidental thereunto. For it happens by reason of the Bodies, which are all different therefrom. And he saies that Space is no otherwise a place, than as it affords a place for bodies to abide in, and of its own nature before it is a place, it is a part of the universal space. And to that common objection, If Space be any thing, it is either a Substance or Accident, he answers: Space of it self, since it goes before the world, and is without the world, is no worldly thing, excepting that part thereof which contains the world, or which the world possesses with its Body but goes before all worldly things, whether bodily or not bodily, Substantial or not Substantial, and as all things are accidents to it, so is it to all things: and that this same space was unknown to the Authors of the Predicaments. And at last he defines Space to be an hypostatical extension, subsisting of it self, inherent in nothing, But if it must needs be of some predicament: if (saies he) that be a substance, which sustains other things, which subsists of it self, which is not inherent in any other thing, then Space is perfectly a Substance. For Space subsists of it self, it rests upon nothing, it needs nothing, to help it to be, or to sustain it, but it self sustains substances, and so enables them to be, and it supports all other things in nature. Also that it is the Original of Quantity, and that it has length, breadth, depth, and all dimensions: also that it is never moved in whole or in part, but whatsoever things are moved, are moved through this space, so that it self is wholly unmoved and unmovable, What he further writes at large see in his Book *de spacio Physico*. This one thing only I ad. The Quantity of a Body, is moved with the body it self whose Quantity it is: but as *Aristotle* himself saies, a body translated into the place of another, possesses the same place in number and nature, which that body into whose place it comes did before possess. For example sake, Water succeeds Air in the same numerical place; and so the Quantity of the Air and Water, are numerically different from the Quantity of the Space; since each remains in its own body, though it takes up and possesses another place. And seeing the Place is no part of the thing placed, nor any part (as has been shewed) of the ambient body, what other thing I pray you can we imagine, when both the Ambient Body, and the thing placed be removed, but a Space having three dimensions of Length, Breadth, Depth? And so much for this point. Let us conclude this hard discourse with an excellent saying of *Julius Caesar Scaliger* in the 297. Exercitation. 'Tis easier for any man to oppose the Sayings and Opinions of wise men, then safely to commit his own Opinion to the judgment of others. Nor do I ever forget, but alwaies put my self in mind, to see, consider, remember, how weak the Eyes of our minds are to pry into the secret Closets of Nature.



## Chap. 8. Concerning Time.

**A** Peculiar adjunct of Essence, is that which Philosophers call Duration; that is, as they say, a continual tract of being, as *Scaliger* rightly has it, in his 350. *Exercitation Sect. 7.* For Duration is the measure of the being of every thing; and in every thing, these three follow one another Essence Existence, and Duration: which hold this order, that Essence is first, Existence next, and Duration last of all: Now Duration differs, as well from the Essence as the Existence of a thing. And indeed from the Essence of a thing it differs really. For there are divers things which have the same Essence, and yet have different durations. But from the existence of a thing, Duration differs not really. For it is in a manner nothing else for a thing to dure, than to exist; and it is all one for a thing to be of a short or long existency, and for a thing to have a short or a long duration. And as the extension of Quantity is to Quantity (which nevertheless do not really differ) so is the Duration of Existency to Existency itself, yet there is some difference between them. For the Nature of existency, is only this, that a thing be out of its Causes, and actually somewhat; But Duration signifies the extension of a thing, in this its being, and the continuation or abidance of the existency. Duration therefore properly belongs to existency, not to Quiddity, and it alwaies presupposes existency, without which it can neither be, nor be understood. Hence therefore Duration is not amiss defined, that it is the Extension of the Existence of a thing: or the abidance of a thing in its Essence.

How Duration differs from Essence & Existency?

Duration defined.

Now such as the Essence of things is, such is also its Measure: and as many manners as there are of a things abiding in its Essence, so many durations it has. As things therefore are threefold, so is there a threefold duration, or as some phrase it, a threefold measure of Duration; Time, Age, Eternity. For the measure of the duration of things, which are no waies infinite, and which have both a Beginning and End, is Time: The measure of the duration of things, which are partly finite, *viz.* in respect of their beginning, and partly infinite because they have no end, is called *Ævum*, Age or *Æveternity*. But Eternity is the measure of the duration, of that which is absolutely infinite, having neither Beginning nor End. But we are now to treat of Time.

A threefold Duration.

All Men do frequently talk of Time, and are often mentioning To day, Yesterday to Morrow, and tell of daies, months and years; and in so doing they acknowledge that time is really somewhat: but what that is, very few can tell: and there have alwaies been sundry opinions about the nature of time, as may be seen in *Francisc. Piccoliminius* his *Book de Nat. com. Affect. ch. 13.* *Aristotle* reckons up three and refutes them in 4. *Phys. ch. 10.* For some would have time to be the motion of the Heavens; others the greatest of the celestial Spheres, others Motion simply considered. That we may therefore find out what Time is, we must know, that time may be two waies considered; First as the internal duration of a thing which has had beginning, and shall have end, and is successively continued, and to say all in a word, of a thing which is movable; Secondly for the measure of the said duration by some motion: and in this latter sense time is commonly understood by natural Philosophers, who hold that time is not without motion, nor can be understood without motion. For then we understand Time, when we understand there has been motion, and when we perceive no motion, we are ignorant that any time has passed: as appears in such as sleep: For they when they are awaked, joyning the moment wherein they fell asleep with the moment of their waking, conceive no time to have passed between; which that Tale shews cited by *Aristotle* in *Lib. 4. Phys. ch. 11. t. 97.* Alike Story to which others relate, of three men at *Athens* who being drunk at a Festival, slept three daies together. For when one of them did awake the next night after that in which he first lay down, and saw the Stars still shining, supposing that first night was not yet over, nor the Sun yet risen, he composed himself again to sleep, till at last awaking with his companions on the third day, he returned to the Feast, believing it was the next day following that night wherein he went drunk to bed. And a Story or Fable not unlike is related by *Pliny* in his 1 Book

of

*Time is somewhat of Motion* of his *Natural History* ch. 52. of *Epimenides*. And dayly experience suggests the like. Time therefore is not without motion, yea and somewhat thereof is motion. For *Time and Motion are perceived together*. For though we sit still in the dark, and perceive no motion by any of our Senses: if we conceive any in our minds, presently time presents it self therewith; and again, as often as we think of time, some motion does also therewith offer it self to our minds. Time therefore is something of Motion: which what it is, let us thus further search out.

Whatsoever is moved, is moved from somewhat to somewhat, that is to say, from the term from which, to the term to which; so that between those two terms there lies a Magnitude. Now all Magnitude is continued. And therefore that motion which is made continually, through a continued magnitude, must it self be continued: and consequently Time also must be continued: for so great as is the motion, so great is the Time: and a longer motion is performed in a longer time, a shorter in a shorter. Moreover in magnitude, there is former and latter. For every magnitude is divisible into parts, which are so disposed, that some go before, others come after. For which cause, there is proportionably somewhat which comes before, and somewhat which goes after in motion: and those parts of a motion are first, by which the Movable is moved over the first parts of magnitude, and those latter, by which it is moved over the last. And for the same cause, also in time there must be a former and a latter; and so motion inasmuch as it has former and latter, agrees with time, so that by the distinction of former and latter in motion, we come to the knowledg of time. For when we consider two Instances or two extrems, wherewith motion is terminated, and understand that there is a middle space betwixt these two extrems, presently we conceive time. Contrariwise, when we conceive any thing under the notion of one Instant, and do not think of two Instances one former, the other latter: we perceive no time at all.

*The Definition of Time.* From what has been said we therefore gather, that *Time is the number of Motion in respect of former and latter*. Which Definition that it may be more rightly understood and explained, these things are to be observed. In the first place, that Number is two-fold, the one *Numbring* as two three &c. the other *Numbred* as two Stones, three Trees, four Men. The former, which is also called formal number, and wherewith we reckon, is one *Ens* or being of it self, *viz.* discreet Quantity, by cogitation abstracted from all matter, and perceptible by the mind: and it is common to all things, nor is multiplied according to the variety of things numbred. Or the word Number is taken two waies; First for Quantity discreet, or a multitude consisting of parts distinct one from another, or for any measure though continued. Now time is not a number in the first, but in the last sence; nor is time a number wherewith we count (seeing time is a continued Quantity, number a Quantity discreet) but a number counted or reckoned, *viz.* the parts of motion reckoned up, For we must not here pass over, that some distinguish betwixt a number numerable and numbred, and say that a number numerable are things, which have an aptitude to be numbred and distinguished by the understanding, although actually they are not numbred: but a number numbred are things, which are already actually numbred by somebody. And they say that time is a number numerable, or a motion, which may be distinguished, so as to have some parts going before, others coming after, although there were no man actually to number the same. From whence it appears, that *Time is a real thing*. For the aptitude to be numbred, or the numerability, does not depend upon the numberer, but is in the time and motion it self. A number numerable is again twofold: the one which Coheres to things which are really separate one from another: and such a number time is not: the other, consists of parts distinguished one from another, not really, but by our thoughts, as if a man should conceive some continued magnitude divided into certain parts; and such a number is time. For it is a flux and continual spinning out, of the parts of motion, which perpetually follow one another.

*A Measure twofold.* Moreover this also is to be observed in this place; that a Measure is twofold: one formal which is called *mensurata* measured, or *mensurabilis* mensurable; the other *Measuring* which is called active: which others express by saying that time is the number of motion actively or passively. Formal Measure, is that which when it is

is in any subject, it makes it formally measurable; and thus every quantity, inherent in any Subject, makes the same to be formally measurable, and this measure is as it were an accident in that thing whose measure it is. But Measure measuring, is that which as a rule measures another thing. For this is alwaies without the thing which it numbers and measures.

Hence therefore a Question arises: *Whether Time be a measure or number, with which being it self out of motion, we number motion: or whether time be the measurable motion it self?* And although Authors say in both senses that time is a number or measure: yet primarily and principally, Time is a formal measure, and a number which is numbred. *Aristot. 1 Phys. c. 11. t. 102 and 12. t. 110.* For the nature of time does not depend thereupon, in that therewith we number other things; but herein it consists, in that it is a motion numbred according to former and latter. Moreover to be a measure (*viz.* measuring or active) is a thing respective: but time is a thing absolute. It is not therefore essential to time to be a measure measuring. For as the essence of an Ell-yard does not depend upon measuring, *viz.* that we should therewith measure Cloth or any other thing: but herein, in that it is a stick or other material of so many or so many Foot long, to which it afterward happens that we measure somewhat therewith: so the Essence of time consists herein, that it is a motion numbred, and distinguished according to former and latter, which afterward is followed by this adjunct, *viz.* to become the measure of other things. So by time, which is described by the conversion of the Heavens, we measure the motions of other things; and by the parts of time, hours, daies, months, years, we measure some whol motion or other.

Time is  
a Measure  
Measured.

Nor because time is a number; and a number does not exist without the Action of our mind: does it therefore follow, that time is only a feigned thing, and a notion of our Brains. For we must know that here are two things to be considered in time: First its *Essence*, which is a certain duration of the parts of motion; The other is its *Affliction* or *Adjunct*, which is numerability and mensurability. The former, *viz.* the absolute essence of time, does no waies depend upon our understanding, but it would remain though our understanding were gone. But mensurability does in some sort depend upon the operation of our mind. For seeing the parts of Time are either actually measured; or have an aptitude to be numbred: according to the Act and as they are actually numbred, they depend upon the operation of our mind, which being taken away, yet the mensurability would remain nevertheless. Nor when our Minds compares the parts of time past and future, joyns them, and reckons; does it feign any thing which is not, but finds out the parts which were before really in the motion. For as an Ell-yard, when we do not think thereof, has the Quantity of so many or so many Foot: yet the distinction and the marking them out, is the work of our mind and Art: so also Motion is of it self in nature, according to succession, without the operation of our minds; but the comparing of the parts going before and coming after, and the reckoning up the said parts, is the Action of our Mind.

Time is  
not a thing  
made.  
In Time  
two things  
are consi-  
derable.  
1. Its Es-  
sence.  
2. Affliction.

We must also in this place take notice: that although time be a reall thing, yet it is no permanent thing, which has its parts together actually present and permanent: but it is a *Successive* thing, which has no part actually existing, but all its parts in a continual flux and succession, so that when one is past another presently follows.

Time is  
no perma-  
nent thing

And we must also here enquire for better understanding of the definition: *what things motion it is which is meant in the said definition?* And we are to know, that chiefly and principally is understood the *Motion of Heaven*, which is of all others most known, most regular, uniform, and perpetual: but especially the motion of the first Movable or *Primum mobile*, of the Sun and the Moon, by whose Motions Daies, Nights, Months and Years are described. But the common People attribute no time to the motion of the rest of the Stars; because their motions are to the vulgar unknown. Howbeit Mathematicians, do not quite omit the same. And as the motion of Heaven is universally common to all Nations: even so all Nations use this Time. Howbeit, we must not say, that time is not at all in other Motions; for seeing there is former and latter in every motion, and it may be accordingly numbred: in every motion, also there will be time.

What that  
thing is  
whose mo-  
tion is un-  
derstood,  
in the de-  
finition of  
Time?

*Whether there be one time or many?* Out of what hath been said another Question arises; *Whether there be one time or many.* To which that an answer may be given, we must know. First That one may here be said to be one in *Number* or in *Sort*. Secondly, That time as hath been said is *more* or *less* principal, *more* principal is of the heavens, *less* principal and secondary, of all other motions. Thirdly, That there are two things in time, as the Schoolmen speak, the one *Material* which is motion, the other *Formal* which is number. Hence we answer to the Question, That *the first and principal time, is but one in Number.* For as there is every where, and in all Nations but one motion of the Heaven: so is there but one time, depending thereupon. But if time be taken absolutely, for the number of every motion, it is not one in number: but formally indeed it is one in Sort, but materially it is many being Multiplied, according to the Multiplication of motion. For as seven trees and seven Horses, do not differ as they are seven, but as they are Horses and Trees: even so, what ever motions are together, do not differ as they are numbred according to former and latter, but as they are peculiar motions. Time therefore is formally one with all, for the Nature of present, past, and future is common to all, and those things which are distinguished according to these differences of time, they are also distinguished according to time: and they which agree in any of these differences, they also agree in time although they differ otherwise.

*Whether in the definition of time Rest should be added?* And now there comes another Question; *Whether Rest should be added in the definition of time?* Because not only the motions of things, but also their rest, is numbred by time, and as well rest as motion, is in time. But no evident reason persuades, that we should mention Quiet in the definition of time. For time is of it self the measure of motion, but of rest, by accident. For Rest because it hath not former and latter, cannot of it self be measured and numbred. For rest is measured by time, either as it is a privation of motion, for the measure of privation and habit is one and the same: and a thing is said to have rested so long a time, as it has not been moved, or as it should have been moved, if it had been moved all that while; or because the rest of one body is alwaies joyned with the motion of another, by means whereof, the rest is measured.

*Whether time do really differ from motion?* And seeing time and motion do hang so one upon another, this Question must also be discussed: *Whether time do really differ from motion.* Now the sense of this Question must be first observed. For the Question is not concerning the time of the *Primum Mobile* or first moveable, compared with the motions of other Bodies. For hereof there is no Question, and all do grant, that the time of the motion of Heaven, differs really from the motion of other Bodies; seeing they are in several subjects; but the Question is, *Whether any time compared with that motion whose number and measure it is, do really differ therefrom.* And although others do think otherwise: yet theirs seems to be the truer opinion, who conceive that motion does not really differ from time. For time is nothing but motion numbred, according to priority and posteriority.

*What we are to understand by priority.* Finally, This remains to be explained in our definition: what is to be understood by fore and after or *Priority* and *Posteriority*. Touching which we are to take notice, that fore and after are not taken here absolutely, for a bare respect but as *added to the subject, and concretely for the parts of motion, including such a respect.* For priority and posteriority do in this place signifie nothing else, then the parts of motion numbred, according as they last, and one follows another.

*The parts of time.* The Parts of time are *Past* and *Future*: which parts are both distinguished and coupled by the *present moment*. Yet *is the present moment no part of time*: As a point is no part of a Line. For so is *now* to time, as a point is to a Line: now that which is continued *is not made up of indivisible parts.*

*Whether time generate and corrupt.* Lastly, Concerning time we must not omit to enquire *whether it be in the power of time to generate or corrupt things.* And although it is commonly said, that time does produce and perfect some things, and corrupt other some, and the Poets commonly say, Time consumes all things; Time is a devourer: Time is able to change all things, and that nothing is stronger then time, as may chiefly be seen in *Ovid* his 4. de *Tristibus*, *Eleg. 6.* Yet we briefly answer with *Scaliger* in his 352. *Exercitation*: That *Time as time hath no Force to effect anything.* For seeing that it is Quantity,

tity, it acts nothing. And all those effects are to be ascribed to things, which are in or with Time. But Time it self is therefore said to corrupt or generate things, because the Application of Natural Agents for the corruption or Generation of any thing happens in time. *And so much for Time.*

Whereunto for Affinities sake, though they do not properly belong to this place, I think fit to ad a few things touching *Ævum* and *Eternity*. The term *Ævum*, <sup>Ævum</sup> although in that signification as it is distinguished from *Eternity*, and comes short thereof as having a beginning; it was not used by *Aristotle* nor the ancient *Peripateticks* and *Platonists*: Yet is it at this day very much used by School divines and other noble *Phylosophers*, who distinguish it both from Time and *Eternity*, taking it for such a duration as hath had a beginning, but shall have no end, which they attribute to Angels. Now touching this same *Ævum* or *Æveternity* although there are sundry opinions of Authors: yet this shall suffice us to say in this place; that all the Nature of *Ævum* or *Æveternity*, does consist herein, that it is the Measure of the duration of those things, which have a beginning but no end: or as some will have it, It is the duration of things which have no end but have had a beginning. Now the way to measure this *Ævum* wherewith we are best acquainted, is by its coexistency, as they speak, and its relation to Time. For we say the Angels have dured 5661. years, which is the Time since the worlds Creation. Hence it is manifest, that *Ævum* differs from time and *Eternity*: from time in respect of the end which Time hath, but *Ævum* or *Æveternity* hath not; from *Eternity*, in respect of its beginning, which *Ævum* hath, but *Eternity* hath not. Which *Leo Hebraeus* expressed in his third *Dialogue of Love*: The *Æveternity* of Angels (saies he) is placed in the confines of Time and *Eternity*.

But *Eternity*, although there are other significations thereof: yet properly it signifies a Duration which hath neither beginning nor End, In which sense, we frequently meet with this definition thereof in *Boetius*: *Eternity* is a total and perfect possession of a boundless Life, all at once. For all the Essence of eternity consists in immutability or unchangeableness. For that which is *Eternal* neither begins, nor ends, nor is any way changed; but is alwaies the same, and hath its whol Essence all at once. Whence there results two proprieties of eternity, First, that it hath no bound, in respect of beginning or end: Secondly, that it is all at once. For though we attribute daies and years to eternity, yet we do it only for our better understandings sake. All which *Plotinus* considering, in his 3. *Ennead. Book 9. Ch. 2.* he saies, *Eternity is a life all together, alwaies wholly present, and not now one part and after another.* But these things belong not to this place. I conclude therefore with *Augustine*, in his 12. *B. de Civitate Dei, Ch. 12.* Nothing lasts long which hath once an end. and al the bounded spaces of all Ages, if compared to boundless eternity, are not to be accounted smal, but nothing at all. Six hundred Millions of years or that sum multiplied by as many, so that there were no name for the product or total Sum, yet all compared to *Eternity* is nothing; and if the said sum be subtracted from *Eternity*, not once or twice, but as often as any accountants are able to subtract the same, yet should they never reach to the beginning of eternity, which hath no beginning.

### Chap. 9. Concerning Motion.

WE come now to a remarkable Adjunct of Natural Bodies, viz. Motion, by the knowledg of which we are brought acquainted with the greatest part of the most abstruse things in Nature; and by the guidance whereof, in a manner all the knowledg of Natural things hath been found out. Now to Question whether there is any Motion, is the part only of a contentious and froward person: since it is discerned by al our senses. And therefore *Diogenes* did wel, who having heard the reasons of *Zeno*, whereby he endeavoured to prove that there was no motion, he judged them not worth the answering, but only Rose up and walked, intimating that in things subject to sense, we should believe our senses. Which *Aristotle* also approves in his 8. *Physic. Chap. 3. T. 32.* to say that nothing moves, and to go about to prove it, omitting our senses, is weakness of Understanding.

But

But as it is most known that there is motion : so what is the Nature thereof, is sufficiently obscure. And therefore, that we may the better understand *what motion is*, we will in the first place propound *Aristotle's* definition of motion, and diligently consider the same : by which means we hope to attain to a good degree of knowledge touching the Nature of motion. Thus therefore *Aristotle* defines Motion in the 3. of his *Phylicks*, Ch. 1. T. 16. *Motion is the Act of that thing which is in a possibility, in as much as it is in a possibility, or of that which is moveable, in as much as it is Moveable.*

*Aristotle's*  
his defini-  
tion of mo-  
tion.

In this definition first we must diligently consider the word *Entelecheia* (translated *Act*) which as it is most usual in *Aristotle*, and every where to be found in his works ; so is the signification thereof not so well known, and many have taken pains to find out the true meaning thereof : so that it is reported of *Hermolaus Barbarus* a very learned Man, that having once attained to speak with a spirit. he desired nothing else of him, but that he would expound what the word *Entelecheia* in *Aristotle*, did signifie.

*Endele-  
cheia and  
Entele-  
cheia differ*

In the first place, we are to note that the words *Endelecheia* and *Entelecheia* are different : although some do confound them, wherein they are to blame. For as these words do herein differ, that *Endelecheia* is more ancient, being used by *Menander* and *Plato* in his *Timæus*, Yea, and commonly by the people of *Greece* ; but *Entelecheia* is a new word, witnesses *Tully* in the 1. of his *Tusculans Questions*, and by *Aristotle* either invented or frequently used ; so they differ also in Derivation and Signification. For *Endelecheia* does signifie a continual and perpetual motion or agitation, so called from *en cai dein cai Helam to echomenon*, because it is in the subject and draws and moves the same, as appears from that Greek proverb *Ranis endelechousa coilainei petran*, the still falling drop hollows the stone. From *Aristotle* in his 2. *de generat. & corrupt. Chap. 10.* and other Greek Authors.

*Entele-  
cheia what  
it is ?*

But *Entelecheia* is derived from *en* and *telos* or form *Enteles* and *Ecchein*, to have its end, to have perfection ; and *Entelecheia* if you would render it word for word, is the having of perfection, or the possession of perfection : and *Entelecheia* is alwaies in *Aristotle* opposed to possibility or aptitude, as may be seen in the 3. of his *Physick* Ch. 1. T. 2. in the 5. of his *Metaphysicks* Ch. 2. and in his 2. *de Anima*. Ch. 1. T. 2. Out of which may be collected, what *Entelecheia* truly signifies. For seeing a thing is said to be in a possibility to be somewhat, when as yet it is not that thing which possibly it may be : *Entelecheia* must signifie to be really and actually that which it is said to be, and really to have attained to be such a thing, and no longer to be in a potentiality thereunto : and *Entelecheia* must be that which perfects and fills up the Possibility or Aptitude of a thing ; and makes that the thing may now really and perfectly be said to be that, which before it was said to be only in way of possibility or Aptitude : And to speak all in short *Entelecheia* is the filling up of the Potentiality or Aptitude of a thing.

This being the signification of this word (which though new to the dull multitude, yet was known to wise men to whom *Aristotle* wrote and not to pedants, as *Scaliger* in his 307. *Exercit. Sect. 39.* has it) it is chiefly attributed to the substantial Form, For it is the substance and perfection of a thing, and because of it a thing is really that which it is said to be. And indeed, as *Franc. Piccolbomineus* saies in his 4. *Ch. de Motu*, *Entelecheia* is applied, as well to formes free from matter as to such as are joyned thereto : which opinion of his seems to be countenanced in the 3. *B. of Physicks* Ch. 7. Text 3. Howbeit *Zabarella* herein dissents from him in his *Book de Mente hum.* Ch. 7. who denies substances severed from matter to be properly called *Entelecheias* : and he saies that only in one place in *Aristotle*, viz. 2. *Metaphys.* 1. 49. the supream or first intelligence is termed *Entelecheia*, and that not without Reason. The same word is also attributed to accidents or accidental Forms ; seeing also because of the things themselves they are so called, and they fill that possibility and Aptitude which the things had to receive accidents. Yea, And as it appears out of *Aristotle* in his 2. *de Anima*, Ch. 1. T. 2. *Entelecheia* is not only attributed to forms, whether substantial or accidental, whence the operations proceed ; but also to the operations proceeding from the forms. in a word *Entelecheia*, signifies all that, by means of which every thing, is really that which it is said to be.

But

But for the word *Entelecheia*, Aristotle often uses the word *Energeia*, which signifies not only operation, as Zabarel conceives, who in his *Book de mente humana* Ch. 7. teaches that *Energeia* signifies only operation, and formes conjoynd with the matter, whose essence differs from operation as an accident, he denies to be called *Energies*; and he saies, among substantial Forms, it is only rightly attributed, to those that are free from matter. Howbeit this word is attributed as wel to Forms joyned with matter, as to those without it. For Aristotle in his 9. *Metaph.* Ch. 6. simply opposes to be in energy, unto being in potentiality or Aptitude, and in the same place he calls the substantial Form joyned to the matter *Energeia*: and up and down in the same Book, he calls the substantial Forms of things, *Energeias*, as may be seen, chiefly in the 8. *Chap.* which he also does in 8. *Metaph.* c. 2. And in the 4. *B. ch.* 2. *Energein* signifies not only to operate, but really to be. Also, that *Energeia* is used to signify the accidental Form, appears from the 3. of his *Physicks*; Ch. 2. T. 15, and Ch 3. T. 18. but more evidently from the 20. *Metaph.* Ch. 8. where he thus writes: *Seeing every thing is divided into Act and Aptitude, I call the Act of that which was before only in power, Energeia, Motion.*

*Energeia*  
what it  
signifies &  
whether it  
differs from  
*Entele-*  
*cheia.*

To these Greek words, the Latin word *Actus* does answer, which does not, in this place, signify Action only; But that, from which every thing is said to be what it is. For as Scaliger saies in his 359. *Exercitation Sect.* 2. we must borrow ordinary words to signify abstruse matters: which seem harsh to Novices, and ridiculous to curious Ciceronians. Now according to Scaliger in the same place, *An Act is that being, which wants nothing to make it be what it is, but has all its causes.*

*Actus* or  
*Act* what  
it means.

Now here in the definition of Motion *Entelecheia* is taken, neither for the perfect form, nor for the operation alone; but for a certain imperfect Act. For there is a twofold Act, one perfect, which when it comes, it expels all Aptitude or potentiality, and leaves none of it behind: another imperfect, with which there alwaies remains somewhat of possibility; which when it is taken away, the Act is also taken away; and such an Act is Motion. For seeing that is called moveable, which may be moved: motion is the fulfilling and perfecting of that possibility, in regard of which a thing is called moveable, and makes that it hath not only a possibility of being moved, but that it is now really moved, indeed and in truth. Howbeit this *Entelecheia* does not take away all possibility, but only so perfects the Body moveable, that it retains yet the possibility of being more moved, until at length it come to the utmost term of motion, to which while it is moved, it must needs have the power of motion. For truly the thing moveable, while it is in the term from which, is not yet moved; but while it is in the term to which, it is moved no longer, but now it is moved, and ceases from motion. But then it is truly said to be moved, when it is now in the Act, in which before, when it was in the term from which, it was not, but only had a possibility of attaining the same; and when it yet tends to that further act, which in respect of the term from which, it hath not, but may attain. For if it had already the last term, it would be no longer moved thereunto. For which cause it is also said in the definition of Motion: that Motion is the Act of that which is in possibility. For whatsoever is moved, as may appear by the premises, is part in act and partly in possibility. In act, in respect of the Form and of that term which by motion it hath already gained, and actually possesses: in possibility, in respect of that which it hath not yet obtained, and for the sake whereof it is still moved. For examples sake: Water which is in heating, is said to be moved, that is to say altered. For it hath already some degrees of heat, and has the possibility of gaining yet more, and does likewise gain them by growing warmer: and when it has attained all the degrees, it is then termed hot water; but is not said any longer to grow hot, or to be altered and moved.

What *Entelecheia*  
signifies in  
the place.  
An act is  
twofold.

Motion is there fore neither a pure act, nor a pure possibility, But a certain middle and imperfect act. And in every motion are found these three things: Some of the Form, which is by motion already attained; a power of receiving that form more perfectly and in a greater measure; a Flux and Progress or Tendency to the said Form. Finally Aristotle adds in the definition, *in as much as it is in possibility*, to signify that motion is not made in respect of that Form and term, which the moveable thing hath already attained. For a thing is no longer moved for the sake of that, which it already possesses; but for the sake of that term which it has not yet attained, and which it has a power to obtain. From what hath been said,

Motion is  
an imper-  
fect act.

'tis easie to gather wherein the Essence and formality of Motion does consist.

**Two things in Motion.** For seeing there are in every motion *two* things, one the form it self flowing; the other, the flux of the form: Motion formally, is neither simply a form, nor a form flowing, but a continual acquisition of Form, and the flux thereof, partly already acquired and partly to be acquired. For to be moved, is not to have the form; but to be moved, is to tend to the form.

**To natural motion are required.** Moreover, to all Physical or Natural motion, these things are required.

**I. A Mover:** For every thing which is moved, is moved by some other thing. For it is impossible that the same thing in respect of the same form, should be in Act and in Possibility: But that which moves, or introduces any form, does actually possess the same; that which is moved has only a power to receive the form. And therefore it is not the same thing which moves and is moved. Howbeit touching this Axiome we must observe, that it is only to be understood of *material things and natural bodies compleat, and of the motion of the whol compound*; and that the intent of Aristotle in the 7. *Physick, cap. 1.* when he delivered this axiome was to deduce natural motion to one first Principle, and thereby to prove that there was one first mover, by which as by a first Principle, all bodies are moved: otherwise, unless this axiome be warily understood and explained, many difficulties arise; seeing not only Animals are moved by an internal force, but also the Elements by an inward principle are carried to their place, where not only the body of the Element is moved by its form to its place, but also the form it self tends to its place. See also beneath *Book 2. ch. 3.*

**II. A movable or thing moved,** and hence every thing that naturally moves it self is divided into a part moving, and a part moved. Now that which moves must needs be with that which is moved, or that which primarily does move any thing, without the Intervention of any intermediate agent, ought to touch that thing which it moves, and to be very neer unto the same: For we cannot so much as imagine, how any thing can suffer from that, by which it is not touched, or how any thing can act upon that which it does not touch. For since operation follows the Essence of a thing: where the thing is not, there its operation cannot be. For though the first mover be absent from the thing moved in respect of its substance, yet is it joyned therewith, by the Virtue which it sends forth. And thus *the next mover and the thing moved, are alwaies together, and every action is caused by touching.* Now motion is in the thing moved. For the Act is in that thing, whose act it is. Yet is not the action of the mover different from the act of the thing moved, but there is one act of the Agent and the Patient, For it is one and the same thing which the mover produces by acting, and which is produced in the Patient by suffering. And *the Action of the mover and the passion of the moved are one only motion, not really distinct one from another; but only respectively, viz. in as much as the same Act, does proceed from the mover as from its Principle, and is received by the Moved, as the Patient: which is well exprest by Aristotle in the 3. Phys. ch. 3. t. 22. For to be the Action of this in that, and of that from this, differs respectively.* So that the same motion as it proceeds from the Agent, is an action, as it is received by the Patient, a Passion. And the heating of water by fire, is but one action: which as it proceeds from the Agent, viz. the fire, is called an Action; as it is received by the water, a Passion. And therefore Action and Passion are in one Subject. For seeing passion is in the Patient, and action really differs not from passion: the action must also needs be in the same Patient. Yet this must be observed that we spake here of a transient action: but not of an immanent action, which abides in the Agent.

**III. The Term from which.** **IV. The Term to which.** For seeing every motion is a kind of change; it must needs go from somewhat, which is called the term from which, to somewhat, which is called the term to which. And there are neither more nor less, than these two terms. For though one motion may have many terms to which: yet they are not the last & total, or they are not primarily intended and for themselves, or they are not intrinsecal. But in motion we are chiefly to regard the term to which. For that is it for the sake whereof the movable is moved, and from it the Unity, Distinction and Contrariety of Motion are chiefly taken. For seeing motion is a kind of continual progress from the term from which, to the term to which, and the term from which is rejected, and the term to which acquired: justly



ly therefore the motion receives its denomination and distinction from the term to which.

V. *Time*: For no motion is performed in an Instant, but *Successively and in Time*. For since motion is the Act of a Being in possibility, and has no abiding Essence: of necessity the thing moved, must be partly in act, and partly in possibility: and therefore motion must be successive. For if it were all together, it were all in Act, and the thing could no longer be said to be in motion, but already moved.

5  
Time.

VI. *Continuity*, or Unity of Motion, in respect of time, and the term to which. For the Continuity and Succession of the Motion depends chiefly, upon the Term to which the motion is made; and the motion is said to be performed successively, because the Term to which the motion tends, is successively gained. But that a motion may be one in number, *three* things are requisite: one movable, one term to which; and one continued time. To which a fourth may be added, the Term from which. For one motion cannot proceed from divers Terms.

6  
Continuity

What is the Nature of Motion has been explained hitherto, it remains that we now shew you what are the Sorts of Motions. Where in the first place you are to take notice, that there is a difference betwixt *mutation* and *motion*. *Metabole* or Mutation is of larger extent, and signifies every variation of a thing, whether the terms in respect of which the thing is varied, be positive and contrary, or contradictory: but *Kinesis* or Motion properly so called, is not of so large an extent, but is conversant betwixt terms (upon which, especially the term from which its nature chiefly depends) which are contrary, or if mediate, yet having the nature of contraries.

Motion & Mutation differ.

*Motion* therefore properly so called is conversant betwixt contraries. Now we term such things in this place contraries, not only which do most of all differ under the same kind: but whatsoever positive terms, by the coming of one of which another is changed, whether it be in respect of contrary qualities, or according to intention, or according to extension. Whatsoever therefore ought to be reckoned for a term of motion, must have these two conditions. First that it have a contrary in such a manner as has been said; so that the motion must pass from one contrary as the Term *a quo* from which, unto the other contrary as the term *ad quem*, to which. Moreover, that must of necessity be attained, which terminates the motion of it self, and not without the change of the Subject, which is performed by real action and passion.

Motion is made betwixt contraries.

From which may easily be gathered, that true motion is *only in three Predicaments*, viz. *Quantity*, *Quality*, and *Ubi* or Place; or that in respect of that thing to which the motion tends, it may be reduced to these three Predicaments. For both the forms of these Predicaments have contrariety, and positive opposite terms; nor can their change happen without the change of the Subject.

Motions are only in Quantity, Quality & Place.

But Generation and Corruption which are changes in the substance of a thing, are not properly Motions. For that Contrariety necessary to motion, is not found in substances. Moreover, since every thing which is moved is an actual Being; but that which is generated is no actual Being (for if it were already, there were no need that it should be generated) therefore *Generation cannot be a Motion*. Lastly, *Every motion is continued and performed in time*: but generation is not performed in time, but in a moment, and therefore also it cannot be a Motion. For substantial forms being indivisible and not capable of more or less, cannot be successively acquired and by piecemeal.

Generation and Corruption are not properly Motion.

Howbeit we must here observe, that Generation and corruption are taken *two waies*, either only for the acquisition or loss of a substantial form, without precedent alteration: or for the introduction of a form, with alteration which went before the same. Generation and Corruption taken in the former Sense, are no motions, but are performed in an Instant: but in the latter sense they may be allowed for Motions.

A two fold Acception of Generation & Corruption.

Moreover, this must not be omitted neither, That *Succession in motion is considered two waies*: Primarily and chiefly as was said before, in respect of the form, which seeing it may be intended and remitted, and has certain degrees, in respect of which it is capable of more and less, it therefore successively acquires those degrees, viz. one before, another after. But since the substantial form has no such degrees, it cannot

cannot

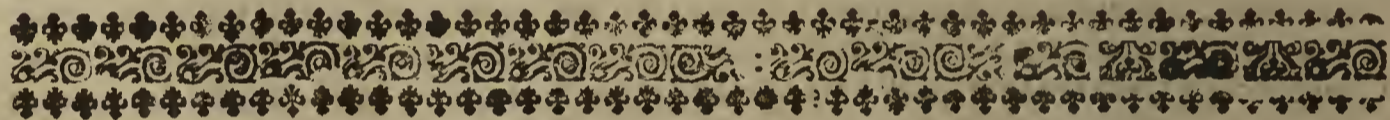
cannot be intended, nor remitted, nor is it successively introduced, but in an instant and all at once. Afterward there is said to be a succession *in respect of the Subject*, which is movable: which succession others seem to call extension. For since a thing movable is divisible, and has some parts formore others hinder: and the mover acts first upon the formore parts and which are neereft it self, and afterwards upon the hinder and more remote: also in this manner we may grant that Generation is made successively. But both these successions are considered, in motion properly so called: but the former holds more of the nature thereof: which being absent from Generation it cannot be called motion.

Moreover, it is evident, that there is no motion in *Relation, Action, Passion, When, and Habit*, the Predicaments so called. For those mutations which are made in them, do either not happen with the change of the subject, or not of themselves primarily, but consequently and by accident.

*The sorts of Motion.* Motion therefore properly is only made out of one subject into another: and there are three sorts thereof. In Quantity there is Augmentation and Diminution. For these two mutations have no common name. In Quality, there is Alteration. In Place, there is local motion from place to place.

*Rest what it is.* To Motion Rest is opposed, which is the *Privation of Motion in that thing, which is naturally apt to be moved*; and in as much as motion is made to attain rest, it may also be said to be the end and perfection of motion. So a body, when it has attained its natural magnitude, ceases growing.

*Rest twofold.* Rest is either *natural*, whose principle is internal, and to which the *movable* is naturally enclined: So the Earth is naturally moved to the Centre, and rests there. Or *Violent*, whose Principle is external, when a body is kept by force in a place not natural thereunto; as when a stone or clod of Earth, is hung up in the Air.



## THE SECOND BOOK

### Chap. I. Of the World.

*H*itherto we have treated of a natural Body, as it is a General term, comprehending sundry sorts, and we have spoke of the common Principles and common adjuncts of a natural Body in general, without any consideration of the sorts: we are now to come to the *several sorts of natural Bodies*. And because the whol mass and heap of all Bodies natural, does make one total sum, which is called *the World*; before we treat of any sort of natural bodies, or of any part of the world, we must first speak of the whol, and explain what the world is, and what proprieties and adjuncts it has.

*The sundry significations of the word Mundus* That which is by the Greeks termed *Cosmos*, because of its absolute and perfect Elegancy and Ornament the Latins call *Mundus* for the same cause: which word because it signifies a thing which is absolute, perfect and comprehending in it many things orderly ranked, many things are so termed. *Marsilius Ficinus* on the 3. *Book of Plotin. Enead 1.* makes two worlds, one intelligible, being the divine mind, the Pattern and Idea of this sensible world: the other sensible, *viz.* this which we behold, being the Image of the divine Pattern. Others do again divide these two worlds, and make more worlds. The *first* is the Archetype or Intelligible world, which is the divine mind or God himself, who contains in him the patterns and Ideas of all things: the *second* is the angelical world, made up of the multitudes of Angels rank'd in their Hierarchies: the *third* is the Elementary, which is made up of

of Heaven and the Elements: the fourth is the great world, which contains all created things, both corporeal and incorporeal: the fifth, is the little world or *Microcosme*, which is Man.

We are in this place chiefly to treat of that world which consists of Heaven and Earth and the Bodies therein contained, and by another name is called *pan*, the Universe because it comprehends all natural bodies, & to which the term *Mundus* or World does chiefly belong, and which in regard of its order was given it by *Pythagoras* as *Plutarch* saies in the 2. of his *de placit. Pbylosop. ch 7.* though we may doubt hereof, because the word *Cosmos* is read up and down in the writings of *Hermes Trismegistus*. For this universe is truly *Cosmos* or *Mundus*, that is to say adorned, orderly marshalled, and beautiful. And therefore *Ocellus* inscribed his Book of natural things *peritou pantos, de universo*, of the Universe, and touching these names he thus writes. *I cal this whol world by the name of universe: For because it is distinguished and adorned with all things that are, therefore it has gained this name Cosmos and Pan, the world and Universe.*

And as there are sundry significations of the term world, so there are sundry definitions or descriptions thereof, which *Franc. Piccoloninens* has collected in his Book *de Mundo* ch. 2. But those are of all other most pertinent and most fit for this place, which the Author of the *Book de Mundo* has in his 2. Chap. (for whether it be *Aristotle's* or *Theophrastus's*, or of some other Author is a question, of which see *Ludovicus Vives* upon *Austin de Civitate Dei Lib. 4. Chap. 2. Collegium Conimbricense* in the prozme to *Aristotles Physicks* quest. 5. art. 4.) the first is this, *The world is a Fabrick framed of the Heaven and Earth and the Natures in them contained.* The second is this, *The world is the Order and Disposure of all things, which is preserved by and through God:* which may thus I conceive be fitly joyned both in one. *The world is that same orderly Disposure of all natural Bodies, proceeding from God and by him preserved.*

The Matter therefore of the world are all natural Bodies, not only simple but also mixt; not only liveless, but also living: yea and universally, a natural and sensible Body, as *Aristotle* saies in his 7. *de Celo*, ch. 9. t. 98. And the world is compounded of the Heaven, the four Elements, mixt bodies, inanimate and animate, mettals, things dug out of the ground, Plants, and Animals or living Creatures.

But what is the Form of the world is not so evident, and there are sundry opinions thereabouts. For some say God is the Form of the world; others a soul common to the whol Universe; others, the Heaven; others, its Figure; others, Order. But among these opinions, two have at this time the preheminance: the one is that which attributes a certain soul to the world for its Form: the other is that which makes order to be the form of the world. That the world has a soul is an old opinion, approved by many most renowned men. It is countenanced by *Hermes Trismegistus*, *Zoroaster*, and *Orpheus*. So in his Book called *Nous proserme*, All things (saies he) are full of soul. And in his Book *de Intellectione & sensu*, he attributes a proper Sence and Intelligence unto the world. *Pythagoras* held the same, with *Plato* and his Followers, who oft times cal the world a living Creature, and assign it a common soul, which every where through Land and Water, contains in it self spiritual and quickening seeds; and of it self ingenders, wherever corporeal seeds are wanting; and also cherishes the seeds left by Animals, and of a putrified Grape-kernel engenders a various, orderly and precious Vine; which wherever there wants a generator, and accidental qualities seem only the Cause of Generation, supplies the place of a generating Substance; as *Marsilius Ficinus* shews at large, in his 4. Book of *Platonick Theologie* Ch. 7.

But the Peripetaticks like not of this Opinion For seeing no evident reason perswades the same, nor is there any necessity that it should be so; they neither attribute to the world any informing Substantial form, nor one common soul, nor do they think it fit to multiply things without great occasion. For no Action does plainly appear in the whol world, as proceeding from any peculiar soul common to the whol world: but all operations do proceed from peculiar and distinct forms. And therefore since all parts of the world have their peculiar forms, there needs no common form to knit them together; seeing without it, the severall forms can perform their own operations. Moreover, if there were one form informing the world, the other forms, must either be parts thereof; or be informed thereby;

both

The  
worlds  
matter.

Touching  
the form of  
the world  
sundry O-  
pinions.

both which are absurd. They cannot be parts; for all formes are not univocal, and differ more then in kind, nor can they make up one whol: And one form in number, cannot constitute distinct things, such as Natural things are. For since the form gives unity as well as being: all Natural things should be termed one rather then many. And that the other formes should be informed by this, is also many waies absurd. Nor is there any reason to beleve that this form of the world, comes upon the other forms, just as the form of a living Creature comes upon the form of a mixt Body. For if this were so, it should be more excellent and more perfect then the rest of the forms: which the Platonists nevertheless, will not grant. For the Soul of the world does not include more and more excellent faculties, then the forms and Souls of all Natural Bodies.

The Form  
of the  
world.

The Efficient  
cause  
of the  
world.

And therefore the Peripateticks deny that the world is one, by the unity of a Form informing; and they attribute thereunto only an unity of order of those things, which proceeding from one principle, do tend unto the same as their end, agreeing one with another and with it; because all things come from one and tend to one, as *J. C. Scaliger* saies in his 6. *Exercitation*, S. 2. The Form therefore of the world is the order or orderly disposure of Natural Bodies. Howbeit, we are here to observe, as Number is twofold, the one numbering, or wherewith we number, the other numbered, which is nothing but the things themselvs which reckoned: so there is a twofold order, an order ordering, which is an accident, and the mutual respect of the parts one to another, or as *Augustin* defines it in his *de Civit. Dei* B. 19. Ch. 13. a Disposure which among things like and unlike gives every one its place: and an order ordered, which is nothing but the things themselves aptly disposed, and such is the world. For natural Bodies, as they are aptly disposed, and participate of the condition of one first principle, and mutually accomplish and cherish one another, do make one orderly System, which is called the world.

As to the efficient Cause of the world, though the Epicureans were so mad as to think and say that this beautiful Theatre of the world was made by a blind and fortunate concourse of Atomes: yet all sound Phylosophers agree in this, that this world depends upon the most good and great God; as the only first principle of all principles. For as *Austin* in his *de Civit. Dei* B. 11. ch. 4. saies, The world it self, by its most orderly mutability and mobility, and the most beautiful Feature of all visible things, does after a sort silently proclaim both that it was made, and by none but God, nor could be made by any but him, who is unutterably and invisibly great, and unspeakably and invisibly fair. And *Scaliger* in his 3. *Exercitation*, shews that *Simplicious*, *Philoponus*, *Ammonius*, *Avenroes*, and many other renowned Men, neither fewer in number nor of less Authority, then those of the contrary foolish opinion, did hold that the world depended upon God, as its Efficient Cause: and at last, thus concludes. For if by his Providence all things are governed (which no man in his wits can deny) it necessarily follows, that he was the maker of al. For if he made not the world: then he received it made by another, either as borrowed, or by force, or by sale, or as a pawn, or hired, or by lawful succession, or seazing upon it when empty, or by command, as a Minister, Servant and Mercenary from his Lord. All which are meer trifling and Impious Conceits.

The End  
of the  
world.

As for what concernes the end of the World: The End moves the Agent to a ct. But there was nothing before the world saving God alone. Nothing therefore moved God to create the world, but he himself moved himself. and therefore he created it, that he might communicate his infinite goodness. Which *Augustine* has neatly expressed in these words, *de Civit. Dei* Book 11. Ch. 21. Three things we ought chiefly to enquire concerning the Creature; who made it, by what he made it, and wherefore he made it. God said (quoth he) let there be light, and there was light, and God saw the Light that it was good. If therefore we ask who made it? it was God. If wherefore he made it? because it is good. There is no more excellent Author then God, no more efficacious Art, then the word of God, no better Cause, then that what is good might be made by the good God. Nor does *Plato* render any other cause, why God made the world, but because he is good. For it is the property of goodness to communicate it self. And this is the end of creating the world.

But what the End is of the world already constituted and existing, is elegantly taught

taught us by *Hermes Trismegistus*, in his Book *de Pietate & Phylosophia*. First there was God, then the World, then Mankind; the world for Mankind and Mankind for God. For since every end is good, and the perfection of that thing whose end it is; and God is the ultimate and most perfect of all things: God must needs be the end of all things, and all things are for that one, which is for none but himself: and all things stand in need of God, Both to be and to be well: Man therefore was made for God, and the world for Man. But how all sorts of things are made for Man, is not so plain. For *Scaliger* calls them the Enemies of Truth, who will have all things to be made for the use of Man. For what profit hath Man from Fleas and Wiglice? 'Tis truly ridiculous to say, that Fleas are made to suck out the unprofitable blood, and Wiglice to awake us in the night, that we may fall to our prayers. Nor does *Scaliger* allow that some sorts of things were made only for varieties sake, and to stir us up to admiration: but he determines that God made all things for some certain end. For variety and bare ornament, is not the end, nor the Perfection of the Universe, but a way only to that perfection. For from sundry sorts of things orderly disposed, the perfection of the Universe does arise: *Scaliger* therefore himself thus resolves the matter: that Man is a little world, and as it were the Rule and measure of other living Creatures; yea and the Prince of all. But he could not be Prince unless he were such as he is, viz. In the middle: nor could he be in the middle, unless betwixt extreams. Therefore the extreams were made that he might be in the midst: and if any of the extreams, or those things seated betwixt the middle and the extreams were wanting, there would be a vacuity amongst the forms. Which is much more absurd, then that there should be a Vacuum without a Body. For seeing the most good God is full of himself, and the world as the *Platonists* say, is Gods Statue or Standing Image: it must also be full, and have no defect either in sorts, or Quantity. And therefore if even the smallest thing were wanting in the world, the Universe would be no longer the Universe, and the world would cease to be the world, that is to say, beautiful, orderly ranckt, and perfect.

God is the end of all things.

And thus far we have known the world by its Causes; it remains that we take a view of the cheif adjuncts therof, and discuss the controversies raised touching them. Now in the first place comes Eternity; and the question is, *Whether this world be Eternal or not?* This question is much canvassed by the disputes of many Men, and the opinions of Phylosophers concerning the same have been various; some affirming the world had a beginning and shall have an end; others that it had a beginning but shall never have an end; and others again that it never had beginning nor shall ever have end. That we may therefore disintangle our selves from so great a variety of opinions, we must first observe this: that the chief question in this place is not: whether God made the world. For though the madness of some hath been so great, that they durst say that this world was made by Chance; yet all sound Phylosophers, do agree that God is the author of the world: and therefore the Author of the Book *de Mundo*, Chap. 6. saies Elegantly and Piously: *It is an ancient saying spread amongst all Men from their Ancestors, that all things were made both of God and by God; nor can any Natural thing be sufficiently furnished to persist in safety, if it be left to its own saveguard. without the tuition of God.* And that *Aristotle* himself knew the most good and great God to be the maker of the world, and that he expressed as much in words, is the judgment of most worthy Phylosophers. Verily if the world were not made by God, it must be made by it self: which is absurd. For a finite thing cannot be the first being; and every finite thing depends upon some other: nor are there many prime, infinite, eternal beings.

Whether the world be eternal.

The world was not made by chance.

Here therefore the question is; *Whether the world be from eternal, or were created in the beginning of Time?* The most renowned Ancient Phylosophers have held, that the world had a beginning. But *Aristotle* held that this world hath been from all eternity, as himself witnesses, in his *1. de Caelo* ch. 10. t. 102. But let not us care what this or that Phylosopher hath thought, seeing our Religion does teach us, that this world was made in the beginning by the most great and good God. For whom may we better beleve when the world was made, then God himself the Author thereof.

The world is not eternal.

But whether or no, setting aside divine revelation, it may be firmly proved by natural Reasons, that the world is not eternal, many do doubt. *Iul. Cas. Scaliger*

in his 61. *Exercitation* S. 6. saies that Religion only does perswade him, that the world had a beginning and shal at last be consumed by fire. Yet he concludes in his 77. *Exercitation*, S. 5. that because God is the efficient cause of the world, it must needs have had a Beginning and not be eternal. For whatsoever is made, is after its efficient cause, and nothing that is made is of equal durance with its maker, for so it should not be made. This Argument others also use, and say that for a thing to be made and to be eternal implies a contradiction. For that which was made, somtimes was not. And they say that Eternity is the duration of God alone, nor can any creature be Coeternal with its Creator.

Nor are those Arguments which *Aristotle* and his followers bring to prove the eternity of the world, such as mans wit cannot answer and refute. And I conceive it is well said, that no reason brought against our Faith is true, or can be: because truth is not contrary to truth. For though things of Faith are above the order of Nature, yet they are not contrary thereunto. For even here, these who contend for the eternity of the world, do cheifly build upon two fall foundations: one, that Creation is impossible, and that even the first cause cannot produce any thing out of nothing: the other, that God acts by the necessity of his Nature.

*Creation is possible according to Physo-phy.* Now that Creation is not impossible and that the first Cause can produce somwhat out of nothing, may be evinced even by the light of Nature. For such as is the being of a thing, such is its operation: but the immortal God, since in respect of his essence he depends upon none, and needs no outward thing, neither does he need any external thing to be presupposed in his acting. Moreover God is the cause of all things, and nothing except God hath its being of it self, but all things depend on God. And in very deed, they who deny creation, and say it is impossible God should make any thing of nothing, and yet grant that God is the Efficient cause of the world (for they must needs grant that) do contradict themselves. For if God be the efficient cause of the world: doubtless, he made it of nothing. For besides God and the world, there is nothing out of which he should produce it. Others bring more reasons to prove the same. And in truth, they who deny that God could produce something out of nothing. they deny God to be God, that is to say, that his power and perfection is infinite.

*God made the world freely.* And that God acts freely and not compelled by his Nature, and that he most freely produced this world, is not contrary to humane reason. For since God is a most perfect being, depending upon none, standing in need of none, self sufficient, *Autexousios*, *Autagathos*, and (which word was elegantly invented by *Scaliger Exercit. 365. S. 2. Autautos*, self, of himself: the wil of God cannot necessarily desire any Creature, nor can he necessarily produce any, nor can his power be compelled by any thing: but himself most freely wils, what by his wisdom he knows to be best: and he could, if he pleased, have made this world much sooner or later, or not at all. Yet he does alwaies, that which is best. Nor, because he made the world in the beginning, was his will therefore changed. For from eternity, it was his pleasure to produce the world, then when he produced the same. Nor must we think, as *Austin* speaks in his *De Civitate Dei B. II. Ch. 5.* That any thing hapned accidentally to God, in that he made the world rather then, then in former times; since the former times had passed equally through infinite spaces, neither had there been any difference, why one time should be chosen rather then another. And as he saies, in the said 11. *Book, Ch. 12.* where he handles this argument excellently; that which we now enquire after five thousand and od years, posterity may ask with the same Curiosity six hundred thousand years hence, if this mortal condition of men born and dying shal continue so long, and they retain their childish infirmity. Those who were before us in the infancy of the world might move the same Question. Yea and the first man himself, the day after, or the same day he was created, might enquire why he was made no sooner. For indeed, as he saies in the same place, all the bounded spaces of Ages, if compared to boundless Eternity, are nothing.

*The world shal have an end.* As it appears from Scriptures, that the world had a beginning: so they alone perswade us that this World shal have an End; nor is any Philosophical reason strong enough to prove the same. For though it be true which *Scaliger* saies in his 61. *Exercitation, S. 5.* and *Exercit. 307. S. 20.* that all things because they have not the cause

cause of their being from themselves, but depend upon another, are of themselves mutable, and corruptible; but are not corrupted, because God wil not have it so: yet true it is, that the world left to it self, with that common and ordinary concurrence of God which now it has, may for ever endure, nor does it of its own accord tend to corruption: but it shall end by the free command of God, viz. when he shall withdraw from it his ordinary assistance, and change it into a better condition. And so much for that Question whether the world be eternal.

Nor is it much less controverted: *Whether this world be one.* For here Philosophers are at great variance, as may be seen in *Mirandula* his *Exam. Vanit. doct. gent. Lib. 7. Ch. 20.* For some have held the world to be but one, others that there are many worlds, and they either like or unlike one another. For some were of the opinion, that there were other worlds besides this, in some of which there is neither Sun nor Moon; in others, that there is Sun and Moon greater then those in this world; and in some many Suns; also that there are some Worlds void of al Plants, Animals, and Moisture: and *Metrodorus* did say, that it is as absurd that there should be but one world, as that in a vast field there should grow only one Ear of Corn.

In this variety of opinions, we beleve there is but one world: but we hold setting aside what may be urged from our religion, that there is no Philosophical reason strong enough to prove the same. For sure enough God can and could have made more worlds: But whether or no he will make more: none can tel but himself, seeing neither sense nor reason can inform us. For as for the reasons every where alleadged by *Aristotle* and others for the unity of the world; they are not such as do certainly prove the same. Which *Plutarch*, besides others, does shew in his *Book of the Ceasing of Oracles*, and *Mirandula* in *Exam. Vanit. Doct. Gent. L. 6. Ch. 9.* who at last thus concludes: truly, as it seems to me, if those other worlds pleaded for, be of several sorts, *Aristotles* reasons will be invalid: because the sort of Earth and water and other parts and their Nature would be different. For so the parts being of one and the same Nature would hang together and would not go out of their world; all heavy bodies would seek their own Centre, and that lighter would fly upwards, and the same may be judged of the rest, proportionably.

Howbeit this one world does sufficiently demonstrate the goodness of God, because he made it of his own accord, not being obliged so to do; also it shews his great power, because he could make it of nothing; and exceeding great it shewes his Wisdom, because he hath made al things so admirably and with such rare skill.

And although we beleve this world to be one; yet we hold the same to be perfect, with such a kind of perfection as a Creature is capable of. For it was made by a perfect Artist according to a perfect Pattern: nor is there any thing wanting, in the absolute perfection of the things whereof it is made up, nor in their Variety. For it containes all degrees of beings. Nor in order: for in so great a diversity of things, there appears a rare order, and all things are fitly disposed in their places: all which are enclosed with the Heaven, which because it is round, the Figure or accidental form of the world; therefrom resulting, is round also. And so much of the world in General.

## Chap. 2. Of the Heaven, and the Stars.

NOW the world is divided into two Regions, the *Ethereal* and *Sublunary*: and being to treat of the *Ethereal* or *Celestial* in the first place, those most Famous Questions present themselves, agitated by the disputes of most Famous Philosophers, now for many Ages: *Whether there is matter in Heaven:* and if there be, *Whether it is of the same Nature with that which is here below.* And although as to the former question, there are scruples good store on al sides: yet that opinion seemes to me more probable which attributes matter to the Heaven and I conceive it was well said of *Scaliger* in his 359. *Exercitation, Sect. 11.* to make a Body without matter, is all one as to make a dream without sleep: or as he hath it in his *de plan-*

*is Bread without meal.* For where ever there is quantity, Figure and Local motion: there must needs be matter. For Quantity immediately follows the Nature of matter, and cannot be in any thing without it, and all forms and accidents have no quantity of themselves, but are said to have quantity, because of the Quantity of the matter wherein they are. Wherefore since we see, that the Heaven hath quantity, is of a certain Figure, and a determinate magnitude, and locally moved: we must needs confess that it hath matter in it.

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But what kind of matter this is, whether such as this of ours, or some peculiar: is so obscure a Question, that resolve which way you will, you may easily find arguments to maintain your Assertion. We deny that the Heaven consists of one or more of these Elements of ours, which was the opinion of very many ancient Philosophers: yet I conceive we should not assign it any other matter, then this first matter of ours. For there is no need to invent a new one, nor any necessity to introduce a new being, into the Catalogue of Nature: since what ever is attributed to the Heaven in respect of its matter, may rightly be attributed to this matter of ours. *Scaliger* therefore in his *Exercitation*, 61. does well conclude this Question: One matter differs not from another, save by the Form entering thereinto, whereby it becomes this or that. For matter as matter, includes no act in it self, and has nothing determinate, but receives all determination from the Form. Whereunto this may be added, that in Heaven there is Quantity, and some other Qualities, which are common to it and these inferior Bodies, and proceed from the first matter. Which things being to the opinion of *Averroes* cannot be admitted, who invented a new simple Body not compounded of Matter and Form, and held that Heaven was a Body, that was neither pure matter, nor pure Form, nor any thing of them compounded, but a certain middle thing betwixt these, *viz*, A certain form consisting of it self, furnished with dimensions and apt for Local motion. For these things seem to be invented without cause, yea and hard to conceive, That there should be a thing (to use *Scaligers* words *Exerc. 61. S. 1.*) in Nature subsisting of it self, which is neither God, nor an Act, nor a power; neither informing nor informed; neither matter nor immaterial; neither a Body nor incorporeal; without the Predicaments, and yet having Predicamental Quantity and Qualities. Which what for a thing it can be, let himself consider. And if it could be proved, that there is a simple Body not compounded of matter and Form: verily a great foundation of peripatetical Philosophy will fall to the ground. And if there were such simplicity in the Heaven: there can be perhaps no cause assigned, why it might not also be admitted in some sublunary Bodies.

Nor if we should attribute to Heaven this first matter of ours, need we to fear that the Heaven should fall and at one time or another of its own Nature come to destruction. For according to *Zabarella* himself *Lib de Ortu & Interitu* c. 11. who nevertheless in this point takes part with *Averroes*, the first matter, seeing it is a being meerly potential, and acts nothing, is no adequate Cause of Generation and corruption of things: and every action is to be ascribed to the Agent; and to matter, passion only belongs. Nor is matter the subject of Corruption, save when it is with Natural Forms corruptible, from which the accidents flow, which have contrarily, or contraries also under contrary differences. Therefore we must not deny the Heavens to have matter, though they be not generated nor corrupted. For there are two offices of matter. Universally and primarily it is given to all things, to sustain Quantity, and to receive motion, and the actions of Agents. For it is the first subject of Quantity, and is meerly passive, acts nothing, but only suffers: and all things naturally suffer, because they have matter. Moreover Matter is given to sublunary things, because of Generation, to which it concurs as a secondary cause, *viz*. In as much as it is apt to receive the Action of the Generator. The cause therefore why there is no Generation nor Corruption in the Heavens is, because there is nothing contrary to Heaven, by which it may be corrupted, and because it has no Particular aptitude to receive other forms, which is only opposed to act, and is really the same thing with privation. For in Heaven there is no Privation of corruptible Forms; because the Heaven hath no immediate aptitude to receive sublunary Forms, But the Form of Heaven does so dispose and bind its matter to it self, that it has no Particular aptitude to receive other Forms, but only that same universal one, which is an aptitude to receive all Forms indifferently; in respect of which nevertheless unless a Particular aptitude be added, and a contrary agent



agent be at hand, no Generation is made. Yea and (which I would have those to consider, who think the Heaven must perish, if it have matter.) the Earth which is in the Centre of the world is safe from all Corruption nor is corrupted, because no contrary Agent pierces so far, by which it might be corrupted. We conclude therefore; that *The matter of Heaven has no particular and immediate aptitude to receive corruptible forms; and that it has only an appetite of perfection, but not of Mutation, as Scaliger saies.* For the Matter because it cannot subsist of it self, desires to be perfected by the form, whatever form it be, whether of a Man or of a Beetle, nor of its own accord does it lay down one form and take up another; but the whole vicissitude of Generation and Corruption, depends upon the Contrariety of the forms and the qualities issuing out of them, as on its principal Cause: which seeing the Heaven has not, we need not to fear, that it shall come to decay, only because of its matter. Of which see more in *Scaliger's Exercit. 17. and 61.*

Moreover that is also no Inconvenience *that there should be one matter of Celestial and Sublunary things.* For the difference and excellency of things proceeds not from the matter, but from the form; and the same first matter which bears the form of a Mushrome or Flea, is also the subject of our understanding, which is verily a divine Substance, and more noble than Heaven it self.

Nor is it a less Controversie, *What that form of Heaven is.* Averroes and they which follow him do not allow the Heaven an informing Form, but say that it is a simple body, without composition of matter and form. But this opinion has been already rejected. But we do more rightly to attribute unto Heaven an *informing Form* also, since as we have shewed it consists of matter. For matter cannot subsist of it self, nor perform those most noble actions which proceed from Heaven, besides its motion; since it is purely passive, and no action belongs thereunto. Yea and matter of it self, cannot be moved: for *every thing which is moved is an actual Being.*

But *whether it be formally a soul or not,* needs inquisition. It is indeed an old opinion of the Pythagoricks and Platonicks, that the Heaven has a soul: howbeit the contrary opinion is truer, which holds that the Heaven has no soul. For there appears no actions of any kind of living Creature therein, which can proceed from a soul; nor has it any of those Organs, which are necessary to perform the actions of a living Creature. The Heaven is not nourished: because in Heaven nothing is corrupted or dissolved, which needs to be restored by nourishment: nor does it feel because it has no organs of feeling, nor of other senses, nor is there any end for which the Heaven should have senses: Much less can we allow an intelligent soul to the Heaven to inform the same, lest we fall into that Error which many have condemned in *Origen*, who taught the Stars had souls and were capable of Virtues and Vices. It is sufficient therefore to attribute to the Heaven a form which is no soul; but yet more noble than the forms of the Elements, by means of which, it is that which it is, has a certain figure, and a certain power by means of its Light and Influences of acting upon these lower bodies, and also motion. And this is the matter and form of Heaven by means of which it is also rightly termed a natural Body. For if it were destitute of these, a just cause could hardly be found, why it should be called a natural Body. And this Body consisting of matter and form is termed *Æthereal.*

Moreover the Parts of the Heaven are *twofold*, some quite perspicuous, which are the Orbs, and are sometimes in a special manner cal'd Heaven, others are not to be penetrated by our sight, and shining, called Stars. Touching the Orbs certain weighty questions are moved, and in the first place we are to enquire: *Whether the Heavens be one continued body, or distinguished into divers Orbs or contiguous Spheres.* Now the ancients have endeavored to prove that there are many Heavens, by reason of the diversity of motions, which cannot be in a simple body: seeing every simple body, is moved with one simple motion naturally, as *Aristotle* tells us *1. de Celo. ch. 2. t. 7.* For when the ancient Astronomers and natural Phylosophers, began to observe the motions of the Sun and Moon and other Stars; they observed that all the Stars did not observe the same swiftness and distance, in their motion, but that some were moved more swiftly; others more slowly, some never joyned but alwaies keeping the same distance one from another, and others again coming neerer one to another, even to a conjunction; that the Sun went alwaies in the middle of the Heaven,

What is the Form of Heaven

Whether the Heaven has a Soul.

Some parts of the Heavens perspicuous, some not, whether the Heaven is one continued Body?

Heaven, and that the other Planets declined some whiles to the North other whiles to the South. From which variety of motions they gathered; that the Heaven is not one continued Body, but is compounded of divers contiguous Orbs.

But most of the latter Writers deny, that the various motions of the Stars do rightly prove a plurality of heavenly Orbs; and they aver that this variety of motions does not proceed from the number of the Orbs, but that it belongs primarily to the Stars themselves. And in very deed it is more likely, *that the Stars are moved of themselves with their own proper motions*: and that the Heaven is a body, not hard, nor distinguished into real Orbs, wherein they stick fast and are moved by their motion, *but a body fluid like the Air, of a substance most thin and delicate wherein the Stars perform their motions*. For not to speak now of refractions, of which if the Heaven were solid, there should be two. one by reason of the vapors ascending from the Earth; another by reason of the solid body of the Heaven: whereas nevertheless those skil'd in Opticks and Astronomy, have observed one only refraction which is sensible and worthy of note: the motions of the Comets, do evidently demonstrate that the Heaven is not solid. For since it is now out of Controversie (unless any wil call in question the most certain demonstrations of Astronomers) that Comets or unusual Stars (for we shal not now contend about the name) have been seen in the Region of Heaven above the Moon, and have observed peculiar motions, not like the motion of any other Star fixed or planetary; this could not be, without the penetration of Bodies if the Heaven did consist of solid Orbs: For if the body of the Comet were fixed in the orb of any fixed or planetary Star, it would alwaies keep the same distance, from the said Star or Planet. Which since it does not, a peculiar Orb should be attributed to every Comet, to carry the same about: Which cannot be; since the whol Cystern of Heaven according to the ancient Doctrine, is possessed by the Orbs of the fix'd Stars and Planets. Also the motion of the Planets proves the same. For seeing they are somtimes neerer the Earth, somtimes further off, which the Doctrine of *Paralaxes* teaches, and the appearing Quantity shews; for *Venus* appears somtimes so great that the unwary beholders take her for a new Star; and *Mars* is somtimes seen equal to *Jupiter* in bigness: which cannot any otherwise come to pass, save because in the fluid and penetrable body of the Heaven, the said Stars come somtimes neerer the Earth, and otherwhiles go farther from the same. And how could *Mars* be somtimes higher, otherwhiles lower than the Sun, if both were carried in a solid Orb?

The Premises therefore considered, we must hold that in that same fluid, penetrable, most thin delicate, and invisible body of Heaven, *The Stars are moved by a power and faculty implanted in them by God their Creator*, without any violent and external impulse or carriage. For that God who willed and commanded, that the Stars by their Motion, should describe the Times, Daies, and Years, gave them power likewise to Effect the same. And if the Creator could put such Power into the Elements Earth and Fire, that in a most streight Line, the one should move down to the Centre, the other upwards from the Centre, why could he not give the Stars such a power as to move circularly? And therefore *Cicero* vainly wonders in his *2. de Natura Deorum*, where this constancy comes in the Stars, this so great an agreement from all Eternity in such several motions, how it can be without Mind, Reason and Counsel. For this faculty of Motion is not quite void of reason, and Counsel, but by the most wise Creator, it is granted to these his Forms and Instruments.

Mean while it hinders not, though the Circles and Orbs be retained by Astronomers as hypotheses. For such figures are not without cause used, to describe the motions of the Stars, as are described in the said Orbs, and Circles.

Now this Heaven is a *Body most simple and most pure*, of a different nature from the Elements and therefore a *fist Essence* so called by *Aristotle*: which also is true nevertheless of the Stars. *It is void of all color cleer and transparent*, and therefore cannot be seen. For though as *Scaliger* saies in his *66. Exercit. Sect. 1.* the Heaven seems to be of a blewish or saphire color: yet it rather seems so, than is so indeed. For even the Air also, though neer us it have no color, yet afar off it seems to be color'd. The Reason is, because it is thickened, not by composition of parts, but by disposition. For distance represents many parts to the sight, disposed all along in a visual line.

The Heaven is not colored.

The Stars are moved by a faculty planted in them by God.

Why Astronomers retain the Orbs.

Heaven is a most simple Body.

The Heaven is not colored.

The said *Heaven is unchangeable and uncorruptible* (as also the parts) For there is not any body in the world, by which the Heaven or the Stars, can be affected or changed. Contrariwise, the Heaven has power to work upon these lower bodies, and does diversly affect them. For though the chief action upon these lower bodies, proceeds from above from the Stars: yet must not all active power be denied the Heaven it self, wherein the Stars are and are moved; seeing it also has its form, which can no waies be idle. Moreover the Heaven is the *greatest of all bodies*, since it imbraces all other bodies of the world in its Compass: also it has a *Spherical Figure*, because it is of all others the most capacious.

*It is unchangeable. The Heaven also it self works upon these lower bodies.*

*It is the greatest of bodies.*

*The Original of the Stars.*

As to the Nature of the Stars, it is indeed commonly held, that they are the thicker parts of their Orbs; but the truer opinion is, that the most good and great God, did on the fourth day distribute that same primitive light, which he made the first day, into the Stars, and hence was the original of all this number of Stars. For it is absurd to think that first light returned to nothing, seeing it was good. Or if any man please to place that primitive light in the upmost region of the world, above the starry Heaven, and to make that upmost Region its mansion place; yet it must be confessed, that God the Author of the world, created the Stars themselves full of light upon the fourth day; whereas he created the Heaven before, upon the second day. And this light is, doubtless, a most noble substance, most excellent, most simple, than which among all bodies, nothing is more beautiful, more sweet, nothing more admirable: by which all these sublunary things are inclined and cherished: without which this world would have no beauty: this as among bodies it is most beautiful, so it is the first and chiefest Image of the wisdom, beauty, power and goodness of the most high.

Howbeit, the inmost nature and Essence of this Light, is unapproachable and unsearchable by humane wit; and therefore we cannot in this darkness of humane understanding perfectly understand the nature of the Stars. For seeing the Essences even of those things which are about us in this lower world, are unknown to us; 'tis easie to see how little we can promise our selves concerning the knowledge of things so exceedingly remote.

Very like it is, That every Star has its proper substantial form, and as here below, Plants and Animals do by their forms differ from the Air wherein they live, and one from another, so also that the Stars differ both from the Heaven and one from another, by their specifick forms, which appears even from their essential proprieties and Effects. For the Stars have light, the Heaven has not, and the Stars do thereby differ one from another; and Experience shews, that these things below are differently affected by different parts.

Since therefore we cannot pierce into the knowledge of the inner form and Essence of the Stars, let us weigh and consider these proprieties and effects which flow from the form and Essence of the Stars. And there comes here chiefly to be considered, Their Motion, Light and Shine, Heat and hidden Influences.

And in the first place the most wise and powerful Creator, has placed this power in the Stars, that every one is moved with a certain motion; and he that commanded them to describe the times by their motion, gave them a power to move and to perform what he had commanded.

*The Motion of the Stars.*

Now these Stars have a double motion. For some are moved with an equal motion in such sort, as they retain alwaies the same distance one from another, and these are commonly cal'd the fix'd Stars: others have divers motions. nor are they alwaies equally distant one from another; but now are joyned, and after a while separated, one while they are neerer another while further one from another; and those Stars are called Planets.

*Some Stars are fix'd others Planets.*

Which being so, they make two motions of the Stars, one whereby the fixed Stars are perpetually moved altogether, retaining the same distance one from another: the other is both different for the motion of the fixt Stars, and thereby every Planet is moved after a peculiar manner. These motions are vulgarly termed the first and second motion, and they teach that the first motion, is that whereby the uppermost Sphere is carried about once in twenty four hours, and carries all the other Spheres with it from East to West; and the second they say is that which is proper to the rest of the Spheres, whereby they move contrary to the *Primum mobile* or first Sphere from West to East, some more swiftly, others more slowly:

*whether there are two motions of the Stars?*

which

which distinction of motion we willingly allow the Astronomers, if they will take it as an Hypothesis or supposition. Howbeit we conceive this distinction needlessly introduced into the Schools of Natural Philosophy, and peradventure against the Consent of Nature: and we think it no absurdity to say that all the Stars are moved from East to West, the fixed ones most swiftly, in the space of twenty four hours the rest by how much they are lower, so much the slower, and the Moon most slowly, much about the space of twenty five hours, only some minutes less.

For that seems not a sufficient Cause which they assign for their second motion, *viz.* Because we see the Moon or some other planet, which was joyned to some fixed Star, in the West or the South, after one or two daies, one or more degrees Eastward, that Star being left Westward, with which it was before conjoyned, it becomes nearer and therefore was moved from the West toward the East. For if you shall suppose all the Stars to move from East to West, and every upper Star to be swifter then the lower, there will be the same appearance in the Heaven, and the lower which move more slowly will be left behind by the upper which are moved swiftly: which is more likely to be true then that the planets move towards the East. Let the Sun and Moon be joyned in one point Westward, and let us suppose that the Sun once in twenty four hours and four minutes, and the Moon in twenty four hours, are carryed about the Heavens; when the day following, the Sun shall be returned to the same point, the Moon will be yet distant therefrom almost twelve degrees, and will at last reach it after fifty one minutes are past. And this opinion which we propose *Plato* seems to have favoured in his 7. *de Legibus*, where thus he writes concerning the Sun, Moon, and other Stars. *Every one of them goes round the same way, not many waies but one way: though they seem to be carried about by various and manifold waies. And that amongst them which is most swift, is not rightly judged to be most slow, and that which is most slow, most swift.*

Howbeit as to the period of the Stars, and their return (as they call it) to the same point of Heaven; it comes all to one pass, whether you hold the Stars to be moved with one motion or with two. For the Moon being departed from one point of Heaven, after twenty nine daies or near upon, she is seen in the same again, which space is called *Mensis Lunaris*, the Moones month. The Sun, Venus, and Mercury, return to the same place in the space of about a year: Mars in two years; Jupiter within twelve years; Saturn in the space of thirty years; the fixed Stars in the space of 48000 years, which space of time they call *Plato* his great year: and *Plato* is said to have beleaved that when so many yeats are past, all things in the world shall return unto their old State.

*Lux, Lumen, and Radius, how they differ.*

*The Stars shine both with their own and borrowed light.*

In the next place we are to consider in the Stars their *Lux* and *Lumen*, Light and Shine, then which the whol world hath nothing more pleasant, and which are rightly called by *Franciscus Patricius* in the fourth Book of his *Panaugia*, the good and great God his greatest and best Instrument. And first let us see what *Lux*, *Lumen*, and *Radius* are, and how they differ one from another. Some there have been and still are in that opinion, that Light is a substance and the Form of the Celestial Bodies; but their opinion swerves from the truth; since no substantial Form can be discerned by the sight. We must therefore hold, that *Lux* light is a quality and Essential propriety of a lightful body, of it self perceptible by the sight. But what is the first subject of light, or, whether all the Stars shine with their own light, or borrow it from the Sun, herein the opinions of Philosophers do vary. For some hold all the Stars shine with their own proper light, others hold they all borrow their light from the Sun, and others again hold that only the Moon borrows her light of him. This is our opinion: That all the Stars do indeed receive some light from the Sun: yet that they have also some light of their own, Both which we are taught by experience. For first we may chiefly observe, it in the Moon, which in regard of her several posture to the Sunward, hath various Appearances, in regard of the Variety of light which she receives from the Sun: the same is to be seen in the rest of the Planets, which are observed to be brighter or darker in regard of their several postures to the Sun. And therefore *Orpheus* calls the Sun the quickening Eye of Heaven: *Heracitus*, the Fountain of Heavenly light; the ancient Philosophers, the Heart of Heaven; and the *Platonists* placed the Soul of the world in the Sun, as *Marsilius Ficinus* tells us in his *Book de Sole* Ch. 6. The latter may be observed not only in the Moon, but also in the other planets. For in the  
Eclipse

Eclipse of the Moon, we see she has some light, and the same appears also after her conjunction. when we may many times see that part of her which is from the Sun, by means of her inbred light: which also any one may observe in the planets which are lower then the Sun, as *Franciscus Patritius* teaches, in the 7. Book of his *Panaugia*.

From the light proceed *Lumen* and *Rady*, shine and Beams, which *Franc. Patritius* saies are two divers things in the 3. B. of his *Panaugia*. The truth is, where there are Beams there is shine, but there may be shine where there are no beams or raies. For in a Chamber which looks towards the North, and is not right against the Sun, there is a shine at noon tide, but no beam or Raies. And therefore a Ray or Beam as he there shews, is as it were a secondary Light, or a brightness arising from the first light, and shooting to a right and an acute Angle. And *Lumen* or shine; is as it were a third light, flowing from the first and second, not diffused into Lines and Pyramids, but loosely shed abroad. First therefore there is *Lux* light in the lucid Body; then there is *Radius* a Beam which is an image of the light, diffused from the lucid body in a right Line; thirdly *Lumen* or shine, which diffuse it self obliquely, aside the falling of the raies into all parts of the *Medium*. And indeed there seems to be some difference between a Ray and shine, or at least it is one thing to represent the light as a visible object and to offer it to the sight, and another thing to illuminate the Air. For light seen from a dark place, does not enlighten all the air, betwixt the eye and the lucid thing; and that light which enlightens the Air hardly a furlong, is seen some miles of, in the night time; yea and the Stars themselves, are seen by us at an huge distance in the night; though they do not illuminate the whol Air. Which difference causes, that there is a twofold definition of *Lumen* or shine. For absolutely considered, shine is the image of light, or the quality of a Lucid Body, whereby it communicates it self to other Natural things, affording it self to their sight, and cherishing them. But as *Shine* is considered in respect of other things which it inlightens, it is the act of Colours whereby they become visible.

Now concerning *Lumen* or shine some Controversies are agitated. And first touching the Nature thereof there hath alwaies been great dissensions amongst Philosophers, which are not yet composed, so that it is dangerous to determine any thing in this point. Howbeit I shall briefly deliver, what seems probable in so obscure a matter. Now the question is whether it be a substance or an accident. For there are very many who hold that it is a substance, some corporeal, others incorporeal. And they that say the Raies and shine are a substance, are chiefly moved thereunto, because the shine and Beams are diffused through the Heaven and the Air, and that in a moment; which seems improper for an accident, which passes not out of one subject into another and because falling upon a dark and solid body they are reflected and leap back again. And those arguments could almost move me, unless the same arguments, did make as much against all visible, yea, and sensible species or representations. For, neither are other visible species moved with the motion of the Air, and they are in a moment diffused through their whol Sphere: Yea, and some also, witness the Echo, is reflected And therefore as oft as I think of this matter, I thus complain of the obscurity of Nature with that most learned Philosopher and Physician *Hieronimus Fracastorius*.

What shall I say, Poor wretch, that I do, what life that I lead now?  
Restless in my mind, and alwaies busily searching  
After Nature, who still flies, and leaves me behind Her.  
And when a while sh' has shew'd herself, then straight in a moment  
Proteus like to a thousand shapes, She turns Her Visage.  
And so She leaves and vexes me, continually mourning,  
For lost Labour, and old Age, so vainly bestowed.  
For when of late I busily sought, those thinly appearing  
Images that flow from things and shed them all over,  
And to the Wayles woods went alone to the Silent  
Secret shades, there I found, how by these shews I deluded  
Was, though they smite alwaies our sense and still they assail us.  
Passing and Repassing through the Doors of our senses,  
Haunting our Soul all day, and in the night when She sleepeth.

E

Yet

What a  
Beam or  
Ray is.

whether  
light is a  
Substance  
or Acci-  
dent?

These are  
Hexamet  
Verses in  
Imitation  
of the La-  
tine.

Lumen,  
light, or  
shine is an  
accident  
not a sub-  
stance ei-  
ther corpo-  
real or in-  
corporeal.

Whether  
light be a  
real or in-  
tentional  
accident.

Yet if we may say what is probable, that opinion seems to be truest, which does affirm that light is neither a Body nor a substance incorporeal, but an accident, and quality produced by a lucid Body in a transparent Medium whose act it is. For if the light were a body, since it is diffused through the whol Air, and is received by all the parts of the Air, there would be a penetration of Bodies. Moreover, if it were a Body, it should be moved successively in time. For a Body cannot be moved in an instant through a Medium filled with another Body: because the middle Body through which it is moved, would resist the same in its motion. But we see the light spread far and near in a moment. And that it is no incorporeal and spiritual substance is hereby apparent: in that spiritual substances fall not under our senses, or have dimensions; both which are true of Raies and Light.

That light therefore is no substance but a Quality, hath been made appear. But whether it be a real or Intentional accident as they Phrase it, is a great question amongst the expositors of Aristotle. And in the first place we must rightly understand the sense of this question. An intention and an intentional being, though it is commonly taken only for that which depends upon the operation of our mind, and without it, is nothing, viz. For an intelligible species which represents somewhat without the Soul to our understanding, either immediately, such as are the first notions, or mediately by the mediation of the first, such as are the second notions: yet here in a more general sense, the word Intention, signifies that which is the Image and representation of another thing without the Mind, that is to say the representation of a sensible subject in the Medium; and so an intentional being is taken for every spiritual species representing a real object, whether it be sensible or intellectual. So the Collor which is in our Cloaths or on a tree, is called real; that which is in a Looking-Glass, and is the Image of the color in the Cloaths, and that which from the tree is shed upon the Cloaths of him that lies under it, is said to be an intentional color. And in this sense we hold, that the shine, is an intentional quality: yet that nevertheless, it is a real being, as having its own Essence, without the operation of our mind, yea, and that it hath a more noble office then other intentional species so called, and that it is ordained out only for representation, but also for other effectual operations. Others do thus explain the matter. That light is a spiritual quality, not principal or real, or rather material. Now there is a great difference betwixt principal or material, and spiritual Qualities. For the former are not the image of another thing; they are received in the subject successively, and are moved in time according to the motion thereof; they are not totally in any part of the subject; they are not many of the same sort in the same subject, differing only in number, and kept unconfused and distinct. Whereas the contrary holds in spiritual Qualities; as we may see in Lumen or shine. For shine is the Image of Light; 'tis shed through the whol Air in a moment; it is not moved according to the motion of the subject. For though the Air is tossed with winds yet the shine of light is not moved thereby. Every part of the shine represents the whol lucid Body from whence it comes, and in the same part of the Air, many images of lucid Bodies or lights are kept distinct and unconfused.

The divi-  
sion of a  
Ray or  
Beam.

A Ray or beam is divided into a right, a reflex, a fract, and a refract: and that is termed right or streight, which passes from the lucid Body, without any hindrance of a dark Body. That is reflex, which lighting upon a thick dark Body rebounds back. That is fract, which passes out of a thin into a gross Medium, as that which comes out of the Air into the Water. That is refract, which comes out of a thick Medium into a thin. Howbeit Scaliger opposes the terms of a reflex and fract Radius in his Exercit. 75. Sect. 10. and conceives, not without cause, that that which is commonly called reflex, should rather be termed fract: for the reflex commonly so called, is not one Beam but two; one falling on, and another rebounding back: and that the fract, ought rather to be termed shed, or powred abroad. For that is one Ray, which is in the Water and in the Air; differing only in the variety, and density of parts, being thinner in the Water, thicker in the Air.

The Hea-  
ven & the  
Stars do  
not there-  
fore heat,  
because  
they are  
fiery.

After Lux and Lumen, Light and Shine, the Heavenly heat comes to be considered, and the causes thereof to be searched into. And although, not only some of the ancients, but of the latter writers also, have been of opinion, that the Heavens and Stars do therefore heat, because they are of a fiery Nature; and have in them

Heat

Heat formally, as a Natural accident, by means whereof they again heat other things: yet that opinion is by most men rejected, and it is resolved, that the Heaven though it is not of its own Nature hot, hath yet a power of heating these inferior Bodies; and as *Scaliger* conceives in his 23. *Exercitat.* that the heat is indeed from the Stars, but not in them, but in these bodies beneath; and in the 74. *Exercit. Sect. 2.* that calefaction or heating does primarily and of it self belong to the Sun, without any Medium, as to a first Body, the author of Heat, but not the first subject thereof. But if any man shall hold, that the Stars are hot, not with a fiery heat, but with an heat proper to themselves, I see not by what solid reason, he can be confuted. For there is no cause why the Heaven should be void of all qualities. And Heat seems to be an individual companion to light. Nor need any man fear, that the Heaven should be corrupted by these inferior Bodies, if it be hot. For since the Heaven does not participate with these inferior bodies, either in the Nature of its Essence, or its Qualities: the inferior bodies no waies act upon the Celestial. Nor was *Carden* the first that held heat to be in the Heaven, but the *Arabian* Phylosophers long before, and *Mirandulanus* and others who followed them. For thus writes *Job. Picus Mirandulanus* in *Astrolog. Lib. 3. Ch. 4.* Heat follows light as a propriety thereof, not fiery heat, nor Aereal but Celestial; a proper quality of the Heaven, as light is. I say an heat most effectual and saving, peircing all things, cherishing all things, moderating all things.

From the Premises some light arises to that Question, how Heaven heats these lower Bodies? 'Tis commonly held that Heaven heats them, by its motion and light. But touching motion, 'tis a doubtful case. It cannot indeed be denied, that a swift motion of a solid Body, does heat the Air next unto it: since experience shews that to be true. For motion does heat by attenuating, it makes the parts of the Air thin, and so heats them; yea and if it be more vehement, turns them into fire. For the fire being, as hotter, so thinner, then the Air. If the Air be a little more attenuated, the Form of the Air can no longer subsist in a thin matter, but the form of Fire is introduced. But this is doubted, whether the Heavens motion, produce heat in these lower Bodies? some holds the motion of the Heaven pierces as far as the Earth, yea and into the inmost bowels thereof, and produces heat by making the Air thin, and by grating thereupon. But contrariwise, *Scaliger* in his 23. *Exercit.* saies, that he did not beleve the Son of *Roes*, who said, that the Heavenly Bodies did not warm by any heat in themselves, but that through the swiftness of motion, both heat and light came from the Stars, by their motion grating upon the Air; and held that the cause of the motion of Heaven was, that the Stars might communicate their virtues to the parts here below, but not that they should heat. And indeed great cause there is to doubt, whether the Heavens motion do heat the inferior Bodies. For they who hold that the Heaven by its motion, warms these inferior Bodies, do all presuppose, that the Heaven is a solid Body, by the Circumvolution whereof, the neighbouring Elements are wheeled about. But that this is false, hath been already declared. Nor can the bodies of the Stars perform that with their motion, nor does their motion reach to these lower bodies, by reason of their so great distance. Nor does that fire which is next the Moon, receive heat from their motion. For it hath the highest degree of heat before, by its own Form. For if it were not in the highest degree hot, it were not fire. And therefore the fire hath not its essential heat from the Heavens, but an accidental heat, as the most subtle *Scaliger*, in his 23. *Exercitation*, saies subtilly, Yea, and obscurely enough. For what heat can be added to that which is hot in the highest degree? But peradventure, that is thus to be understood. That the fire receives not essential heat from the motion of the Heavens, but hath it from its own form; but it is nevertheless preserved by Heavens motion.

Now it is commonly held a clear case, that the shine is the Cause of heat: though that of *Scaliger* in his 75. *Exercitation*, may give occasion of doubting. Heat (saies he) is an accident bred by the Heavenly Bodies, and through the Heaven, without any affection thereof, brought to the Aire, and that not by the shine, but both with and without the shine. And indeed the Raies or Beams, rather then the shine, are the cause of Heat.

For there is not Heat, where ever there is shine, and in Winter, the Cause of the cold is not want of light; seeing in the midst of Winter, there are many times

How Heaven heats these lower Bodies.

Whether the motion of Heaven be a cause of Heat?

The fire has not its essential heat from Heaven.

The shine is not the cause of heat, but the beams.

as clear and bright daies as in Summer, but it is the obliques of the Suns beams. And therefore when *Lumen* or shine, is said to be the cause of heat; the Beams or raies are to be understood.

How the Raies or Beams do beat?

But how the Raies or Light does heat, Doctors are not yet agreed. Some are of the opinion that light therefore heats, because it rarifies and makes thin the Air, after the same manner as motion does; and that the doubled Raies do it in a special manner. For though the incident and single Raies, have also the power of heating and attenuating: yet their force, they say, is weak; but the doubled Raies beating one against another do more strongly grate upon the Air and rarifie the same. Howbeit many do contrarywise hold with probability enough, that the light does of its own Nature produce heat, and that a Ray compounded of a streight one and a reflex, does heat more then a simple, not because two Raies smiting one against another do grate upon the Air (for how should that grate upon the Air which is no Body?) but because, that portion of light which was to go streight forward, being hindred by an Opake Body is reflected, and joyned with the incident Ray, and so virture conjoynd becomes stronger then that which is dispersed. Hence some Raies are stronger then other some to excite Heat. For those which fall perpendicularly, and reflect upon themselves, are of all others most effectual: and those are next these most powerful, who go least into oblick Angles; but the more they go oblickly from the point of incidence, the least heat they raise. For the nearer the Sun comes to our Zenith and the directer his beams fall upon us; so much the greater heat is caused. And it goes contrariwise in the Winter, when the Sun darts his Beams upon us oblickly.

Perpendicular raies most effectual.

The Stars are not placed in Heaven only for ornament sake.

Now it will be worth our while to enquire whether the Heavens do not also some other waies work upon these inferior Bodies. There are some Men found so silly as to dare to deny, not only other more noble actions of the Heavens upon things below, but also their power of heating; and to hold that the Stars were set in the Heaven only for ornaments sake like Golden Spangles; of which sect of men *Nicho. Frischlinus* seems to have been. But away with such Barbarousness! *Asclepius* was long since of a better understanding, when he thus wrote to King *Ammon*: the good operations of the Sun, are not terminated in the Heaven and Air alone, but even in the Earth, they pierce into the deep bowels thereof: from whose Judgment, the learned Men of latter ages, have not receded, but all have taught, that Heaven acts upon these lower Bodies, and is a cause of much good to mortal Men. For nothing in the whol Universe is idle, nothing made in vain, but all things as they have their Forms; so by them they operate and act. Experience not to be contradicted does witness the same. For we see and feel, how that by the Heavenly Bodies, through the various augmentation of heat, the changes of times and seasons, and the vicissitude of generation and corruption are caused; tempests are raised; the humors of Animals, especially shellfish do encrease and lessen according as the Moon Fills or Wains. Let them go therefore, who deny the

whether the Heavens work by influence upon the inferior bodies.

Heavens to have any virtue, and let us consider: whether besides their light the Heavenly Bodies do work upon things below, also by another peculiar and hidden way, which they call influence? Most indeed of those who write against Astrology, say that the light only of the Heavenly Bodies, which is variously communicated to several places according to the variety of the Heavenly motions, is of it self sufficient to produce all the effects, which are produced by the said Bodies. Yet we must hold the contrary, viz. That the Heaven, not only by its motion and light and the heat thereon depending, but also by certain peculiar powers, which they call influences, does act upon these lower Bodies. For many effects proceed from Heaven, which cannot be ascribed to light. For light may be kept out, by a dark or dense Body; whereas many things are generated by the concurrency of Heaven in the profoundest Cavities of the Earth, under the Waters, whether neither the light of Heaven nor the heat produced thereby can pierce. And verily since there are in the Load-stone and other vulgar things, rare virtues to act upon distant things; without any light: we ought not to deny the same to the Heaven, so Magnificent a Body.

The Heavens work upon things material, but does not immediately affect the soul.

Howbeit we must enquire how far this Influx of the Heavens extends it self, and upon what things it works. It is not to be denied, that the Heaven acts upon all material and merely Natural things: but it is a question, whether that Celestial Influx, do



do work upon our Soul and will. All sound Phylosophers do answer that the Stars do not work directly and immediately upon our wills. For since the Heaven is a corporeal and material Agent, it acts only upon corporeal and material things, but our will is a power not allied to matter: Mediatly nevertheless and indirectly, viz. by Mediation of the Organs of our Body, which being variously Qualified do move and provoke the Fancy and the sensible appetite, and thereby the will; the stars may encline our will to this or that. Upon which ground 'tis also commonly said, that Mens manners follow the temperament of their Bodies. Howbeit, neither the temperament, nor the stars by the temperament do compel but only encline. For though any one through abundance of Choler in his Body, be enclined to anger, and through flegm to idleness: yet it remains in the liberty of his will, either to refrain or give the reins to his anger; or to give himself to labor or to take his ease. Hence we may easily know what to think of Astrology, which is said to foretel future events, by observation of the Heavenly Bodies. It is not to be denied, that Astrologers may many times probably foretel Tempests, Rains, Barrenness and fruitfulness of the Earth, Diseases, and other such like Natural effects, which Naturally depend upon the disposition of the sublunary matter in respect of heat cold, Moisture, Driness, and other such like qualities, and may betide sublunary Bodies: Yet Experience shews that they cannot alwaies certainly foretel such things as these.

What is to be thought of Astrological Predictions?

For seeing there is requisite to these kind of effects, not only the influx of the Heavenly Bodies, which is the universal Cause, but also a certain disposition of the Earthly Globe, which affords matter to Rain and other Meteors, and also of the Matter and sublunary qualities, which are all unstable and subject to change, and cannot be sufficiently discerned by the wit of man: the judgment and prognostication cannot alwaies be firm and certain. Much less can any thing be certainly foretold concerning human actions which depend upon the wills of Men, and touching things contingent and fortuitous. For though these things depend in some measure, as hath been said, upon the temperament: yet because our temperament does not compel our will, and the Heaven it self is not the immediate and principal Cause of the temperament, it is also hard in this Case to foretel any thing with certainty.

Nor dare the founder Astrologers themselves attribute any greater efficacy to the Stars, nor to themselves any greater ability of Prediction. Whence also Ptolomy himself, *de Pred. Astronom. Lib. 7.* teaches that those things only can be foretold, in the Calculation of Nativities, which depend upon the temperature, viz. That the Body of such an one is so and so, and his manners so and so, whence such and such events will follow, because the quality of the Heaven suitable to the temperament, is fit to produce a good habit, or contrary thereunto. And he himself saies in terms exprefs, that those who foretel other things, which have not Natural Causes, are coufening fellows, that abuse the people. Ptolomy therefore the Prince of Astrologinians hath set them their true bounds and limits: within which nevertheless, all the Predictions which he delivers in the following Books, can hardly be contained. And the same Author also teaches in *Lib. 1.* That many things besides the Heaven, do concur to the Temperaments of Particular persons, and that the seed falling from the Bodies of their parents, hath the chiefest force, also that the Countrey makes a difference, and that education and Custom have no smal force to change the temperament.

The Causes of many Sympathies and Antipathies doubtless, betwixt the Heavenly Bodies and these things below, do proceed from these hidden influences, the Inquisition whereof does belong unto another place. Mean while let us hold with that opinion of the Chaldæans and Assyrians, recorded by Pselus, viz. That there is a Sympathy betwixt things above and things below.

As to the other adjuncts of the Stars, viz. Their Figure and quantity: that their Figure is Spherical is Demonstrated. First, By the Illuminations of the Moon: Secondly, By the Ecclypses; the sight of all Men wherever inhabiting: since plain Bodies do change their Figure as often as those who look upon them from below, do change their place and Scituation.

The Figure of the Stars is Spherical.

And whereas the Stars appear flat like dishes; that comes from their over great distance, for all lines drawn from the Eye to the surface of a Spherical Body far off

off, appear equal to the middle or perpendicular line, drawn from the Centre of the Eye, to the Centre of the spherical body. *Vitello B. 4. ch 65.*

Two sorts  
of Stars  
fixed, and  
wandering  
or Planetary.

The Stars are of two sorts, the Planets and fixed Stars, as was said before. Those are called fix'd Stars, which are in the uppermost part of Heaven, and in their motions do alwaies keep an equal distance one from another. The Planets or wandering Stars, are not so called, because they really wander, or are moved with an uncertain motion, but because though they hold a certian rule in their motions, yet in respect of the fixed stars, they have a more free kind of motion, and are sometimes in one, another while in another part of the Heavens.

The number  
of the  
Planets.

The Planets are commonly reckoned to be but seven. For though *Favorinus* in *Gellius B. 14. ch. 1.* did doubt whether there were only seven Planets; and supposed there might be more, though not seen by us, in regard of their exceeding either splendor or altitude: yet because neither experience, nor reason can evince there are more, the vulgar number has been retained hitherto.

Howbeit amongst the late Astronomers *Galileus* a Florentine, has found out certain new Planets, formerly not known or seen by any man, by help of his optical Tube or prospective Glass; which he observed to move about *Jupiter*, and cal'd them the medicean Stars (from *Cosmos medices* the Duke of *Tuscany*, so called, to whom he dedicated his labors) also the Jovial Stars or *Jupiter's* Stars: whose number and motion he described in a Book called *Siderius Nuncius*: where in he described other things by him observed in the face of the Moon, in innumerable fixed Stars, the Galaxy or Milky way, and cloudy Stars, worthy of consideration.

The number  
of the  
fixed Stars

Astronomers at this day reckon the fixed Stars to be 1022. but there are more indeed and in truth. For even *Pliny* in his *Natural History B. 2. ch. 41.* saies that skilful men had reckoned 1600. remarkable for their effects and use; and those that have in our times sailed into the South parts of the world, relate that they have observed more. And therefore though we may grant to the Astronomers, that there are so many fix'd Stars which may evidently be observed, and may conduce to astronomical Calculations: yet if any shal contend that there are indeed no more, we shal stop his mouth with that of *Austin* in his *16. B. de Civitate Dei ch. 23.* *Whosoever* (saies he) *boast that they have counted and set down the total number of the Stars, the Authority of this Book (Gen. 15.) does condemn them:* and that there are indeed more, the observation of the foresaid *Galileus*, does evince.

The Order  
of the  
Planets.

Also there is some controversie touching the order of the Planets: *Metrodorus Chimus*, *Anaximander* and *Crates*, as *Plutarch* informs us in his *2. de Placit. Phyls. ch. 15.* held the Sun to be highest, next him the Moon, after her the fix'd Stars and Planets. *Plato* and all the Greek Phylsophers in a manner, did beleve the Sun to be next the Moon. *Ptolomy* placed the Sun in the midst of the Planets, and made such an order of the Planets, as that the Moon should be lowest and next the Elements, *Mercury* next above her, *Venus* next above him, in the fourth place the Sun, in the fifth *Mars*, in the sixth *Jupiter*, in the seventh *Saturn*, in the eighth the fixed Stars, which opinion is by most men followed. For both the observation of the Parallaxes, and other Astronomical reasons do confirm the same.

For the greater Parallaxe a Planet has, the neerer it is to the Earth; and the lesser parallaxe, the further from the Earth. But amongst all the Planets, the Moon has the greatest Parallaxe; *Mercury* somewhat a lesser; *Venus* yet a lesser; and the Sun the least. Whence we collect, that the Moon is neere the Earth, *Mercury* a little further off than she, *Venus* more remote than he, and the Sun more remote than *Venus*. Moreover the Moon obscures and takes out of our sight *Mercury*, *Venus* and the Sun; which could not be, if these Planets were lower.

Nevertheless, although this be certain, and the reasons aforesaid do sufficiently demonstrate, that the Moon is below *Mercury* and *Venus*: yet it is not thereby proved that *Venus* is higher than *Mercury*. For suppose the Moon obscure *Venus* and *Mercury*: yet it does not hence appear, whether *Mercury* or *Venus* be next the Moon, or whether *Mercury* be below or above *Venus*. Nor do the Parallaxes demonstrate the same. For though they teach that the Moon is next the Earth, because it has the greatest parallaxe: Yet that which is vulgarly reported of the Parallaxe of the Sun, *Venus* and *Mercury*, is not so certain. For latter Astronomers have observed, that *Mercury* has many times the same Parallaxe of the Sun, *Venus* oft

oft times the same, and often times also a lesser. Which cause moved *Tycho Brahe* that most noble Astronomer, to invent a new disposition of the Planets; with which as more probable, most Astronomers at this day content themselves, til some body shal teach them better. But whatever Scituation of the Planets we shal allow, yet this remains certain, that it cannot be defended, unless we hold, as has been shewed before, that the Heaven is no solid body, and that there are indeed no Orbs therein of which it should consist. Which if it be not allowed, but we shal include the Stars in their Orbs; there must needs be penetration of bodies, if their motions be salved; which the motions of the *Sun*, *Venus*, and *Mercury* do chiefly declare. And most probable it is, which also I propounded before, that there is not a double motion of the Planets, one from East to West, another from West to East, but that all the Planets are moved from East to West; since Entities or Beings are not rashly to be multiplied, and without necessity: and since it suffices that the Stars have an internal principle of their motion; 'tis needless to add an external and violent one. *Aristotle* saies rightly in his 1. *B. de Celo* ch. 2. when he demonstrates, that a violent motion is contrary to a natural, and that a simple motion suits with the celestial bodies being simple; and that as the fire is moved upwards, the Earth downwards, so the heavenly bodies are naturally moved with a circular or wheeling Motion.

Astronomers have reduced the most considerable and visible fix'd Stars, for better knowledg and memories sake, into certain figures resembling living Creatures and other things, which they cal Constellations. Which distinction of Figures and Constellations is of exceeding Antiquity, and was known either before, or soon after the flood; witness, not only the most ancient Poets *Hesiod* and *Homer*, but also the holy Scriptures: for in *Job* 9. 9. mention is made of *Arcturus*, *Orion*, and the *Pleiades*.

The distribution of the fixed Stars into Constellations.

Now credible it is that the Astronomers were Authors and Inventers of these constellations who were studious of the Heavenly bodies, also Sea-faring men, as appears by the Southern Constellations, found out by the Navigators of the former Age and by them named, of which *Virgil* was aware, when he wrote,

*Navita dum stellis numeros & nomina fecit.*

When the Sea-men, numbred and nam'd the Stars.

Also Husbandmen, who in daies of old wanting the benefit of Calendars or Almanacks, were fain to begin their Labors, according to the appearance of certain Stars or Constellations. Whence also it happened, that some Stars have divers names, according as the Astronomers, Sailers, or Husbandmen cal'd them.

Here also is to be observed, that the signs of the Zodiack or Austerisms differ from the twelve houses, each of which has thirty degrees, according to which the motions of the *Sun*, *Moon* and other Planets are reckoned, being obvious to the mind, but not to the Eye-sight. But the signs of the Zodiack, are Stars visible to the Eye, reduced into certain Images, which Images, are not equal. but some greater, others lesser. For the Constellation of *Virgo* than *Libra*, and *Libra* than *Gemini*.

The Constellations differ from the twelve Houses.

Now these Constellations are divided into those of the Zodiack, and those without the Zodiack, which are Northern or Southern. For the Zodiack is the pathway of the Planets, out of which though the Planets, excepting the *Sun*, do decline some whiles to the South, otherwhiles to the North, from the ecliptick which is the *Sun's* path: yet they never wander out of the latitude of the Zodiack which consists of sixteen degrees. The signs of the Zodiack are *Aries*, the Ram; *Taurus* the Bul; *Gemini*, the Twins; *Cancer*, the Crab; *Leo*, the Lyon; *Virgo*, the Maiden; *Libra*, the Ballance; *Scorpio*, the Scorpion; *Sagittarius*, the Archer; *Capricornus*, the Goat-Buck; *Aquarius*, the Water-man; *Pisces*, the Fishes.

The Northern Signs are twenty one. The *Bear* greater and lesser; the *Dragon*; *Bootes*; *Ariadne* her Crown; *Hercules*; *Cepheus*; the *Harp*; the *Swan*; *Cassiopeia*; *Perseus*; *Henochus*; the *Serpent*; *Serpentarius*; the *Arrow*; the *Eagle*; the *Dolphin*; the *Pegasus*, or *Flying Horse*; *The little Horse*; *Andromeda*; the *Triangle*.

The Southern signs as yet discovered are fifteen: The *Whale*; *Orion*; *Eridanus* *River*; the *Hare*; the *Dog*; *The little Dog*; the *Ship Argo*; the *Hydra* or *Water-shake*; the *Cup*; the *Crown*; the *Centaire*; the *Wolf*; the *Altar*; the *southern Crown*; and the *southern Fish*.

But

But *Americus Vespacius*, and they who after him have failed the southern parts of the world, do aver that the southern part of the Heaven, which has been yet unknown, is adorned with many very bright and remarkable Stars: which in imitation of the Ancients they have reduced into certain Constellations, by them thus named; the *Triangle*; the *Peacocks Tail*; the *Camel*; the *Indian Bee*; the *Crane*; *Noahs Ark*; the *Hornet*; the *Cross*; *Touta*; *The Water-snake*; the *Clouds*; the *Phoenix*; the *River Indus*. All which Constellations, both old and new, may at this day easily be known by the Globes artificially made for the same intent.

The Stars  
divided  
into tribes.

The Stars are also divided according to their magnitude, into six Orders or Magnitudes; and some are said to be, of the first; others of the second; others of the third; others of the fourth; others of the fifth; and others of the sixth magnitude: which are every where reckoned up by Astronomers. Yet this is to be observed, that the Stars which are said to be of the same magnitude, are not all really of the same Quantity or Splendor; for the *Syrus* or *Dog-star*, does far outstrip all other Stars of the first magnitude.

what the  
milky way  
is

To these heavenly bodies belongs also questionless the *Galaxia* or *milky way*: now it is nothing but a Circle or Zone rather of a white color, to be seen a nights in the Sky, reaching from North to South; and dividing the Heaven into two Hemispheres or half circles: the progress and carriage whereof *Pliny* in his 18. of *Nat. Hist. ch. 29.* has briefly described, and *Manilius*, more largely, in the first Book of his *Astronomical Poem*.

whether  
the *Via la-*  
*ctea* be a  
meteor?

Touching the nature thereof, sundry men are of sundry minds. We, omitting the Poets fables touching *Juno's* milk a part whereof fell upon this region of Heaven, as *Hercules* was sucking, as *Cælius Rhodiginus* relates in his 6. Book *Ant. Lect. Ch. 7.* or concerning the burning of the world by *Phaeton*; the fight of *Apollo* against the Giants; of the way of souls; of the seat of the Heroes or *semy-gods*; and the opinions of others reckoned up by *Aristotle* in the 1 *Meteor. Chap. 8.* *Plutarch* in his 3. *de plac. Philos. ch. 1.* *Picus Mirandula* in his *Exam. Van. Doct. Gen. l. 7. c. 12.* we shall in this place only consider whether the *Via lactea*, be somewhat that is Elementary and a true meteor, or some heavenly thing. *Aristotle* in the place newly alleadged, saies the *vialactea* is not in Heaven, but in the Air and consists of an hot and dry exhalation, gathered into that place, where are the greatest number of largest Stars, being drawn up by the said Stars; so that it is as it were a great Comet, and is perpetuated, by the continual and perpetual attraction of vapors, caused by the great abundance of Stars, in that place.

Nevertheless divers most noble Philosophers and Astronomers, have rejected this opinion of *Aristotle*, for these reasons chiefly. First the perpetuity of the *Via lactea*: for seeing all meteors are somewhat disorderly made, nor is there alwaies matter enough, of the same figure, or color for meteors, nor is it alwaies carried to the same part of Heaven: the *Galaxie* or *milky way*, if it were a meteor would not be alwaies, nor of the same magnitude, figure, color; nor alwaies in the same place. Again if the *Vialactea* were not in the Heaven but in the Air, it would not be alwaies seen in the same place of Heaven, and about the same Stars, and would admit some parallaxe; after the same manner as Comets, which are in the Air, in this Region appear under one Star, in another Region under another. Howbeit, experience teaches the contrary, which witnesseth, that for so many ages of years the *milky way* has alwaies been seen, when the Sky is clear, in the same place, of the same greatness, shape and color, and in all places, about the same Stars.

Nor has the opinion of *Franciscus Piccolhomineus* any place, who that he might some waies defend the vulgar opinion, saies that there is a twofold *Galaxie* or *milky way*; the one Celestial, which is an abundance of shining Stars, in the eighth Sphere; the other the Effect of the former, which is an abundance of dry exhalations, brought together into the shape of a Zone Girdle or Swath-band, in the upper Region of the Air, apt to be inflamed, placed under the Heavenly *Galaxie*, and preserved thereby; which by reason of the Light it receives from the Heavenly *Vialactea*, presents unto us the resemblance of a large white Way or Road. For though it be true, that a greater company of Stars, wil more heat, and raise up more vapors: yet no sufficient cause, can hence be assigned, why the *Galaxie* or *Vialactea*, should appear alwaies of the same Greatness, and Figure, and in the same place. For to

the

the constitution of a meteor, there is not only required, the force of one or more Stars, but also matter, and that after a certain manner disposed: which because it is fluent and unstable, and is wonderfully changed by reason of the Influx of so many Stars, no meteor can be perpetual, constant, and alwaies return in the same measure and manner: nor does the Sun nor any other Star, yea though in the same position, or returning to the same place, raise the same tempests, nor can they cause the breeding of the same meteors, by reason of the plenty or penury, or the various disposition of the exhalation.

That opinion therefore of others is more probable, that teach, the *Vialactea* to be a collection of very many and very smal Stars, which they cal *Sporadae*, in the eighth Sphere, which because of their smalness and abundance, cannot be distinctly seen, so that their light being jumbled together, represents to our sight a white, or milky color. To this opinion others do also add: that this part of the Heaven is a little more compact than the rest, and by reason of its compactness comes neer to the nature of Stars, and therefore both by its own light, and by that which it receives from the other Stars, it appears more bright than the other parts of Heaven which are more thin and transparent, and is of a remarkable whiteness.

Next to the Stars we ranck Comets; and truly there is an extream diversity of opinions touching their Nature. *Anaxagoras* and *Democritus* held that a Comet was the gathering together of divers Planets, which because they were met in one place, by the mingling of their lights they seemed to make one Star. The *Pythagoreans* taught that a Comet was a Planet distinct from the seven vulgar Planets, which commonly lies hid under the Sun-beams, and by reason of the splendor of the neighboring Sun cannot be seen: howbeit sometimes, after long Intervals, it departs from the Sun and comes into sight, which also commonly happens to *Mercury*. *Hippocrates Chius* and his Disciple *Aeschylus*, did consent with the *Pythagoreans*, that a Comet is a Star: yet herein they dissented, in that the former held the tail of the Comet to be a part thereof; but these latter held the tail to be vapors lifted up on high, and neer the Comet, receiving the raies and light of the Sun, and so representing a stream of Hair. Howbeit *Aristotle* reckons up and refutes these opinions in his 1 *Meteor. Cap. 6.* *Seneca* in the 7. *Quest. Nat. Cap. 11, 12.* &c.

Divers Opinions of the Nature of Comets.

The Opinion of *Epigenes*, which *Seneca* relates and refutes in his 7 *Book of Nat. Quest. ch. 4.* &c. was; that Comets did arise, when moist and dry exhalations being shut up in one Globe, by reason of the internal Spirit and the discord of contrary bodies, were agitated and whirled about. For then that same force of the Wind going round about, did by its motion inflame whatsoever it caught, and lift it on high, and that the shining of the Fire and the Comet did so long last til there was no more fewel to feed it, which fewel ceasing the Comet ceases. The Opinion of *Aristotle* though it differ in part, does mostly agree with this. For *Aristotle* teaches, that a Comet does not consist of Celestial but of elementary matter, namely of plenty of fat & thick exhalations raised into the upper Region of the Air and there set on fire. *Plutarch* in his third *de placit. Phylosoph. ch. 2.* besides the opinions of the *Pythagoreans*, *Anaxagoras*, *Democritus*, *Aristotle*, *Epigenes*, relates also the opinion of *Strato*, conceiving that a Comet was the light of a Star, comprehended in a thick Cloud, as it happens in Candles: and of *Heracles Ponticus*, who said that a Comet was a Cloud on high enlightened with light from above. *Seneca* in *Lib. 7. Nat. Quest. Cap. 22.* conceives that a Comet is no suddain Fire, but reckons it among the eternal works of nature. *viz.* the Stars. For he conceived there were more Planets than Fire, besides the Sun and Moon, but that the beginnings and endings of their motions were not yet known; seeing they finish their courses at vast distances of time.

Late Writers do also differ in this point. *Scaliger* herein consents with *Aristotle*, in thinking that a Comet is made of Elementary matter: but he denies that it is inflamed. For in his 79 *Exercitation* thus he writes: *I conceive therefore that a Comet is a Vapor drawn by the force of some Star into the upper Region of the Air; the nature of which vapor is not burning, but of a mixt matter, like a fume or steam, receiving the Sun-beams, and therefore visible, and letting them through, and by that means tailed.* *Cardan* whom *Scaliger* there refutes, had said, That a Comet is a Globe in

the Heaven inlightened by the Sun, through which the Beams being transmitted, do make as it were a tail. Because the Heaven is full of Stars, which are not very compact, but when the Air grows dry, or for some other causes, they receive and retain light.

*Bodinus* in his Theatre of Nature Lib. 7. P. 217. thinks it better ingeniously to confess his ignorance, than rashly to affirm any thing in this Point, or to assent to most light opinions. Yet he in P. 221. of the said Book, seems to be almost of opinion, that Comets are the minds of illustrious men, which having for innumerable Ages had a great stroke on Earth, at last being about to die they perform their concluding triumphs, or are recalled into the starry Heaven, there to be as it were bright Stars: and that therefore, famine, popular diseases, and civil wars do follow, as if Cities and Peoples were forsaken by those most excellent Captains and Governors, who did pacifie the offended Deity. Other late Writers, who teach that the Heaven is not solid, but a fluid body like the Air, hold that Comets are not generated below but above the Moon; some say of exhalations carried thither, others of a part of the Heaven condensed, and by that means shining.

And these are the chief opinions of Phylosophers about the nature of Comets: in so great a number whereof, 'tis doubtless hard to judg which is the truest; nor wil the nature of this work, nor my design of Brevity suffer me at large to examine them all. Yet that it may appear, what we conceive to be most probable; their opinion seems to us most agreeable to truth, who hold that *all Comets have been, and appeared in the Region of Heaven which is above the Moon*: and if any man will call them new Stars, we shall not oppose him. Now that their abode has been in the *Æthereal* and not in the *Elementary* Region, may be gathered, chiefly by the regularity of their motion, the paralaxe, which they have had less than the Moon, as also by their equal duration. For since it has been observed that Comets have often endured a long space, and for six months together, in the same Quantity, and have alwaies had a regular motion: this can no way be attributed to a body composed of exhalations. For all such kind of Meteors, are made after an irregular manner, as may among others be seen in the Clouds, in which there is nothing perpetual, lasting, or regular. And the reasons which are brought for the contrary opinion, are but weak; and later Authors, do not without cause, call in question the observations of the Ancients; seeing there is need of great diligence to observe the Parallaxes. But whether they are bred anew by natural Causes, or are miraculously produced by God, or whether they were before out of sight, and now at last appear, it is no easie matter by sufficient reasons to determine.

Yet this one thing, I think fit to acquaint you with in this place, that even the Ancients also did take Comets to be Stars, which sometimes appear, and then again become invisible, as may be manifestly seen out of *Hermes Trismegistus* in his *B. de providentia & fato*, where he thus writes *There is another kind which they call Comets, which appear but for a time, and a while after become invisible neither setting, nor being dissolved, and others become evident Proclaimers of Universal Events*. Now those have their place under the Circle of the Sun. When therefore somewhat shall befall the world, then they appear. And having appeared a few daies returning again under the circle of the Sun they become invisible, having shewed themselves in the East.

They say that Comets signifie wars; because hot and dry exhalations, do breed yellow choler in the bodies of Men especially of Kings, which afterwards make men prone to more violent motions, wrath, brawlings and wars thereof proceeding. Yet verily these are too remote causes of wars; the Politicians can tel us of neerer causes than these. And if wars depend hereupon, there is no need of many consultations, touching the composing of wars; we must fly to the Phyicians, who by giving choler-purging medicaments may take away all wars, and pluck up by the roots all the Causes of Wars, out of the Bodies of Kings and Princes. Moreover, experience shews, that Comets have appeared, which have not been followed by any such events. This is for certain, since the Appearance or the Generation of Comets in the Heaven, is very rare and unusual, that they do undoubtedly portend somewhat, if not peradventure as Causes, yet as signs appointed by God to denounce his wrath against sinful men: whose particular signification, is nevertheless known only

only to God, and not reveal to any mortal Man. This indeed hath been found true by the Experience of all Ages.

*Nunquam Spectatum impune Cometam.*

Ne're did a Blazing Star appear, but a sad story follow'd.

An Hexa-  
meter verse

And that after Comets great changes have happend in Empires, so that *Lucan* rightly call'd Comets, Kingdom changing Comets, and *Camerarius*, thus turned the old Latin verse into Greek; *Oudeis Cometes, Hostis ou cacon Pberei.*

But to what regions and Provinces they portend their bad tidings, 'tis scarce possible for a man to know, till the Event hath taught him.

Chap. 3. *Touching the Elements, in as much as being Simple Bodies, they with the Heavens, do make up the Bulk of this World.*

Now the Bodies of the sublunary Region are two fold, simple and compound. The simple, are those which are called Elements, because the rest are made up of them. Now the term Element which the Greeks call *Stoicheion*, although it have sundry significations, yet it seems they may fitly be reduced to two principal ones, the one *General*, the other *special*. For generally it is taken for whatsoever is first in its kind and has nothing before it: in which sense 'tis defined by *Aristotle* in the 4. *Metaph. Ch. 3. That is called an Element, out of which first inexisting in the individual species, a thing is compounded into another species.* Moreover in a more special signification, Elements are the immediate principles of mixt Bodies, and thus are defined by *Aristotle* in his 3. *de Calo. Ch. 3. t. 31.* The Element of Bodies is that into which the other Bodies are divided, wherein it is potentially or actually: but it self is not divisible into parts of sundry sorts. And in the signification we are hereafter to treat of Elements.

Element  
has a two-  
fold signi-  
fication,

And these Elements truly have a twofold office and a double consideration. For their first office is, with the Heaven to make up this whol bulk of the world: and in this manner they are absolutely considered according to their essence, without any relation to mixt bodies: The Second is, to be the matter of mixt Bodies. And for the performance of both these Offices, peculiar qualities are given them by Nature. For that they might perform the former, they have heaviness and lightness: for the latter, heat and cold, moisture and dryness; whereby they can mutually work one upon another and make up a compound. Now the Elements are to be considered by us in this place, both waies.

Element  
in that lat-  
ter sense  
have a  
twofold  
Office.

Because the Elements do first perform that Office of theirs whereby they are carried to certain places in the world, and do therein naturally rest; we must first speak of their motion, and thence draw their Nature and number. The Elements are simple Bodies. For although, being considered as made up of matter and form, they may be termed compounds, yet in respect of mixt Bodies, they are called simple. For they are not made up of other Bodies which were before them, but themselves are the first Bodies of themselves existing in the world, of which all the other Bodies are compounded. Since therefore they are simple bodies, a simple motion is due to them.

The Ele-  
ments are  
simple bo-  
dies and  
have a  
simple mo-  
tion.

Now there are two simple motions: the *Right* or *Streight*, and the *Circular*. The *Circular* belongs to Heaven: and therefore the *Streight* motion we attribute to the Elements, having therein experience to justify what we do. For we see these Elements so called, and all things compounded of them, according to the Nature of the prevailing Element, go in a direct line to their proper place. Now direct motion is either to the *Middle*, or from the *Middle*; to the middle place of the world which is also the lowest, heavy things are carried; from the middle to the outmost part which

There are  
two simple  
motions.

*why heavy things move downwards and light things upwards.* which is also the highest, light things are carried. For *light* things are such as being un-hindred do alwaies move upwards, and which alwaies swim at the top: and *heavy* things are those, which not hindred, are alwaies carried downward, and sink to the bottom of every thing. But what the cause is why some Bodies move downwards, others move upwards, we must now enquire, and see into the end and efficient cause of this motion.

*The end of this motion.*

*As to the End,* since Nature does nothing in vain, and all Natural things act for the sake of some good, we must not think the Elements are moved with certain motions to no purpose; but we must hold that every Element is carried to its own place, as to its perfection: whence *Aristotle* saies well 4. *de Celo. c. 3. t. 22.* For every thing to be carried to its place, is nothing else but for every thing to be carried to its own Form. For the Forms of the Elements being of al others the lowest and most ignoble, and hardly able to defend themselves sufficiently from external injuries, their proper place is added to their form as an assistant to preserve the Body thereof, which as it were an external Form, supplies what is wanting to the internal Form. To its proper place, therefore, as to its own perfection, every Element is moved. And the perfection which they receive therein, is the preservation of their, Heat, Cold, Lightness, Heaviness, and consequently of their Form.

*The Efficient Cause.*

*As to the Efficient Cause of the motion of the Elements* Authors do many waies vary. Yet verily, if we shall rightly weigh the matter, and not wilfully intangle a plain matter with difficulties, and rightly mind the sense of the question, it seems not so hard to answer thereunto. For if a man should ask, what is the efficient cause, that the Fire and Earth, actually existing by their forms, the former mounts right upwards, the latter moves downwards, unless they be by some other thing violently detained; we answer simply; that the Fire by its Form is moved from the middle of the world upwards, and the Earth by its form is moved to the Centre of the world downwards, for this motion is to them Natural and therefore it must also proceed from Nature, or an inward principle, which is their Form, and not from an outward. For this is proper to Natural things, to have in themselves the principle of their motion, as may be seen in the 2. *Physic. c. 9. t. 48.* Also the form of an Element which informes it, and is its Nature, is also the principle of its motion. Also to what hath been said may be added, that as *Aristotle* saies in 2. *Physic. c. 3. t. 37.* an effect actually existing, requires a cause actually existing; and that especially in effects, whose whole essence is in the present performance, as motion is: for the cause hereof being taken away, it is also taken away, nor can it ever be separated from its efficient cause. But the motion of the Elements is an effect actually existing. It requires therefore a cause actually existing; which can be no other then the Form. For this only alwaies actually exists with the motion: but those other causes which some do bring, as the Generator, the Remover of impediments, may be separated from motion, and while it is yet existing, they may either perish, or if they perish not, yet may they not coexist with the motion. Nor does what hath been formerly said of motion, hinder this opinion: that the Moveable is distinct from the mover; which seems not to agree to the motion of the Elements, if we hold their form to be their mover. For the Earth, when it is moved to the middle of the world, it is not moved, as having matter. For the matter in it self, is no more enclined to move upwards then downwards, but is indifferently capable of al motions; but as it hath a form, which determines and restrains the aptitude of the matter, to receive this form. And therefore seeing the matter is here the passive principle of the motion, it cannot be the active. And this doubt, truly, may be satisfied, if we distinguish betwixt an Agent with the transmutation of another thing, which is properly called an efficient, and requires alwaies a Patient different from it self: and betwixt an Agent only (as they say) by emanation of the effect, which does not by acting change another thing, but after the Nature whereof, the effect follows of its own accord, that as it were not acting; and such an agent is the Form in respect of al the accidents which are Naturally in the compound. For all accidents do of their own accord follow the form, without any motion or transmutation of the subject. That therefore which hath formerly been said concerning the



The distinction betwixt the moveable and the mover, is true of an Agent by transmutation. But an Agent by emanation is not necessarily distinguished from the Patient. Howbeit, even in an immanent action, or which is produced only by emanation, we may observe some distinction of Agent and Patient. For the Form, as the form acts; and suffers as it is in the matter. And therefore, in the motion of the Elements, the form as the form, is the Efficient Cause of the motion; but as it is in the matter, it is moved with it. For the compound is moveable, or is the subject of motion, which is distinguished from the form, in respect of the matter. For the matter also, is really distinguished from the form. And this is the true explanation of this Question, Dextrously propounded, which must be by no means confounded, with other questions which border thereupon. For it is quite another question; Why an Element actually existing by its form, not hindered by any thing, tends to its own proper place, the cause whereof hath been already expressed; from this, why for examples sake, water which of it self moves downwards, fire being put under, begins to mount up in vapors; or, what is the Cause that a Stone which hung in the Air fastened to a string, as soon as the string is cut falls downward. For the cause of the former is the admixture of Fiery and Aery particles, which attenuate the water, and carry it with themselves aloft. And the cause of the latter is clearly, that which removes the Impediment.

why water  
ever the  
fire moves  
upwards?

The Elements therefore not being hindered, are moved by their forms, as the internal and immediate cause, as hath been shewed: which formes as all others, cannot be perceived by sense, but are by us known and described by heaviness and lightness as accidents. For it is an usual thing to describe the hidden forms of things, which want peculiar names, by their proper adjuncts, which are better known to us.

Moreover what may be the Cause, why the Elements are moved successively and leisurely, whether only because of the resistency of the Medium, or through some other cause, comes now to be enquired. Some late writers are indeed of opinion, that there is a twofold resistency, one external, which proceeds from a full Medium, which is the Cause that motion is slower then it would be, if it were performed in an empty space, if such there were: another internal, which proceeds from the Nature of the moveable, resisting the mover. Howbeit the opinion of Aristotle and Averrhoes is truer, who hold, that the Elements have only an external resistency in their motion, proceeding from the Medium; (For it being full and corpulent, resists the mover in its motion, according as it is more or less thick) but no internal. For if there were any internal resistency, it should proceed either from the Form or the Matter. Not from the Form: for, it being the mover, does not resist its self in its own motion, but endeavors as speedily as may be, to carry the moveable to its due place. Nor from the matter. For it being meerly passive, and indifferent to receive all motions, and having no power to act, can also be no cause of resistency. All the swiftness therefore and slowness of the motion of Elements, depends upon the proportion of the Virtue and power of the mover, to the resistency of the Medium. For when the force of the mover is much greater, then the power of the Medium to resist, the motion is swift: but when the power of the mover does not much exceed the force of the Mediums resistency, there the motion is slower: but where the mover does not at all exceed the force which the Medium hath to resist, there is no motion at all. Howbeit what hath been said must be understood only of the Elements which are simple Bodies, and have an internal principle of their motion. For in things moved by external force, the case is otherwise for they by their proper Nature resist the mover, and according to the excess, whereby their power is overcome by the power of the mover, they are swiftly or slowly moved.

why the  
Elements  
are moved  
leisurely  
and by de-  
grees.

From what hath hitherto been said the Cause may easily be rendered; why heavy and light things do move more slowly at the beginning and swifter at the end. For experience shews that an heavy thing falling from an high place, smites more strongly where it lights, then it would have done falling from a lower place. For though divers men think differently in this point: yet must we resolve, that the true cause hereof, is the abatement of the resistancy of the Medium; and the abatement of the resistancy proceeds from the forgoing motion, which augments the swiftness of the following motion. Now why the precedent motion augments the swiftness of that which follows, and why it abates the resistency, the Cause is this.

why heavy  
and light  
things are  
moved  
more slowly  
in the  
beginning,  
and more  
swiftly at  
the end?

Every

Every movable is swiftly and easily moved through a Medium, which is moved the same way with it; and less swiftly through a Medium that moves not; slowly through a Medium which resists the moveable, and bears the contrary way: an Argument whereof we have in sailing with or against tide. And therefore, when any heavy Body begins to tend downwards first the quiet Air resists it, the resistency whereof is nevertheless overcome by the heavy Body, and drives the next part of the Air downwards: this first part of the Air being driven, drives the second part of the Air, next unto it. And therefore when the heavy Body comes to this part, and finds it not resisting but going the same way and furthering it in its motion, it begins to be moved more swiftly: and the Body being thus more swiftly moved, will more vehemently force and drive the third part of the Air: and it being before driven also by the second part of the Air, will be more swiftly moved than the second, and will more strongly bear down the fourth part. When therefore the heavy Body shall reach the third part of the Air, finding it more vehemently moved downwards than the second, it will also be therein more swiftly moved; and so it will yet more forcibly bear down the fourth part, being before prest down by the third, and when it comes to it, it will be therein yet more swiftly moved, because of the lesser resistency and the Mediums being moved the same way. And this swiftness of the motion will be for the same Reason continually augmented even to the End. But that no obscurity may remain, we must know, that *Heaviness and Lightness* are taken two manner of waies, Either for the first act or quality, by which a thing hath a propension to move upwards or downwards; or for the second act or operation, and impulse, by which some bodies are moved upwards, others downwards. Which two things the School-men to distinguish, they called the former *Gravitationem*, the latter *Gravitationem*: and hence 'tis said that Gravity in the Elements cannot be augmented, but Gravitation may: also, that the Elements in their own places are *Gravia* and *Levia*, heavy and light indeed, but they do not *Gravitate* nor *Levitate*, that is they strive not to go upwards or downwards.

*Heaviness and lightness are understood two waies.*

*The number of the Elements.*

Now the next thing is, that we search into the *Number of the Elements*, about which later writers do wonderfully differ. I shall prove that there are four in Number. And to prove the same I shall not bring many reasons; seeing our very senses will easily shew us how many Elements there be. For we perceive the Water, Earth and Air which fills that vast space above the Globe of the Earth, nor is the force of Fire unknown to us. 'Tis here my mind only to produce one reason which many use. There are two direct motions, one from the middle, another to the middle. Therefore, for these two simple motions there must be two subjects which are simple Bodies, one which is absolutely heavy, which is called Earth; another, which is absolutely light, called Fire. Now because 'tis the wil of Nature that the world should be one; and two contrary extrems cannot make up one compound; she alwaies couples the extrems by things of a middle Nature, and knits the last of the upper kind, with the first of the lower. And therefore in this case, a Medium is requisite. But this cannot be one only. For if that were allowed, it would possess the middle place betwixt the extrems, and so it could not be capable of a direct motion. For neither should it be truly moved from the middle, nor to the middle, but it should be Capable of both these motions, and so could not be called heavy more than light. And therefore we must hold that there are two Mediums, the one of which is light and moves from the middle upwards, but is in some respect heavy; which is called Air; the other must be absolutely heavy, and tend to the middle, yet in some respect light; which is called Water. There are therefore four Elements: *Fire, Air, Water, Earth*. There cannot be a fifth, for the same cause why there cannot be but one Medium. If any one will hold there are more than five, he will be confuted by sense and experience.

*Whether the Elements are found in the world pure.*

A question there is, *Whether these Elements are found pure in the World*: To which question we thus answer; If the Elements are considered absolutely in that simplicity, which is due to their Nature, and whereby they are the Rule and standard of mixt Bodies, they are surely to be found any where pure. But if they be compared with mixt Bodies, and the question shall be; whether they exist also by themselves, out of mixed Bodies, it may be said they are found sincere and pure, not indeed with an absolute purity, of which we spake just now, but with such an one, as they are capable of, compared to mixt Bodies. Howbeit the extrems are purer than the middlemore.

Middlemore. Nor do the Elements, though they are not found exactly pure, lose their Name, so as to be called mixt Bodies. For those Bodies are only to be termed mixt, wherein there is so great a departure from the Nature and purity of Elements, that the Name and Form being cast away; they come to be now some different thing from the Elements, and receive a new and peculiar Name of some sort of Natural Body. But wherever there is so great an excess of one Element, that it transcends all comparison, with the rest that are joyned with it, in that the Name of Element is retained.

*which are  
mixt Bo-  
dies?*

It now remains that we speak of the Elements in Particular, as much as the Nature of this work will bear. And to begin with Fire, though many late writers endeavor to cast it from the number of Natural things, and take special pains to prove that it does not exist under the concave of the Moon: yet shall we subscribe to the remarkable consent of the chief Phylosophers, to reason strong enough, and experience it self especially seeing the Arguments brought to the contrary do all in a manner tend to prove, that this fire of ours, is no pure fire; whence notwithstanding it follows not, that there is no pure fire, nor that it is any where to be found: nor though all the properties of our fire do not agree to that under the Moon, does it therefore follow, that it is no true fire; seeing most of those things which are vulgarly attributed to our Fire, do agree to Fire not of it self, but accidentally.

*whether  
there is any  
Elementary  
Fire?*

For there is a great difference betwixt this Fire of ours which we daily make use of, and pure Elementary fire. For our fire of the Kitchen is not pure, but mixed with vapors and gross matter, and therefore it shines, it burns, it wants fuel. But that there is pure Elementary fire under the Sphere of the Moon, the great lightness thereof, and its perpetual endeavor to ascend, does argue. For it is of all Elements the most light and thin Body, As next in place to Heaven, so in Nature most of kin thereto, unto which also, if forced therefrom, or generated elsewhere, it tends as to its proper place, concerning which matter Scaliger in his 9. Exercitation thus writes. *The Smoak which ascends, hath very much fire in it. For it ascends not because of water: much less because of the Earth. Nor does that motion proceed from the Air; for it is already in the Air. What place therefore does it seek? That place verily which above the Air is due to the lightest of Bodies. And again, these are the principles of that demonstration whereby 'tis proved, that the Element of Fire is under the Sphere of the Moon, viz. Bodies Natural, Motion, Place. Of these are propositions certain, True, Primitive, immediate, thus made, the Causes of this Conclusion: that the place of Fire is in the upper space under the Moon, above the Air. Every movable thing is a Body: all Fire is movable, Ergo. Other two: Every body is in a place; all Fire is a Body, Ergo. Thirdly, as many more; Every movable moves Naturally to its own space; Fire is a Body movable, Ergo. And the two last, which knock the Nail to the Head. Every space to which a Body Naturally moves, is the proper space of that Body; The Fire moves Naturally upwards, Ergo the space above, is proper to the Fire.*

*How Ele-  
mentary  
Fire and  
Kitchen  
fire differ.  
Fire the  
lightest  
Element.*

The exceeding lightness of the Fire is attended by exceeding rarity, and it hath least matter of all the Elements, and amongst natural things, it comes nearest the Nature of Form; and therefore it hath the greatest activity of all the Elements. Yet, when it is pure, and of it self, it does not burn: but that our Fire burns the Cause is; in that it is condensed, and sticks in gross matter, whence its parts being condensed and brought into a narrow compass, attain the greater force. Or as Scaliger saies in his 2. Exercitation, S. 2. it hath the power of burning from the propinquity, Multitude, Cohesion, Coagmentation and union of its parts. An argument whereof we have in a red hot Iron, wherein the force of the Fire is greater, because of the condensation of parts, then it is stubble which consists of more spongy matter. The same appears if you set spirit of Wine on Fire, for you may draw your finger through the same without hurt, as also through the upper part of the flame; which in a red hot iron you cannot do. The said Elementary Fire is not of it self visible, no more than the Air, nor does it shine, unless it be received in a thick matter.

*Why our  
Kitchen fire  
Burns?*

No found Phylosopher denies that the Fire does belong to the Elements, which make up this world and constitute mixt Bodies. For although Cardan hath endeavored to exclude the same from the number of Elements; yet is he well confuted by

*Fire is an  
Element.*

And the  
first sub-  
ject of  
heat.

Not only  
potentially  
hot as  
Aristotle  
would  
have it.

by *Julius Cæsar Scaliger* in his 9. *Exercitation*. For seeing, as he also teaches, in his 10. *Exercitation*, that heat which is a most manifest and effectual Quality is accidentally in many things, there must of necessity be some first subject, wherein it is primarily and essentially: For nothing is in any thing accidentally, which is not essentially in some other thing, primarily and of it self. And truly, the first subject of heat is Fire, at first created by God with the other Elements, and furnished with its qualities. And there was never any time when Fire had not those qualities flowing from the Form thereof. But from the ignorance of the Creation of the world came, that Opinion of *Aristotle*, which he hath in the 1. *Meteorol. cap. 3.* where he saies: *Seeing the first Element is moved Circularly, the Bodies which are therein, alwaies that which is nearest at hand, being severed by the motion of the lower world and Body, is inflamed and causes heat.* For thus we must understand the matter from the beginning. That Body which is under the upper Circumduction, being it is as it were a kind of matter, and potentially hot and cold, and dry and moist, and whatever other adjuncts follow these; such it becomes, and arises from motion and Immobility. An absurd saying, truly, and unbecoming so great a Philosopher! For what matter I pray you can we imagine actually existing of it self, which is potentially Hot, Cold, Moist, Dry, but actually receives these qualities from Heaven? For although some that they might stick by *Aristotle*, have fancied a twofold heat in Fire, one Natural, which follows the proper form of Fire; the other adventitious, which the Fire receives from the motion of Heaven; yet *Zabarella* in his 1. *B. de qual. prim. c. 8.* writes well, that the words of *Aristotle* do not receive all this Interpretation; for *Aristotle* saies, that all this matter of the lower world is potentially Hot, Cold, Moist, Dry, but is made actually so by motion and immobility. Therefore he allows no heat to the Elements, besides what they receive from the motion of Heaven. Yet he himself falls into a much more absurd opinion when he writes in the following Chapter: thus, *If any Man shall aske whether the first qualities are sooner or later then the Forms of the Elements, we must say, they are fore more and later in several respects. For in Original and according to the order of Generation, they are doubtless sooner, as the previous dispositions are in generation before the substantial Form, to the eduction whereof they are directed, but they are Naturally after the same, in as much as they are accidents. For accidents are after their substances. And in as much as they are Effects, but the Forms causes, I do not mean efficient causes but final. For qualities are produced in the matter, for the sake of substantial Forms, and are directed to them as to their End, as also they are conserved in the Elements by Heaven, that the Elements themselves might be conserved; so that the next final cause of these Qualities, is the Constitution of the Elements; but the remote and ultimate, is the production of mixt Bodies. For the Elements are made for the mixt Bodies, and to be their matter. Thus therefore Qualities may be said to follow the Forms of the Elements, in as much as the Forms are their final causes: but the qualities themselves, although they are preparations for the Eduction of Forms, they may not therefore be called the Causes of the Forms, but only the latter Effects; seeing accidents are Naturally later then substances. And therefore while they are together in the Elements, as Naturally conjoynd and substantial Forms and proper qualities; yet the Forms are in the first place, and the qualities afterwards, and so they are said to follow the Forms of the Elements; especially seeing, as we said before, they are given to the Elements by Heaven, for the Eduction and preservation of their Forms. For if heat be a disposition previous to the reception of the form of Fire, into what matter I pray you is that disposition introduced, and in what matter is the Heat inherent, before the Form of Fire comes. And will the Form of Fire be idle, will it shed forth no quality? Thus one absurdity being gathered infinite do follow.*

It is a  
substance. Now the Fire of it self, is a substance most subtil, and thin, piercing through all things; which neither shines, nor is seen whilest it is pure and simple without any mixture. But when it is mixt with and is inherent in other things, it makes our vulgar Kitchen Fire, which differs not Essentially from the pure Element of Fire, but herein only in that it is mixed with some Heterogeneous matter.

Not an ac-  
cidents. *Thomas Fierus*, indeed, in his *Apology* against *Sanctacruze*, p. 50. holds that this Fire of ours which we use, is only an accident. But the Reasons of that opinion are refuted in my 3. *Hypomne. Phys. Ch. 1.*

And

And since this Kitchen Fire of ours, is useful to many intents and purposes, many authors write many things touching the Inventors thereof, as may be seen in *Plinies Natural History*, B.4. Ch. 12. and *Book 6. Ch. 30. in Vitruvius Book 2. Ch. 1.* But it is apparent by the sacrifices and by the story of *Tubal-Cain*, that the use thereof was known to the first Fathers of the world. Though it is not to be denied, but that the other uses thereof were later known to other Nations; and new inventions are alwaies added; as may be seen in Gun-powder, and sundry sorts of Fireworks, made thereof.

The inventors of Kitchen Fire.

Now what the difference is betwixt Fire as it is potentially in mixt Bodies, and as it is actually hot, is not easie to explain, yet a thing necessary to be known. For Sulphur to feel to is as cold as a cold stick that hath no Brimstone in it; and a piece of Willow Wood dried is not colder to feel to then a piece of Pitch-Tree Wood. And spirit of Wine which contains much Fire in it, in coldness to feel to, is not inferior to the Wine it self. Yea in a flame which actually is hot, there is less quantity of Fire and of the smal particles thereof, then in Brimstone; since in Brimstone not set on Fire, that is united in a smal space, which is diffused in a great flame. In Gun-powder a mighty Quantity of Fiery Atomes lie hid, which is nevertheless cold to feel to. But the flame of the said Gun-power, when it is set on Fire, burns exceedingly, though the Atomes are severed. This therefore is to be explained, why in a mixt body potentially hot, so many fiery Atomes contained and collected, do produce no actual heat; or, what it is that causes the Fire to heat.

'Tis either Potential, or Actual.

The Former happens, because the Fire is mixt with other things, and is contained quiet under the dominion of a superior Form. But it heats actually, when it is separated from the rest of the Bodies, wherewith it was mixed, and being set at liberty, freely acts. Of which latter we shall now speak.

what makes the fire not to heat or to heat.

But actual Fire is variously disposed. For if it be pure, it neither shines nor is seen. Of which *Scaliger* in his 9. *Exercitation. Meat roasted on Spits is not touched by the Fire we see, but it is touched by the Fire we see not: and it is so touched, sometimes, as to be burnt to a Coal.* In like manner, if a man hold his Hand over the flame, so that the flame do not touch it, yet his Haud wil burn. Fire also is perceived in quick Lime, when water is poured thereon, in dung when it rots, in Water, Oyl, Stones, Metals, which are heated.

Pure fire neither shines nor is seen.

Now Fire appears to the sight and not only to the touch, two manner of waies; either in an hot Coal or Flame, as *Theophrastus* teaches in his *Book de Igne*, Now by a Coal is understood any Body red hot, that affords no flame.

It becomes visible two waies.

But that we may rightly understand, what Flame and Inflammation is, we must of necessity presuppose some Principles.

Touching flame and Inflammation.

The First is: That there is Fire in all Bodies, and that so as to retain its perfect Form, as I have demonstrated in *Hypomnem. Phys. 3.* Howbeit it is in a greater quantity in some Bodies in a lesser quantity in others.

Axioms. 1.

The Second is: That actual Fire is alwaies Naturally moved. And whereas it is not so in mixed Bodies, the reason is, because it is contained quietly with other things in the compound under the dominion of an higher Form. For the Forms are the bands of things.

2.

The Third is: Fire is two manner of waies in compounds, the one as fixed, in Salts and other things not inflamable, nor combustible; the other, as volatile, so that by means thereof, the Body in which it is, may be inflamed; after which manner it is in Sulphur and al Bodies that partake of Sulphur. Upon which account, those Bodies which have Fire good store in them, are easily burnt by Fire, which, as *Scaliger* in his 9. *Exercitation*, speaks, Gives back ashes to the Earth moisture to the water, and takes and keeps to it self, that which is invisible to vulgar Eyes, but cannot conceal it self from the Minds of wise men.

3.

The Fourth is: That there is a Consent of Natural things, and things like are drawn to like. But contrary things Fly from one another *Ex Hyponem. Phys. 1. cap. 1.*

4.

The Fifth is: That Fire hath a great similitude and likeness to things that are apt to flame; because they consist of Fire for the most part, and Fire does easily unite it self to them.

5.

*The actua-  
tion of fire  
what it is.* Hence we conclude, that the Actuation or actual breaking out of Fire, is the separation of that Fire which is potentially in mixt Bodies, from other things mixed therewith. I say potentially, not in respect of the First act, or the Form of Fire, which it hath really in the mixt Body, but in respect of the second act and operation thereof.

*The man-  
ners thereof* Which separation is made divers waies, as was said before, with flame, and without flame. Without flame in putrefaction, quick Lime, hot Coals; with flame, when Bodies are set on a flaming Fire.

*what in-  
lamation.* Of which to speak somewhat in particular, we say: that inflammation or setting on a flame, is, the breaking out of Fire from a Body apt to flame, and containing a Sulphureous Exhalation, caused by the touch of Fire near applied. For when Fire already actuated, does touch a body inflammable, the Fire therein, is attracted by the external fire, and by reason of similitude, moves of its own accord thereto, and unites it self therewith.

*what  
flame is.* Now flame is Fire breaking out of an inflammable Body, touched by actual fire, and sticking in the fume, as in a Sulphureous Exhalation, and shining therein, and moved therewith. And therefore Aristotle in 1 Meteor. Ch. 4. defines flame to be the *Boiling out of dry Fire* and in the 4. Meteorol. Cap. 9. *Burning Smoak*. For flame is Fire, but not pure, joyned with a Dry and inflammable exhalation. And when it is set on fire, the fire extends much farther then the flame. And therefore, as hath been said, meat roasted on spits, is touched indeed by the fire, but not by the flame, and a mans hand held above the flame, may be burned, and paper or a candle may be lighted also above the flame. Howbeit fire is then only seen, where being in a great quantity, hath a certain Fuliginous matter arising from the fewel, joyned therewith.

*Actual  
fire is bred  
in no waies* Now actual Fire is ingendred, and at last breaks into flame, either by propagati- on, or by Coition, and union. The first is caused, when actual fire manifest to the senses, does touch another inflammable body, and sets it on fire, drawing out the fire which lay hid therein. The second is, when fire which lies secretly hid in mixt Bodies, is drawn out, without the contract of external fire, and being united does actually and manifestly shew it self.

The first manner is most common, when actual fire does set on fire other infla- mable Bodies. For by reason of affinity, it is easily united to them, and draws out and unites to it self the fire in them. Galen in his *B. de usu respirat.* calls that same inflammable Body *the Root of Fire*: and Theophrastus in his *B. de Igne* termes it *the Beginning of Fire*.

*Things  
which  
have su-  
cere sulphur  
in them,  
easily in-  
flamed.* And because all things, are inflamed and kindled by means of Sulphur; those things that have sincere unmixt Sulphur in them; or though they have little thereof in them; yet are so disposed, that fire may easily insinuate it self into all their parts; such things I say are easily set on fire. For in the first place, if the Sulphur be much and pure, and not mixed in its smal parts with other things, but is of it self alone immediately obvious to the external fire, it is easily united thereto, be- cause of its similitude: Contrarily such Bodies as have their Sulphur, though much in Quantity, mingled in its smal parts with other things, are not easily inflamed. Whence it happens that Pitch Wood is more easily kindled then Oak wood, though tis a question whether there be more Fire in Pitch wood then in Oak. For in the Former, the fiery Sulphureous parts are unmixt and at hand; but in the latter the inflammable fiery parts lie deep, yet are they discovered by their effects in warming of a Stove. By reason of plenty of unmixt Sulphur, spirit of Wine does soon take flame, and the purer it is and more separated from the Flegm, the sooner it is set on fire. But this is seen most of all in Bitumen, which is exceeding Sulphureous, and contains in it a spirituous matter, of kin to fire, and therefore is soon lighted, and conceives flame even far from the Fire, as Pliny in Lib. 2. C. 105. saies, Fire leaps to it wherever it sees it. And After this manner they say Medea set Jasons Concubine on Fire, as Pliny writes in the same place. For when Medea had given to Creusa a Crown or Garland smeared with Bitumen, and perswaded her to be present at the sacrifices, the Garland smeared with Bitumen, took flame from the Fire and lighted wood, and so burnt Creusa. And I remember, when I was making Balsam of Sulphur, and had put into a Glass Receiver, flower of Brimstone, spirit of Turpentine and

and spirit of Wine, that they might stand in digestion, and left it to the care of a certain Student, to cover the mouth of the Receiver with a Glass Cover and close it up with Spanish wax; some of the Spanish wax being lighted and falling upon the lid, the Spirit in the Receiver was set on flame, although it was hardly a sixth part full. Hereunto belong common Brimstone, Gun-powder, Pitch, Asphaltum, Ambar: Hence Galen relates in his 3. de Temperam Chap. 2. that a man in his daies, made a great boast of lighting a Candle after a wonderful manner, which he first put out & then applied it to a wall to light it, which he made shew to be done without Fire, which though some thought it to be a magical operation; yet when it was known, that the said wall was smeared with Brimstone and liquid bitumen, the wonder ceased. Like hereunto, is that which Cardan relates in his tenth Book de Varietate Rerum, of a certain man who would light Candles not perfectly extinguished at the mouth of a certain Image, which was made on purpose and daubed with Sulphur and Bitumen or Petroleum, that so the Image might seem to vomit Fire.

Moreover, Bodies spongy and dry, though they have little sulphur in them, yet because they are dry, and the watry parts, which otherwise do most of all hinder kindling into a Flame, are absent, the Fire easily unites it self to the sulphur which is in them, whence they come to kindle. Such bodies are, dry Wood, Torches, Straw, Stubble, dry Hay, Tow, Wool, Paper, Tutch-wood, Links.

why dry  
bodies are  
easiest in-  
flamed.

But that some things, as Oyl, Suet, Wax, which contain store of Sulphur in them, are not easily set on fire, but need store of fire to light them, as when they are boiling, or must have a wick to cause them burn: the reason is, because those bodies are viscous and clammy, and not spongy, and because they stick together in their small parts. Also, because they have a watry Substance, mixed with their smallest parts. And the mixture of watry parts, does most of all hinder Inflammation. For Water as much as any thing hinders the breaking out of flame.

why vis-  
cous and  
watry bo-  
dies are  
hard to  
take fire.

For seeing Water mingled with Wood, only by the roots thereof, does render them less subject to take fire, much more will that Water do it, which is most intimately mixt with the sulphur. But if a dry wick be added to Oyl, Suet, or Wax; the flame or actual fire in the wick, draws to it self its cozen fire mixt in the matter close by, but slowly, because it cannot do it plentifully. For that same watriness hinders, which must first be removed, that the sulphureous part may be lighted. Now this is slowly dispelled: which also while it is in doing, the fire also flies away, and so it needs new to succeed it, which it does because it is freed from the Water. And indeed in every body which feeds fire slowly, there is somewhat which resists fire. For otherwise there were no reason, why the fire should not be altogether suddenly inflamed, as it happens in Tow or Straw. And Brimstone it self affords a manifest example hereof, which does indeed soon take fire, and yet is long before it burn out, because it has in it store of acid spirit, which hinders the Inflammation.

Now the flame which we see kindled in any matter, is not alwaies the same; seeing the fire is in continual motion and flies away, a new fire comes fresh and fresh out of the thing burning. And therefore as Aristotle saies, Meteor 2. *The flame never continues the same.*

And whereas it is commonly said that sulphureous things, and whatever will kindle, is the food of fire; that must be rightly understood. For it is not simply true, because fire is a simple body, which properly is not nourished. But in that the fire cleaves to the body inflamed, it is not because it needs food, but because through similitude, it endeavors to draw out the fire lying hid in the body inflamed, and to unite it to self, and so to multiply it self. For every Nature desires to multiply it self, and there is in every thing an appetite of Infinity and Eternity, as I. C. Scaliger saies in his 9. Exercit. which is chiefly effected by union with its like. And therefore fire sticks so long at least to the body inflamed, as there is sulphur and fire therein, which failing, it flies away.

How the  
Fire is fed

Also from the Premises the difference appears between a flame, and burning coals or other things which yeild no flame. Flame, as has been said, is joyned with fuliginous vapors, and there is more fuliginous matter in a flame than in coals. For when the char-coals were made, the greatest part of the fuliginous matter flew away. And because abundance of fuliginous matter does choak the flame, yea and the fire it self, and hinders the sudden propagation thereof, of necessity the fuliginous vapor must have egress, whence it comes often to pass that fire lies hid in a

The dif-  
ference be-  
twixt bur-  
ning things  
that flame  
and those  
that do not  
flame.

close chamber, but flame arises not therefrom. But as soon as the door or window is opened, and a passage is given to the sooty vapors, it breaks forth into a flame. And because the coals themselves have yet in them some fuliginous matter, the fire consumes the coals no faster, than the fuliginous vapors can find egress. And therefore though the whole furnaces of Chymists are at once filled full of coals, the fire consumes no more of the coals, than is answerable to the egress of the fuliginous vapors, and so by opening or shutting, more or fewer, greater or smaller vent-holes, a man may moderate the fire as he pleases. For no more fire is kindled than the Prohibiter will allow. Yea and coals may be so set on fire as that they shall not consume after this manner. Take a strong pipkin or stone pot, which will endure the fire, fill it with coals, and put on the cover and lute it round about, and when the lute is dry, put the pot into the midst of a fire, that the whole pot may be red hot; and then the coals will be all on fire (and if any will not believe it, he may by breaking the pot be sure of it) which being done, suffer the pot being taken out of the fire to grow cold of itself, then open or break the pot, and you shall find all your coals whole. The cause whereof is because as the fire entered in through the pot sides, so it goes out the same way, but the substance of the coals cannot pass the pot sides.

*What fire needs a free Air, what not.* Howbeit we must here observe that it is not common to all fire, nor does it agree to fire as fire to be extinguished in a close place. For it is known by Histories, that there have been lights which have burnt long in a close vessel: but this is the property of some sort of fire only, namely of that which comes out of a mixt sulphureous body, as Wood or the like, with fumes and exhalations. For the flame only which arises from such bodies, being shut up is extinguished. For since in a continual flame there is a resolution of mixt bodies, and the mixt body is resolved into other things whereof it was compounded, and a body resolved requires a larger space, than that which is close compacted, it happens, because there is no place for the fuliginous vapors which steam out, part oppresses part; and because naturally there is no penetration of dimensions, while the compound is hindered from being resolved or loosened, the cause also of the dissolution is stopped, which is the actual fire.

And all these things which we have said, appertain to the first manner of generation of Fire, *viz.* when actual Fire is applied to a combustible Body, and a combustible or inflammable body is kindled by Fire put to it.

*The sundry uses of this fire.* By this manner of Fire many things are made and prepared for the use of man: and hence come not only the melting and never breaking Fires of Chymists and other Artists, and those which are used in Kitchens, Stoves and Chambers to warm us; but also Candles, Torches, Links and Lamps. Candles, Links and Torches are made of Tallow, Wax, Pitch, Rosin, with wicks of Cotton and Cordage. Lamps are made of Oyl with Cotton, in a Glass or other Vessel. They are made to give light in dark places. Oyl of Olives, Line-seed, Rape-seed, Hemp seed, are vulgarly used; also Lamps may be maintained with spirit of Wine or other spirits. Now that which primarily and principally burns, is the Oyl or other inflammable liquor, which the wick draws, which is hereby apparent, in that there are some snuffs that will not consume with Fire, such as those made of the Wood Asbestum, of which Pliny speaks in his *B. 19. ch. 1. and 2. and Book 36. ch. 19.* and of the stone Amiantos, of which Dioscorides speaks in his *5. B. ch. 147.* as also of *alumen plumosum.* But if the wick be combustible, it is secondarily both inflamed and burnt up.

*Lamps burning in water.* And although Water do quench Fire, yet Lamps may be made, which burn in Water and are extinguished in Oyl; if namely the Wick be soaked in liquid Vernish, and put into Water and so lighted: for then it will burn in the Water; but if Oyl be poured to it instead of Water, 'twill go out.

*Durable Lamps.* And that the Oyl may burn the longer, certain metallick substances must be mixed therewith. So if you take one pound of red Lead, half a pound of Ceruss, four ounces of quick Sulphur, common Oyl two pound, and mix them all in a Mortar by the Fire side, leisurely stirring it sometimes, and then digest them Eight daies in a Glass retort, and at last distill them, you will have an Oyl which will last a long time in Lamps. Or thus: Take Liturige one pound, live Brimstone four ounces, Loadstone one ounce. Let all being powdered be incorporated with two pints of Oyl Olive.



live. Let this mixture digest ten daies together; and let it be stirred about once a day, afterwards distil it with a retort, and use the Oyl for a Lamp. If you would use spirit of Wine for a Lamp, to make it last long, pour it upon equal parts of unslak't Lime, crude Tartar, and Brimstone, and distill it once through a retort. Or pour spirit of Wine upon equal parts of unslak'd Lime, crude Tartar, and common Salt, and so distil it. Concerning the Lamp of *Ammon* see *Plutarch* in his Treatise *De defectu oraculorum*. Also *Cardan* describes perpetual Lamps in his 10. *de Rerum Varietate* and in his 1. *de Subtil. de principiis rerum, Caput 10.*

And so much touching the first manner of the Generation of Fire, to which if any man wil refer that also, which is caused by the Sun's beams, I shal not quarrel with him. For if the beams of the Sun be so collected in a burning Glais artificially made to that end, that meeting in a point, they set on fire a combustible body, they do the same thing that fire applied does.

*Hiberto belongs the propogation of fire by the Sun-beams.*

Moreover, There are also other waies, by which the fire which is potentially in a mixt body (that is to say, which actually and according to the form, is really in mixt bodies, but is not liable to the senses, but lurks invisible) may be called out of the said mixt body, so as to become manifest to the Sences. *Seneca* in his 2. *B. of Nat. Quest. num. 22.* writes, That Fire may be made two waies, one way is if it be forced out, as from the striking of a Flint; another by rubbing, as when two Sticks are rubbed together a long time. But indeed there are more waies, and at least three. For Fire is made. 1. By putrefaction. 2. By the flight of the Contrary. 3. By motion: to which some ad a fourth mentioned by us in the first, viz. the Sun-beams.

*Or by Coition and Union.*

*Which is done many waies.*

In the first place, since in Putrefaction the Heat and fire which lurk in the mixt body exhales, and thereby become united, by putrefaction, Fire is sometimes kindled. And it is known to Country-men, how hot an heap of dung wil grow, so that the straw therein wil be quite burn'd. So they relate out of *Theophrastus*, that a Ship laden with moist Cloaths, conceived Fire and was burnt up. Nor is it unknown that heaps and Stacks of moist Hay and Corn have been burnt up. Howbeit in matter putrifying hardly can there be so great an heat raised, that the matter should flame, unless it gather strength elsewhere. An example whereof *Galen* has in his 3. *de Temperam Cap. 2.* where he writes: that Pigeons dung was cast near the window of an house in *Mysia*, in the middle of a most hot Summer. The dung therefore putrifying, and being heated by the Sun, sent forth a fiery vapor, which set on Fire the boards of the Window which were smeared with Rozin, and at last burnt the whol House.

*1 By putrefaction.*

Secondly, Fire is collected and kindled by flight of its contrary; a manifest example whereof we have in Quick Lime, upon which if water be poured it grows so hot, that it has been seen set wood on Fire that has been by it: which comes to pass, because the fiery atomes or smal particles of Fire which lie hidden in the Lime, whiles they fly from the Water contrary to their nature, come to be united together, and so to operate. Howbeit there is a dissent amongst Authors touching the Reason of this growing hot of Lime when Water is poured upon it. *Theophrastus* in his Book *de Igne*, writes thus thereof: Seeing Heat is not without moisture or exhalation, therefore Lime burns when Water is put to it, rather than alone. He seems to think, that Fire lies hid in the Lime, but that it is not pierced without matter; but Water being poured upon it, it is brought into act, and exhales with the vapor, and so affects the touch. *Petrus Aponensis* conceivs the Cause to be, that the Heat being kept in by Antiperistasis of the cold Water becomes more forcible. *Jul. Cas. Scaliger* in his 5. *Exercitation Sect 9.* thus writes: In the passages of the Lime, the natural moisture being consumed, there lurks Fire: which flying from the Ingress of the Water, and thrusting it self into the solid parts, it collect's it self, and becomes sharpened by condensation: for the piece of Lime, whose half only is covered with Water, as far as it is out of the Water grows hot, receiving into self that Heat which is banisht out of the other parts. The Comentator upon *Theophrastus, de Igne* blames *Scaliger*, because in the Lime it does not so fall out that one part receives the Water, another part the Fire. For the Water soaks through, and every where fills all the passages, nor can this Collection and densation of the Fire be made in the inner part of the Lime as in a Tower of Refuge.

*2 By flight of the Contrary.*

*why Lime grows hot when water is powred upon it. Theophrastus.*

*Pet. Aponensis.*

*J. C. Scaliger.*

*The Comentator upon Theophrastus.*

And

They are  
examined.

And in good deed, true it is, that some humor exhales out of the Lime, with the Fire. But thus a cause is not shewed, why at last the fire begins to exhale with the Water, and why in other hot Bodies, water poured on does not produce the same effect. Nor hath the Antiperistasis of *Petrus Aponensis* any place here, since experience testifies that the heat is rather poured out, then that it gathers it self inwards. So also there is no such Concentration of the Fire as *Scaliger* imagines; for as soon as ever the Water is poured on, it pierces into all parts of the Lime.

The Au-  
thors opi-  
nion.

I conceive therefore that the opinion first propounded is the truest. Namely, In the Lime there are many atomes of Fire, not so much they, which the violence of the fire could not draw out, as those which have insinuated themselves during the long time of its burning in the Kil. For Chalk is of a Spungy Body. Therefore water being poured on, it penetrates into all parts of the Lime, which the fire avoiding, as contrary thereunto, it exhales, and so becomes sensible. And because the Lime contains yet some moisture in it, whereby it hangs together, that unites it self to the water poured on, and leaves the Body, whereupon the Body of the chalk is dissolved and reduced to powder.

Mixtures  
made to  
burn with  
water or  
spittle.

Upon this Ground, mixtures are made which are set on fire, being wet with water, Yea, or with Spittle: *viz.* If a like Quantity of Ship-Pitch, Greek Pitch, Sulphur, Tartar, Niter and Petroleum be mingled together, and double the weight of all in unslak't Lime, be added, and all made up with the Yolks of Eggs, and some daies digested in Horse Dung or in *Balneo*. This mixture is set on fire by Rain or any other moisture. The like mixture may be made of Unslak't Lime, Sulphur, a little Gum Arabick, and Line-seed Oyl: whereof bals being made, they will be set on fire by Water thrown on them. So, if you fill an Egg-shell half full of unslak't Lime, and put Gum-powder on the top and stop the hole with wax: Then the said mass Thrown into cold Water, will be set on Fire.

3.  
By motion.

Thirdly, Fire may be raised by motion: which comes to pass, by the mutual rubbing together of two Bodies, which have Fire in them. For by rubbing and motion, the Fire which did lie still in mixt Bodies, kept in bondage by an higher form, and throughly mixt with contrary things, is moved, and so gains motion and activity. And this betides more easily, if on woods now a while rub'd one upon another, Gun-powder, or Powder of Brim-stone or such like be strewed. So *Pliny* in his 16. *B. Ch.* 4. writes that the *Mulberry Tree, the Bay-Tree, and the Ivy and all Trees out of which Fire is gained, are hot Trees. Spies in Camps and Shepherds have found this Experiment, because they have not alwaies a Flint at Hand to strik Fire. They Rub therefore one piece of Wood against another, whence Fire arises, which is received on tinder, a dry Mushrom or withered leaves of Trees. But nothing excels Ivy which must be rubbed with Bay, or let the Bay Wood be rubbed with the Ivy. Also the wild Vine is approved in this case, not that which is call'd Labrusca, but another sort, which Climbs Trees like Ivy.*

4.  
By the Sun  
beams.

Fourthly, Some refer hither the manner whereby Fire is kindled by the Sun-beams, of which we speak above, in the first manner of gaining Fire. Whereof we allow every Man to Judg as he pleases. The thing is of it self manifest and well known, that by burning Glasses and other Glasses, Wood, Paper and other dry things are set on fire. With such kind of Glasses *Archimedes* set on Fire the Enemies Gallies and burnt them up. Of which see what the Teachers of Opticks say, and *Johannes Baptista Porta*. Yea, and the Raies of the Sun may kindle fire without any Glasses, and experience hath shewed, that woods and bituminous Lands and Seas, have been accidentally set on Fire by the Sun's Beams.

Scaligar,  
refers to  
the Head  
the man-  
ner by at-  
tenuation  
of the Air:  
but he is  
confuted.

*J. C. Scaliger* in the same *Exercitation, Sect.* 1. hath yet another manner of the generation of Fire, and conceives it may be made out of attenuated Air; where thus he writes: *We must confess that out of the Air moved, smitten and attenuated heat may be caused. Which if it proceed it turns to the substance of Fire, and that by Reason of the attenuation of parts.* But that this is fall, does thus appear, that Stones and the hardest Bodies smitten together, do not cause any sparkles of Fire, unless they have store of Sulphur in them. And the Sulphur which is forced out of flints may be perceived by its smel. Moreover the Air cannot be inflamed, either by rubbing or any other way, but this is the property only of mixt Sulphureous Bodies. And if the Air it self could be set on Fire, this lower Region of the Air had been long ago burnt

burnt up, at the burning of great woods and Cities. Aristotle truly, in his 2 de Cælo, Ch 7. Text 42. and 1. Meteor, Text 3. Writes that the Air being moved is set on fire, and that arrows by motion grow so hot, that the Leaden points have melted. But I do not believe the truth of such reports. And if the Leaden points of darts could melt, much more should bullets grow hot, that are shot out of Guns, which they do not. And Pareus, in his Apologismus Primus saies that bullets shot against an hard Stone have been presently taken up without hurting a Mans Hand. And if Leaden points of darts or Leaden bullets, did grow hot with motion, much more would wax grow hot; and yet experience hath taught us that a bullet made of wax shot out of a Gun hath not melted, but hath gone through a boord two fingers thick.

whether  
the points  
of darts do  
melt.

So much for the manners of the generation of Fire. Contraiwise Fire goes out, especially flame, when either the inflamable matter fails, or though it be present, it is hindred from flaming, and the Fire not suffered to come out of the mixt Body.

Contrari-  
wise, Fire  
goes out.

For in the first place, when the inflamable Body fails, the flame ceases, when all the Sulphur which was in the Body is consumed. So when Tallow, Wax, or Oyl fail, the flame dies in the Wick and Lamp; and when the wood is quite burnt and reduced to ashes, the Fire goes out; because that which was there before, flies away, and no more follows it. For Flame is alwaies in generation and being bred it perishes immediatly, as Theophrastus speaks in his Book de Igne. For while the fire is made by consuming the fewel, when the fewel is gone the fire goes out. For the fire properly does not die or perish, but flies away: yet because it sticks so long to the inflamable Body, as long as there is any thing to be kindled and burn, when that fails, it is thought to die. This first manner of extinction, which is caused by defect of fuel, is by Theophrastus in his Book de Igne called, A Corruption almost Natural, and most properly so called.

1.  
Either  
through  
defect of  
inflamable  
matter.

Touching the kindling and going out of Fire, Galen hath an excellent place in his Book de respirat. Cap. 3. Where he writes: All flames are moved with a double motion, the one from the matter, out of which they are kindled, by which they mount aloft and spread abroad every way; the other contrary to this, is to their beginning and their Roots as it were, by which they settle and are contracted. For if you light a brand on the very top, the fire comes suddenly to the lower parts; and if after you have blown out the flame of a candle, and you shall hold another candle over the Smoak of the snuff you shall see it presently lighted, which could not so fall out, if the fire moved only upwards. And he adds that this is the cause of the said double motion, seeing (saith he) every flame is most speedily corrupted: for it is alwaies scattered by the ambient Air, therefore it is necessary that its generation should also be very quick; otherwise it would not last the least moment. Now the generation of all flame comes out of the matter, therefore it hath not without cause given it by Nature, not only a motion outwards from its proper principle, but one contrary thereunto, turning towards its own proper principle. And all flame must needs be corrupted, if it want either matter, or one of these motions. In which place of Galen, those two motions of flame, are diligently to be considered. First, The Fire is carried to the Body inflameable, and the matter, or Root, as Galen calls it, by reason of affinity, and it goes on all sides: the other is whereby the fire which is drawn out, is naturally carried upwards.

The double  
motion of a  
flame ac-  
cording to  
Galen.

The cause  
of this mo-  
tion.

Now the waies whereby the inflameable matter being present, the flame nevertheless decays, are many, which all of them have this in common, that in the extinction, the actuated fire goes away, and no more actuated fire does succeed it, from the mixt Body inflamed.

2:  
Or because  
of no gene-  
ration of  
new actua-  
ted fire.

This proceeds first from suffocation; viz. when as the fire breaking out of the inflamed Body with the Smoak, finds no place to receive it. For then the fire ceases to be moved in the fume or Smoak. For seeing, as was said before, two bodies cannot be in the same place, least there should be a penetration of dimensions; and in the inflammation, of mixt Bodies, many exhalations go away with the Fire which fire which raised them; if they find no place to receive them, their evaporation together with the flame is hindred, by the necessary working of universal Nature. After this manner, all things that deny place to the Fire and the exhalation joyned therewith, do extinguish the fire, and stifle the same: which happens when the flame and fume are so shut up, that they have no free egress, nor place to hold them.

which  
comes to  
pass again-  
1.  
Either by  
suffocations

*Hereunto belongs also extinction by thick Air.* Its also a kind of suffocation, when the flame is extinguished by thick Air and exhalations; which comes to pass in the quarries of metals, the pumpes of Ships, and when Beer and new Wine works. For seeing the Air is then filled with thick vapors, it cannot contain the flame with its exhalation, whence its motion must needs be stopped and choaked in its Root.

*Also the compression of the wick.* To suffocation also, compression may be referred, when the wick being compressed, the flame of Candles is put out unless any one will refer this to the following manner, whereby fire is violently separated from its Fuel and Root as it were.

*Or by discussion and dissipation why flame is both raised and extinguished by blowing* Secondly, A flame is extinguished by discussion and dissipation, when the flame is pluckt away and so departs from its fuel and Root, before new fire can follow, and when the fire is taken away, which drew out the fire in the mixt body. After this manner Torches are blown out by Winds, and we blow out Candles and Lamps with our Breath. And seeing by the blast of ones Mouth or by Bellows, flame is raised, and the fire in Coals turns to a flame, we must enquire the cause of these different effects. Where we are to know; if a little flame do only stick in the surface of the Body, it is soon extinguished by blowing, whereby the incendiary, and the fire into which the mixt Body is resolved, are soon taken away. But if the fire, actuated by blowing, is driven into the inner parts of the Body inflameable the fire is more and more encreased. Thus, by blast of the Mouth, and of the Bellows, the fire is droven into the inner part of the Coals, and flame is raised, which when it hath taken deep root, it is not easily separated, but the fire desirous to preserve itself, alwaies goes more inward, and by that motion, more of the hidden fire is actuated. Which is manifest in Coals. Hence it appears, why as *Theophrastus* saies and experience teaches, Lamps do consume more Oyl, if the Wind blow upon them, then they do when the Air is stil, and torches also are sooner burnt out, when the wind blows. For seeing the flame is perpetually generated, and the Wind or other blast discusses the flame generated, the fire sticking close to its principle or Root, does more greedily and powerfully draw out what ever is therein inflamable, and turnes it into flame.

*When and why the flame in the wick, is extinguished & blown in again.* Hence also a cause may be rendred, why the flame being extinguished, is again excited by blowing upon the snuf. Where you must observe that this does not alwaies happen, but sometimes only, when the snuf is large and full of fire, like a coal. For then, as burning coals by the blast of bellows, do send forth a flame, which otherwise, of themselves they would not do: so also the fire being in great quantity in the snuf, by blowing conceives flame. But if the snuf after the flame is blown out, have not much fire in it, and be not red hot, 'twil be in vaine to endeavour to blow it into a flame,

*Why the fire of a flame, is more powerful than that of burning coals.* This also is to be observed by the Way: that the fire of a flame, is much more vehement than that of Coals, and that not without Cause. For all the strength of Fire is in motion. And experience it self witnesses the same. And therefore Gold-Smiths do most readily melt their Gold by a Lamp, the flame whereof they direct upon the Gold by blowing. And others also that work in metal, and amongst them, belfounders do rather use the fire of flame rising from wood, then Coals, and if in other melting fornaces they use Coals, they use the continual blast of bellows to make them flame.

*Or by hindring the afflux of new fire.* There is yet a third way, when the flame, though the matter of fire be present in an inflameable body, is extinguished, because that which is first bred, flies away; seeing flame is in perpetual motion, and new fire is hindred from coming out of the inflameable body, or the actual fire is hindred from drawing more out of the inflameable body, or as *Theophrastus* speaks somewhat shuts up and stops the beginning. Which how it comes to pass, we are now to enquire. which how it comes

*Whether fire be extinguished by presence of its contrary.* to pass, must be enquired unto. Some men may refer this to the presence of that which is contrary, which when the fire perceives, it flies from it, and ceases its motion. But, Seeing not only water, but also Oyl and spirit of wine, too abundantly poured about the flame, yea, and Ashes, Sand, and what ever covers the inflameable body, that the Flame which cals out the lurking fire, cannot touch the same, puts out the flame; and 'tis not only contrariety that makes to the extinction of the flame. For the fire in the flame flies away, when it can no longer touch the Body inflamed. And though the Body, which interposes it self, be it self also inflameable;

able; Yet, If either by means of the great Quantity thereof, or by reason of the admittance of another Body, it cannot set that body on fire, nor change it into a flame to succeed, the former flame flies away, and so no other coming in its place, the fire is extinguished. Yet, because of all things water doth most easily extinguish fire; if any one will have it, that it puts out fire, not only by interposition of its body, but also by its contrariety which it hath to Fire, I shall not contend with him thereabout.

But how it comes to pass that some fire burns under water, is an obscure question, nor that I know of, sufficiently explained by any Man. For all inflammable things will not burn under the Water. For Rozin, Bitumen, Frankincense, Yea, and Brim-Stone it self, if being set on fire they be put into water, they are easily extinguished: and other things even when they are not on fire will not admit of water, as Oyls, Tallows, Fats. And if these be much heated, and then water poured upon them, there arises a great fight betwixt them and the Water, and the fire flies violently away with a great noise; so that experience hath taught, that fires have been caused by pouring Water on such fat things when they boil. If therefore mixtures be made of such things so fatty, which exceedingly resist water, adding such things as do most of all cherish fire, and keep it from flying away, then those mixtures will burn even in the Water. For a part of such a mixture being inflamed, does vehemently drive the Water from it self, and therefore such things burn with a noise, and hinder the water from piercing into the burning body, and the other things do continually supply matter to the flame.

Why some  
fire burns  
under the  
water.

A Torch that will not be extinguished by Rain or Wind, may thus be made. Take Colophony and Wax of each six pound, Turpentine two pound, Tallow one pound. Mix all over the fire. And in this mixture dip Wicks to make Candles, or Cords to make links, let them boil a little and then take them out and cool, and wreath four together for one link. Which must be covered with four pound of Wax and one pound of Turpentine.

A Torch  
that can-  
not be  
quenched.

A Candle that will burn in water may thus be made. Take Wax half a pound, Brim-stone, unslak't Lime, Turpentine, Salt Ammoniack, of each two ounces, Petroleum one ounce, Camphire half an ounce. Mix them and make thereof Candles, which if they be lighted and thrown into the water will burn nevertheless.

A Candle  
that will  
burne in  
water.

Besides the manners and waies already reckoned up, whereby fire may be extinguished, Theophrastus, in his *B. de Igne*, hath yet another, viz. When a greater fire is put to a lesser. So we see, a great Candle lighted and put to a lesser, puts the lesser out. But then the lesser flame indeed is extinguished, but the fire in the Snuff is not put out: and the fire and flame do not go away, only the lesser flame goes to the greater, because of affinity, and is thereto joyned; or the lesser flame is drawn to it by the greater.

Flame is  
also ex-  
tinguished  
when a  
greater is  
applied to  
a lesser.

And that we may say somewhat also of the effects and operations of fire; Fire is indeed essentially one and the same, but according to the diversity of the matter wherein it is, it workes diversly. Fire is most hot in a solid and Earthy Body, Theophrastus: but in a thin and rare or spongy body, 'tis less hot. And Scaliger in his 9. *Exercitation*: Fire in Iron is most vehement by reason of its density, in wood, less vehement, weaker in Wooll and such Paper as we use; in a flame it is so dilute that we can draw our hand through it without hurt; in *Aqua-vita*, on fire the flame is so thin, that it will not burn a cloath dipt therein. Yea, And the same Scaliger in the same place saies, that the fire burns not of it self, but by accident, viz. Because of condensation. Howbeit, It is a question obscure enough, whether fire of it self burns, and whether some fire be hotter then other some. Cardan hath invented some causes of this thing, which may be seen in Scaliger. Now that this question may be more rightly explained, Scaliger gives us light, in the same place, who saies the common manner and cause why fire is more vehement then fire, is the frequency of its parts, their Coherence, Propinquity, Coagmentation, Cohesion and union; for in a more compacted matter very many parts are contained in a small place.

Of the o-  
perations  
of fire.

Why some  
fire is more  
vehement  
then other  
some?

The opini-  
on of Scal-  
liger.

Andreas Libavius indeed opposes this opinion of Scaliger in his *Comm. Alchym.* Part. 1. Lib. 2. Cap. 12. And saies I know not what intension of substances and qualities, and objects divers things of little validity against him, scarce rightly stating the Controversie. For first he saies, when stubble is loose and spread abroad,

Libavius  
opposes the  
opinion of  
Scaliger.

the

the fire Flams and wanders at large, and we must say its heat is less because of the dispersion of parts. Take them therefore in your hand, twist them and twind them together, yet the fire becomes no stronger: but the answer is easie. The stubble it self, whether spread abroad, or in a bundle, does not change its Nature, but continues spungy. And therefore it stirs up the same degree of fire, save that when it lies scattered it cannot afford so joynt a Flame, seeing much Air comes between, as when it is gathered together. Again, he saies, that fire burning freely in a spungy piece of Wood hath more furtherances to its action, then in an hard and solid, although you imagine both of them to be totally inflamed. The fire of loose Coals is more spirituouse, and more blown through then that of hard Coals, although a greater impression seems to be made by the latter, if you touch them: yet it hath less spirit, it receives less nutriment from the Air; and because it is more shut in, it is more weak, though more lasting in regard of the strength of the matter.

Libavius  
his objections  
answered.

But *Libavius* seems, not to have been well acquainted with the Nature of fire, and there are many things in these objections not agreeing with truth, also several questions are mingled together. For the question is not, what material does more easily take fire, and in which fire is most easily brought into act, and which burns most freely. For we grant that all these things are true of Spungy bodies. But the question is, in which the fire burns most, in a rare or a dense body. And we say, that fire does burn more vehemently in a compact and dense body, as experience shews. For a man may without damage draw his finger through the flame, but if he do but touch a red hot Iron, he is burnt in a moment. Which *Libavius* himself confesseth when he grants, that we perceive a greater heat in hard Coals then in spungy, if we touch them. Now that is false, that the fire receives nourishment from the Air, since whatsoever is lighted must be in the inflamed body. But if fire be allayed with much Air, as happens in the burning of stubble and such like things, the fire is not thereby made stronger but weaker. And *Libavius* confounds the increase of the fiery parts and the stronger action of the fire depending thereupon, with the intensification of the heat it self. That one fire is greater then another is out of question; and manifest also it is, that in a greater Quantity the power of acting is greater, in a less quantity lesser. For that metal which is melted by a large flame of Wood or Coals, will not be melted by the flame of a Candle. But here lies the Question, whether the heat and fire which is in a great flame, be of it self more intense then that in a small one. Which *Scaliger* denies, for the causes aforesaid, and maintaines, that those parts of fire, which they call degrees, are augmented by conjunction of parts, and not by intensification of Virtue. Which opinion of *Scaliger*, though *Libavius* call's it a Nicety; Yet, He must needs allow of it, when he writes that the heat of Fire is as great as may be, in the smallest spark, and of it self suffers nothing to be taken from it, nor admits any part of a cold body into its society. And though he addes that the receptive subject of them both is altered; yet will not *Scaliger* deny this neither. For by how much the more Fire there is in any body, so much the hotter is it; and by how much the lesser, so much the less hot. Take for an example (which *Libavius* himself uses) seething Water. There is in boiling hot Water much Fire, whereupon if you pour cold water, it becomes luke-warm, because of the admixture of cold water, which hath no Fire in it. In a small piece of Iron there may be more Fire, then in a great deal of stubble.

The Authors  
opinion.

I retain therefore the opinion of *Scaliger*, and hold, that one Fire is not hotter then another; but that Fire burns more strongly then Fire, comes by reason of the union of many parts; and that fire burns weakly, proceeds from the distance of the said parts. Which that we may understand more clearly, we must know, that Fire is most of all allayed by Air, which easily insinuates it self into the society thereof. Whence it follows, that in rare and porous Bodies, which containe much Air in them, Fire is more weak and dilute, and its parts are not too near. Contrariwise, In solid bodies, into which Fire pierceth where there is little Air, the parts of the Fire do stick more one to another, and are compacted.

Fire burns  
of it self  
and not by  
accident,  
as *Scaliger*  
imagines.

Howbeit from the premises it follows, that fire burns of it self, not by accident as *Scaliger* would have it; contrariwise that it does not burn by accident at all. For, seeing Fire of it self is the hottest of all bodies (though we have no such Fire with us, that is pure) and in pure Fire there is a great cleaving together of the parts there-  
of,

of, it must also of necessity burn: which also it does in Iron, and other red-hot metals, because the Atomes or indivisible particles of the fire do Cohere together, and are extremely near one another, and very many are contained in a small place, and because of their conjunction they act more effectually. Contrariwise in stubble, and other spongy Bodies, because Air is mixed with the flame; and as *Scaliger* in his 9<sup>th</sup> *Exercitation* speaks, the fire is allayed by the Air, the parts of the fire do not stick together, but are at distance, the Air coming between, therefore they cannot act so strongly. For Fire truly is the first subject of heat, and the hottest thing of all others: but that it does not allwaies Act to extremity, comes by admixture of other Bodies not so hot, especially of the Air.

The next Element to fire is the Air. For it, as it declines from the rarity <sup>what place</sup> and heat of the Fir; so it takes up a room a little more remote from Heaven; and is <sup>the Air</sup> heavy respectively. The Air is divided into three Regions: the uppermost, the <sup>holds.</sup> middlemost, and the lowermost. The <sup>Its three</sup> uppermost is above the Tops of the highest <sup>Regions.</sup> mountaines. For imagine but a surface upon the tops of the Highest mountaines, that shall make the Earth exactly round, the Air above the same, to the Sphere of fire is the uppermost Region. The other are below this, which are not allwaies of a like bigness. For in Summer the lowest is greatest, which reaches as far as the reflection of the Sun beams goes; and in Winter the middle Region. For in summer time when the Sun beams fall to righter Angles, they are reflected higher; but in Winter, the Beams of the Sun being very oblique, are reflected sidewaies, nor do they rebound aloft. The middle Region, in respect of the two others is least hot, and therefore it is said to be cold, because the Sun beams are not reflected so far: the other two are hotter; the uppermost, because of the Vicinity of the Heaven and the fiery Element; the lowest because of the doubled Sun beams, direct and reflex.

Howbeit the lowest Region is variously disposed, sometimes 'tis hot, otherwhiles cold, sometimes moist, otherwhiles dry, sometimes clear, otherwhiles cloudy; and the Air being in this Region variously disposed, does diversly affect our Bodies. For while we breathe, we continually draw it in, and by it the spirits in our Bodies are repaired and cherished, and our heat which in the Body needs continual fanning, is thereby preserved.

After the Air comes the *Water*, an heavy Element, yet somewhat lighter than the <sup>The water.</sup> Earth. This Element is no where found pure, but is every where mixed with the Earth and ambient Air; of which the taste is an argument, seeing you can hardly finde any Water void of taste.

The lowest place is taken up by the Earth, which is of all Elements the most heavy, <sup>The Earth.</sup> and most unfit for motion. It hath much matter, and is therefore thick and dark. The Earth is not found pure on the top thereof, but if it be any where pure, it is in the Centre, whither no contrary does pierce, that may corrupt it.

The Water and Earth do not make a peculiar Sphere as the rest of the Elements, <sup>The water</sup> nor does the water compass the Earth on all sides, but the Earth receives the water <sup>and the</sup> within its Cavities; and in very many places, by a singular providence of God, the <sup>Earth do</sup> Earth stands bare, for the more commodious generation and nutrition of Animals <sup>not make a</sup> and other mixt Bodies, and it lies open to receive the Raies of the Stars. For Beauti- <sup>peculiar</sup> fulness and Commodity overcame the force of necessity, in respect whereof, the <sup>sphere.</sup> water was to have covered the whole Earth. As *Scaliger* saies, in his 9<sup>th</sup> *Exercitation*.

Now, How great the Earth and Water is can hardly be determined. That the compass of the whole Globe made up of Earth and water is 18000. furlongs, or 5400 German miles, and the Diameter thereof about 1718. German miles, is a thing out of question: but 'tis hard to say whether there be more Earth or Water: Yet most likely it is, that there is more Earth than Water. For neither is the greater part of the surface of the Globe of the Earth covered with Water, as appears by the true description of the said Globe: nor indeed is the quantity of the Water greater than that of the Earth; seeing by the sounding Plummet we discern that there is Earth under the Sea; and the depth of the Sea compared with the diameter of the Earth, is a thing of small moment. Of which see *Alexander Piccolhomineus* in his *Treatise of the Largness of the Land and Water*.

And,

The water  
with the  
Earth  
makes one  
Globe.

And, that the Sea is not flat and even, but that it makes one Globe with the Earth, is proved, first by Eclipses of the Moon, in which the shadow of the Earth appears circular; and therefore argues the Body of the Earth to be so likewise; and in the next place by Navigations: For if a man sail out into the main Sea, and take notice of some House or turret on the shore, at first he sees it all, afterwards scarce half, til at last he quite lose the sight of it, because the swelling roundness of the Water interposes it self between the shore and the mans Eye; for sight goes alwaies in a right Line. And although the Earth it self be not an exact Globe, but a Globous Body, high in some places, low in other some: yet this highness and flatness bears scarce any proportion to the whole Body of the Earth; which appears by Eclipses of the Moon, wherein the shadow of the Earth appears Circular, and makes a Circular Line.



## THE THIRD BOOK.

### Chap. I. Of the Elements as they are the Principles of mixt Bodies.

The defini-  
tion of  
the Ele-  
ments.

Since in the Sublunary part of the World there is a perpetual Interchange of the generation and corruption of things, there must needs be some immediate Principles, of which variously mixed and tempered together, all things are generated. These Principles are vulgarly cal'd Elements, and by Aristotle 3. de Cælo, C. 3. T. 30. thus defined. *The Elements of Bodies are those things into which the Bodies are resolved wherein they are actually or potentially, but they themselves cannot be divided into other distinct sorts of things.* And by Avicen they are defined to the same intent and purpose: *That they are simple Bodies, and the first parts of the Body of man and other things; which cannot be divided into Bodies of different forms, of the mixture of which, the several sorts of things generated are made.* Where you are to observe, that the chief Character of an Element, as it is the principle of a mixt Body, is indivisibility, in respect of any parts of several sorts, into which it can be divided. And therefore Galen also, when in 1. de Elem. Cap. 1. He had defined an Element to be the smallest part of that whereof it is an Element, himself adds; but that which appears smallest to the sense, is not indeed alwaies the smallest in reality. For many things by their smalness cannot be discerned by the senses.

The first  
Qualities,  
why so cal-  
led.

Seeing these Elements were to be the Principles of a tangible and generable body, it was necessary that they should have also certain Qualities, by which they might be known to us, might work one upon another, and might be fit to effect all kind of mixture: which what and how many they are, let us consider in the first place. For they being known, we shal easily afterwards know, both how many Elements there are, and what their Nature is. These qualities are commonly called the first Qualities, not because they are absolutely first, or first in dignity, or because all other Qualities arise from them, but because they are originally in the first sublunary bodies.

Their Con-  
ditions.

Now these are their Conditions: that they constitute the first sensible, that is to say, tangible bodies, and be their differences as they are such: that they effect the first sense, viz. the touch: that they be in all bodies subject to Generation and Corruption: that they be contrary, and apt to do and suffer; for they are to be the Authors of



of Generation and Corruption: that they have none before them, whence they are termed first: that they cannot be made one of another.

Moreover, that we may search out how many such Qualities there are, we must take a view of all tangible Qualities. Aristotle, in his *de 2. Generat. & Corrupt. c. 2. t. 8.* reckons up these first tangible Contrarieties; Hot, Cold; Dry, Moist; Heavy, Light; Hard, Soft; Clammy, Crisp; Rough, Smooth; Thick, Thin. Howbeit, among these seven Oppositions of tangible Qualities; only the two first deserve the name of first Qualities. For Heavy and light do not act one upon another. And the same may be said of the other four pair of Oppositions. For neither do they act or suffer one upon and from another; nor are they first Qualities, but arise from others, and belong rather to compound than to simple Bodies. And therefore there are only four first Qualities: Heat, Cold, Driness, Moisture. For in them all the abovesaid marks of first Qualities are to be found.

How many  
first Quali-  
ties there  
are?

These Qualities are defined by Aristotle in the *2. de Gen. & Corrup. ch. 2. t. 8. and 9.* thus: *Heat is that which collects things homogeneal or of like nature.* For in that it separates things heterogeneal comes by accident. For to collect and gather together things of like nature, is to separate things of unlike nature. Now by things homogeneal, or of like nature, we must understand, not only such things as are of the same sort, but which have like temper, and may be changed into one nature: by things heterogeneal or of unlike nature, not only such things as are of a different species or sort, but also such as are of a diverse temperament, nor can be reduced into one nature. For Heat alwaies endeavors to reduce things different into one Nature: which since it cannot do, by reason of the difference of temperaments, it only unites such things as it hath made alike, and rejects the rest as Excrements. These operations of Heat are every where to be seen, and especially in the Concoctions made in animals. For the soul makes greatest use of heat as its fittest Instrument to perform its actions by. For sundry meats being cast into the stomach, the Heat of the stomach reduces such as are fitting into one nature, and turns them into one mass of chyle; the other parts which are unfit, it separates as Dregs and Excrements, to be cast out by the Guts. The same does the Liver; the same do all the members. Also by the help of Heat all chymical operations are performed. For that Art by Heat separates metals; severs the parts of Plants and other things, and does other wonderful works. Heat therefore is of all Qualities the most excellent; the first Instrument of Generation, and most efficacious in its operations.

The de-  
finition of  
Heat.

Cold is a Quality that gathers together, both things of like, and things of unlike Nature. For we see how in Ice, by force of cold, several things, as Wood, Straw, Stones, Earth are congealed together; and the like cold does in other things and places; and it combines things together without any separation of what is heterogeneal. Here we must reject the Opinion of Cardan, who would have cold to be only a defect and privation of Heat. For Cold is doubtless a positive Quality; seeing it is perceived by the Sense, and hath certain powers whereby it acts and opposes Heat; which cannot be in a bare privation. Of which see Scaliger in his 18. Exercitation.

Cold de-  
fined.

That is moist, which is hardly contained in its own limits or bounds, easily in those of another thing. That is dry, which is easily contained in its own bounds, and does not easily receive the bounds of another thing. For we find by Experience, that the Air does of it self flow every where about, and easily accommodate it self to the sides of the thing contained; and the like does Water: but the Earth flows not about, but retains and keeps within its own bounds: nor does it easily accommodate it self to all the parts of the body which contains it. By Moisture therefore things are made to cleave one to another; and therefore we see things overdried do break: and from driness things have stability and Consistency.

The De-  
finition of  
Moisture  
and Dri-  
ness.

Now touching these definitions, this is to be observed: that Aristotle did not define the first Qualities absolutely considered, as they are in the Elements, considered as simple bodies and not compounded into mixt things; but as they appertain unto them, when they go into a mixt body. Aristotle was not indeed ignorant, that the first Qualities had other effects preceding those by which he defined them; and that an Hot thing Heats, a Cold, Cools; a Moist moistens, and a Dry Dries; yet he thought not fit to constitute or make up the definitions of the first Qualities by these effects; both because these definitions would reveal nothing that was hid-

den

den, but the same thing would be defined by the same; and also because the first qualities are given to the Elements by Nature, for no other occasion but that by them as the immediate instruments they might be the principles of mixt bodies. And the first operations of the first qualities are originally more principal than the second operations of the said Qualities: but in the intent of nature contriving the generation of a mixt body, they are not the principal, but the second are more principal than they. Wherefore, omitting those common operations known of themselves, which they perform both in mixt and simple bodies, *Aristotle* would define them by those alone which they exercise in mixt bodies.

*whether the first Qualities are rightly divided into active and passive* These Qualities are divided into *Active* Heat and Cold; and *Passive* Moisture and Driness, of which division, although the opinions of Authors are various, as may be seen in *Archangelus Mercenarius*, p. 239. *Zabarella de Qual. Elem. c. 5. Franc. Piccol. de Qual. p. 1. cap 8.* yet I conceive, this ought to be our judgment. All these qualities, in respect of that univocal action, whereby each one by its first operations begets its like, and destroys its contrary, as well in simples as in mixt bodies, do both act and suffer: yet in respect of their equivocal action, which they only exercise in mixt bodies, and whereby they produce the second qualities, and the nature of the mixt body it self, different from the nature of the Elements; two are termed active, and two passive. And in this respect, Moisture and Driness have no active power, but are only as matter which the Work-masters Heat and Cold exercise their craft upon.

Seeing these Qualities are in the Elements as in their first subjects, we may rightly by them search out also the number of the Elements. And omitting that reason which was produced in the second Book foregoing, we shall thus proceed. If the Elements be alterable, they must needs be more than one: but they are alterable, for they must be the principles of alterable bodies, and bodies that are corruptible. Therefore there cannot be one Element but many, and they endowed with contrary qualities, by which they act and suffer mutually. This reason agrees with that of *Hippocrates*, *Lib. 7. de Nat. Hom. t. 5.* where he saies: if a Man consisted only of one Element, he should never be pained: for there would be nothing to pain him, because he should be one thing; and, as *Galen* saies in his Comment, there would be no second to act upon him. For the self same body cannot suffer from it self.

*The number of the Elements.* Now how many Elements there are, *Aristotle* demonstrates in his 2. *de Gener. & Corrupt. cap. 3. t. 16. and cap. 5. t. 34.* after this manner. The Elements are therefore called the principles of mixt bodies, because being altered and changed one by another, they constitute the said bodies. Now all alteration and mutation depends upon the action and passion of the first Qualities, which are four as was said before. Those simple bodies therefore which are the subject of the first Qualities, shall be the principles of mixt bodies. And that they may rightly cause mixtion, 'tis necessary, that each may suffer from each, and that therefore it have not only one, but two first Qualities.

*whether the first Qualities be the forms of the Elements.* From the Premises therefore, thus we conclude. There are so many Elements, as there are possible combinations of the first Qualities: but they are only four; Heat and Driness; Cold and Moisture; Heat and moisture, Cold and Driness: for the other two are altogether impossible, nor can extream Heat combine with extream Cold, nor extream Driness with extream Moisture: seeing contraries cannot be in one and the same subject. So many Elements therefore there are; The Fire hot and dry; the Air, hot and moist; The Water, cold and moist; and the Earth, cold and dry.

Hereunto may also be added another reason, which *Aristotle* uses in his 2. *de Generat. and Corrupt. Cap. 8. T. 40.* So many Elements there are, as there are things of which perfectly mixt Bodies do consist. But they consist only of four: and therefore there are four Elements. For we see all perfectly mixt Bodies to have much Earth in them, and to be moved towards the Earth: but mixt Bodies are moved according to the motion of the prevalent Element. And mixt Bodies because they are knit together and Co-here, and receive terms, there is also water in them, for it is the part of Water to unite and fasten: if Water and Earth, then the contrary Elements Fire and Air, by which they are to be alliaied, and wherewith to be mingled. For mixture is not made without mutual action and passion. Moreover all

all Generation is made by Heat. And therefore besides water and Earth, heat also is required to mixture: but one hot Element doth not suffice: For it would be vanquished by two cold ones. And therefore, besides Water and Earth, Fire also and Air do concur to constitute all mixt Bodies.

The number of the Elements being found out, we must now enquire into their Essence and Nature. And since the first qualities are very intimate to the Elements, the question is; *Whether the first Qualities are the substantial forms of the Elements?* Or whether the Elements have other forms besides the Qualities. Not to be prolix in a plain case, briefly thus we hold; that the first qualities are not the substantial forms of the Elements, but accidents. A token whereof is, that the first qualities are perceived by the sense; whereas no substance can of it self be perceived by the sense; again they are found in other things as mutable accidents; and therefore in the Elements themselves they cannot any waies be substances. Howbeit the hidden Forms of the Elements are by them Circumscribed by Authors. And therefore Hippocrates himself, oft calls the four Elements by the Names of Hot, Cold, Moist and Dry, as Galen witnesses in his 1. *De Temp. Cb. 8.*

*whether the first qualities be the forms of the Elements.*

By the Qualities therefore the Elements are known to us. For they are in the Elements as their Proper subjects, from whose forms also they depend and have their being. For I hold not with those who deny, that the first Qualities which are in the Elements do proceed from the forms of the said Elements, by way of Emanation, but derive them all from the motion of Heaven, or the Negation thereof. For 'tis an absurd thing, that a Natural Quality should proceed from any thing but its own Form. Nor must we think that the forms of the Elements are Lazy and Heartless, and produce no Qualities, nor work no operations. For if the first proceed not from the forms, which are most intimate with the Elements; I do not see what other Qualities can proceed from them: moreover an absurd thing it is, to hold that cold comes only from the Privation of the motion of Heaven: for since it is a positive Quality, it requires also a positive Cause.

*The qualities proceed from the Forms.*

But in each Element there are two Qualities. For seeing it is necessary, That every Element, for the more commodious generation of things and their mixtion, should be able to act upon every one, and suffer from every one: therefore each have two qualities. Now the Question in this place is; whether both Qualities do equally agree to each Element? Or whether one Element have affinity to one Quality more then another, and have one Quality primarily, the other secondarily: Moreover; *Whether in each Element both the Qualities are in the highest degree, Or one only in the highest degree, and the other remiss: and it is disputed, how that place in Aristotle 2. de Gener. and Corrup. Cap. 3. T. 23. is to be understood; where Aristotle thus saies: The Earth is dry more then cold, the Water cold more then moist, the Air moist more then hot, the fire hot more then dry.*

*Each Element hath two qualities.*

*whether each Element hath one quality in the highest degree?*

'Twere long to recount the different opinions of Authors touching this Question, and to make any certain determination is hard: yet I shall briefly propound what I conceive most probable. Now we hold, that that one quality is most intimate to the Nature of each Element and more of alliance thereto then the other: also that one is more excellent, the other less excellent, *viz.* That the fire, as Aristotle hath it in the place forealleaded, is most Hot and Dry; the Air most moist and hot: the Water most cold and moist; the Earth most Dry and Cold; which also sense does testifie: and that these Qualities do after this manner flow from the form of each Element. And they are in an Error, who while they are solicitous about attributing to each Element its own Qualities, do not so much regard the forms of the Elements, as their greater or lesser distance from Heaven, and think thence to fetch the qualities. Nor is that of any great moment, which hath moved many to think the contrary: *viz.* That the abatement of the quality is caused by its contrary; whereas the Elements are most simple, and have no contrariety in them. For this is true only of mixt bodies, but not of simple Elements: and that constitution of Qualities doth proceed from the form of each one. For as this is the Nature of the Air, that without the mixture of any heavy Body it is not so light as the fire; so it is a property thereof, not to be so hot as fire.

And

*Whether the Qualities where- in the Elements partake, are of several sorts.* And here is also another Question, whether *symbolical Qualities*, for example sake the Heat in the Fire and the Heat in the Air, are of the same sort. Now the Answer is, That these Qualities are not of several sorts, and that we are not to acknowledg eight, but only four first Qualities, which in the first place our Sense it self doth witness, which judgeth all heat to be of one sort: and again when the symbolical Elements are changed, the Quality wherein they partake abides: and the watry coldness it self is as contrary to the heat of the Air, as to the heat of the Fire.

From what has been said may easily be collected, what is the nature of each Element. For the Fire is an Element *exceedingly and primarily hot, and Dry*. Both which experience does witness, wherby we are all dayly instructed, that Fire is dry. For Fire can change both Air and Water. And therefore it must have Qualities contrary to them. For transmutation happens betwixt contraries: and whereas both the Air and Water are moist, the Fire contrariwise is dry.

We must therefore reject the Paradoxical opinion of *Johannes Baptista Montanus*, who teaches that the Fire and all Elements have some moisture in them, and that whatever is continued in Nature and united, whether it be simple or compound, is continued only by humidity, and that not only in this sublunary world, but in the Heaven also. For in mixture only it is, that divers simple bodies are coupled by moisture: not simple bodies, for so they should not be simple. But the form of every simple body, as it gives the being and bounds, so it couples and contains the parts.

*The Fire compared to a King.* The Fire therefore, seeing it is Primarily and principally hot, all hot operations are therefore therein more conspicuous: and therefore it is neatly by *Scaliger* compared to a just King, which tenders every one his due, dividing the Land amongst families: and to a prudent steward of an house that reserves to himself as much as he needs. For out of Wood, it gives ashes to the Earth, liquor to the water, vapor to the Air; and takes that to it self which is concealed from the Eyes of the Vulgar, but not from the mind of the Wise. And although very many in this age seek to banish Fire out of the Universe: yet I conceive we ought not to reject the same, as hath been said before in *B. 2. ch. 3.*

*Air is most moist and hot.* *The Air is hot.* The Air is an Element in the highest degree and primarily moist. Now touching the heat thereof, there is great difference amongst Authors. For the Stoicks as *Seneca*, *Nat. Quest. Book 2. Ch. 10*, *Cardan Lib. 2. de Elem.* and others do hold against the Peripateticks that the Air is cold. But I must take part with the Peripateticks for the heat of the Air; seeing there are strong reasons to back that opinion. For Air is produced and preserved by that which is hot: but is condensed by cold, and turned into water. Moreover the lightness of the Air is a token of its Heat, seeing Lightness follows after or accompanies Heat. Moreover, if the Air were cold, there would be no simple body hot and moist, and water should agree with Air, and therefore one of the two would be superfluous. More reasons are to be found in Authors to this purpose. But all which is said of Air in this case must be understood of it, as it is a pure Element. For being mingled with vapors, and affected with a strange quality, it hath oft-times a faculty of cooling, and oft-times of drying, which nevertheless agrees not thereto of it self, but by accident.

*Water is an Element most cold, and moist.* *Earth an Element most dry and cold.* Water is an Element in the highest degree and primarily cold, and moist: the Earth in the highest degree and primarily dry, also cold. Concerning these two Elements few Controversies are started. For whereas some dispute, whether the Earth or the water is primarily cold, the question may easily be determined, from what hath been said. For they which would have the Earth colder than the Water build up on a bad foundation: *viz.* that all the Elementary Qualities proceed from Heaven, which was before rejected. *And so much for the Elements.*

## Chap. 2. Of the Action, Passion and Mixture of the Elements.

After we have explained the Nature of Elements, the next thing is, that we declare, how mixt bodies are of them compounded. Now forasmuch as the Elements, unless they be altered, cannot constitute mixt bodies; nor can they be altered unless they act and suffer one from another; nor can they act and suffer, unless they touch one another, as Aristotle hath it, *de Generat. & Corrupt. Lib. 1. cap. 6. t. 43.* we must first speak a little concerning Contact or mutual touching, Action, passion and Reaction.

Contact is chiefly twofold: one improperly so called, which they term virtual; whereby things incorporeal do act upon other things, or a distant body, doth by its Virtue work upon another remote body. The other is a Contact of magnitudes; of which there are again many fashions. For absolutely and generally all things are said to touch, which having distinct magnitude and position have their extrem parts close one to another. And then there is a Physical or Natural Contact, of which we are now treating; and this belongs to bodies having divers magnitudes, whose extrem parts are together: and which act and suffer one upon and from another. Or in a word: Those bodies touch with a Physical contact, whose bounds are together, and which mutually act and suffer one upon and from another. For besides these things which are common to all bodies that are said to touch one another, *viz.* to have magnitudes distinct, a certain position of parts, their place and extrem parts together; this is peculiar to Physical contact, that bodies which do thereby touch one another, do act upon and suffer from one another. Thirdly, Those bodies do touch one another, whose extrem parts are together, and one only acts upon another, but suffers nothing therefrom.

Contact is therefore required as a necessary condition in sublunary things. For it hath been before proved in general, that every Agent must be together with the Patient. For since by the Agents action upon the Patient, some mutation ought to be made, of necessity that must be present which changes, or at least its Virtue; and its Virtue cannot be present, unless that be present which carries it. And therefore in every action the Patient is toucht by the Agent, or at least by that which carries its Virtue. For nothing acts upon the extrem, but it acts first upon the medium.

Yet we must here diligently observe; that there is a double action, the one primary, which immediately follows the nature of the thing; the other secondary proceeding from the primary. The primary action of the Sun is Illumination: the secondary Heating. The primary action of the Fire is to heat; the secondary to melt, to harden. Now touching the primary 'tis only true, that the Agent acts not upon the extrem, before it act upon the Intermedium. For the second Action, besides that that it presupposes the first, also it requires an aptitude of the subject to suffer; whence that vulgar assertion in the Philosophick Schools, The actions of Active things, are received in a Patient and that which is disposed also, Whatever is received is received according to the disposition of the Receiver. So by the Sun light is produced, both in the Æthereal and Elementary world; but the Heat not in Heaven, but only in sublunary things. So Fire heats both Wax and Clay; yet it melts the former and hardens the latter: because the former is indisposed to be hard, and the latter is indisposed to melt.

With the Mutual contact of the Elements is conjoynd their Action and passion. Now by action we do not here understand every action, but that only which is betwixt the first qualities. Now among what things there might be Action, the Ancients were not agreed, as may be seen in Aristotle, *de Generat. & Corrupt. Lib. 1. Cap. 7. T. 46, 47.* For some held, that all action and passion was betwixt things unlike; others, that a thing did not suffer from a thing unlike, but only from its like. We with Aristotle, in the place aforesaid, Text 50. do hold the middle opinion, and do say: that every agent endeavours to make the patient like it self, and that therefore a thing like as it is like, and according to the same quality whereby it is like, does not act upon its like: for examples sake, that which is cold, as it is cold, does

not act upon a cold thing: nor does that which is diverse, act upon that which is altogether diverse; for Heat does not act upon heat: but contrary acts upon its contrary. And therefore those things which act one upon another, and suffer one from another, are partly like and partly unlike; like in Kind, but unlike in sort; for contraries are under the same kind, but differ in the sort.

Howbeit, What hath been said, that like does not act upon its like, must be a little more diligently weighed: because from the right understanding of this Axiom, we come to the knowledg of many things in Natural Philosophy and Physick. In the first place it must be observed, that in this place, we speak of that similitude which is betwixt the first qualities; and in the next place that this similitude is three-fold. For some things are alike, only according to the sort of quality; although in the degree, or the intension of the quality and vehemency of the action, which they call activity, they are unlike. So every hot thing is said to be like another hot thing, and fire is said to be like lukewarm Water, and other things any waies hot. Other things are alike, both in the sort and the degree of the quality, although they differ in the vehemency of their action: thus the fire in a red hot Iron, is like that in burning wood. Other things are alike, both according to the sort of the quality, and according to the degree thereof, and according to the power of acting. So two fires, which are in matters of the same bigness, and of the same rarity or density are alike. For this must not be forgotten; that equal activity does not alwaies proceed from the same degree of quality; nor hath every heat which is alike in degree and intension, an equal faculty of heating, but oftentimes where there is no excess of degree, there is yet an excess of operation, either by reason of the plenty of matter, or the density thereof. For the fire which is made of a great Faggot, is not hotter or more intense then that which is made of a stick or two; but only hath a greater activity; and a dram of Pepper is not according to the degree of heat more intense, then one Pepper Corn: but only hath a greater power to act. For in a greater magnitude there is more virtue: and in much matter, much form. So the fire in a red hot Iron, is not hotter then that in stubble: but it hath a greater strength to act. For force united is more strong then that which is dispersed: and an agent the nearer it is to the Patient, the more it acts thereupon. Now the parts of a compact body are less distant from any particular point in the patient, then the parts of the same Body rarified, and extended to a greater bulk. Moreover, in a dense Body, there is more matter, and therefore more form, and by compactness of parts, there is more substance in a less space, and therefore greater force. For parts condensed are like many individuals joyned together, which act more powerfully then one. And therefore wherever there are more degrees of the same quality, whether they be collected by intension, or the magnitude of the subject, or the condensation thereof, there is the greater Action.

These things thus premised, we shall deliver our opinion concerning the action of things like, in these propositions. *I. Things like may act one upon another after the first manner, so that the more intense will intend the more remiss; and that which is remiss will abate that which is intense.* According to the common Axiome of Physicians, which is a principle of the Art of compounding of Medicaments. For seeing action is betwixt contraries, not only the extreame do mutually act one upon another, but also the Mediums and the extreame. For even by the Medium, as a contrary, mutation is made. For as Aristotle hath it in his 5. Phys. Cap. 1. T. 6. *A Medium is in some sort an extreame.* And that which is remiss, is in place of the other contrary. And Aristotle himself explains what he understands by contraries, in 1. de Gener. & Corrup. Ch. 7. T. 51. *Now because the Agent and the patient are the same and like in kind, but unlike in sort; and such things are contraries: it is manifest, that actives and passives are one contrary to another, and also Mediums.* Also experience proves the same thing, which teaches us, that a hotter thing added to a less hot, makes it more hot, and contrariwise; and that lukewarm Water put into that which is boiling hot, does allay the heat thereof; and continually from the mixture of that which is intense with that which is remiss there results a compound, more intense then the remiss parts and more remiss then the intense.

*II. Among things like, according to the second way, there is no action.* For seeing according to the sort and degree, and the first act, wherein the Nature of qualities consists, and to which mutation tends, these qualities are like, and are not of different sorts; and therefore are not contraries: therefore there can be no action betwixt

what kind  
of action  
there is be-  
twixt like  
things.

twixt them. For every action is betwixt contraries, and every agent by acting endeavours to make the Patient like it self, and to give it the same Nature and Act. Moreover, since action supposeth essence, no thing which is in aptitude to be this or that, can be made actually so, but by that which is actually such. And therefore a thing hot to four degrees, though it may be intended to more degrees; yet it cannot be by any thing intended, save by that which hath above four degrees of heat in it. Also experience justifies our assertion. For suppose for examples sake, that there are two Bodies in the highest degree hot, the one greater and more compact, the other less and more spongy; the former indeed acts more vehemently, Yet can it not work upon the latter, because it hath already attained the highest degree of heat.

III. *Also between things alike after the third manner, there is no action.* For seeing it is rightly said by Aristotle, in *1. de Gener. & Corrup. Cap. 7. T. 31.* That the Agent doth make the Patient like it self: Betwixt things perfectly like, there can be no action. And from the premises it appears, betwixt what things there can be action and passion; which Aristotle hath briefly comprehended, in the foresaid place, where he saies: *It is manifest both that contraries, and those things also which are Mediums, do mutually act and suffer, one upon and from another.*

But here arises another Controversie from that which hath been said, *viz.* That all things of the same kind, do mutually act and suffer one upon and from another; for it is hereupon disputed; *Whether amongst the Elements there be a reciprocal Action and passion,* Which they commonly term *Reaction*: or whether an agent, working by the first sensible qualities of it self, being close to the Patient and contrary thereunto, do suffer any thing likewise from the Patient. Now action is here by way of eminency ascribed to the stronger, and passion to the weaker; and that action by which the Patient acts back again upon the stronger and more potent, is termed *Reaction*; and the passion whereby the agent being stronger receives the action of the weaker, may be termed *Re-passion*.

And besides other things, which make a difficulty in this Case, which may be read in *Tolet, L. 1. de Gen. & Corrupt. Ch. 7. Q. 15.* *Zabarella de Reactione C. 2.* *Franc. Piccolbomineus L. de Effect. & perpeß. operant. per Nat. C. 20.* *Victor Trincavellus in Quest. de Reactione.* That passage of Aristotle, in his *B. de Animal. Mot. C. 3.* *Whatever things are of equal strength, they do not mutually act one upon another; but are overcome by exsuperancy,* hath brought many into an Error: some so as quite to deny all Reaction; and others who saw it demonstrated by reason and experience, that there was Reaction, so as to make them feigne false manners of Reaction. For some hold, that there is indeed Reaction, but that either it is not according to the same part, or not according to the same Contrariety. For if there be a certaine hot thing, which hath not an equal degree of heat in all its parts, they say it may act according to its strong parts, and resuffer according to its weak ones: but if all parts have equal Heat, then it cannot suffer any thing from the cold patient, according to the same contrariety, but according to some other: as if the fire act upon Water, it suffers nothing therefrom as it is cold, yet it may suffer therefrom as it is moist. Others do thus think: that Reaction is primarily indeed, and of it self, according to a diverse contrariety, but secondarily and by accident, according to the same Contrariety. Forasmuch as one quality may be corrupted primarily by its contrary quality, and accidentally by the Corruption of that, wherewith it is Naturally in the subject: as for examples sake, the Heat of Fire while it acts upon Water as cold, of it self or primarily it resuffers not from the coldness of the Water; yet because the conjoynd dryness suffers from the moisture of the Water, it is also therewith debilitated and remitted.

You may read more opinions in the Authors forementioned, all which rejecting, thus we determine: that there is a Reaction; and that it is according to the same contrariety, and the same part, and of it self and primarily. And the first is taught, in the first Place, by experience. For if a Man take a piece of Ice in his Hand, both his Hand is cooled and the Ice is melted; and a red hot Iron cast into cold Water, it heats the Water, and is cooled by the Water. And Reason proves the same. For reaction being taken away, there will be no Mixture: seeing mixture cannot be made, unless the qualities of the Elements being by mutual action and passion broken and remitted and altered, be reduced to a certain temper and Con-

cord. Aristotle saies the same, in 3. *Phys. Cap. 2. Text 8. 16. 1 de Gen. & Corrup. Cap. 7. T. 53. C. 10. T. 87. 89. Lib. 4. de Generib. Animal. Ch. 3.*

The same Experience teaches the other, which witnesseth that boyling Water and Cold, which are only opposite in heat and cold, if they be mixed together, become tempered, and that the boyling heat allaieth the coldness of the cold Water, and the cold abateth the Heat of the boyling hot Water. For unless Reaction were according to the same contrariety, there could no mixture be made. For if the Fire as hot should only act, and should not suffer; the heat and moisture of the Water would remain in the highest degree, and consequently no mixture would be made. Moreover, every contrary, Naturally and of it self, acts upon its contrary, as long as it is in presence. Hither tends that, *Out of the 3. de Gener. Anim. That which beates is cooled by that which is heated.*

The same Experience makes for the Third, and Reason teaches, that if there must be perfect mixture, all parts of the Elements must be altered, and reduced to a Mediocrity.

Experience also confirms the fourth, whereby we are taught, that hot and cold Water, which agree in moisture, and are opposite only in heat and cold, can nevertheless mutually act and suffer. And truly, heat is not peculiarly joyned with moisture or driness, but may consist with either: whence it is also that the Elements which have affinity one to another in one of their qualities, do mutually act and suffer.

And that we may free our selves from that difficulty which hath seduced others, we are to know: that there is a twofold action, one imperfect and begun, which they call an action without the Agents Victory, whereby the Agent does not change the whole Passive subject, but only weakens the same, and impresses some degree of a quality thereinto: the other perfect and compleat, which they call an action with Victory of the Agent, whereby the Agent makes the Patient perfectly like it self. Hence, we answer, 'tis one thing to act, another thing to overcome; one thing to suffer, another thing to be overcome. And therefore, if Action be taken in the first manner, for action begun, in every Alteration, there is Reaction, and the contrary Patient reacts upon the Agent; provided it be in fitting distance and quantity. For even that which hath less force, before it is quite overcome and abolished, makes impression of some quality upon the stronger, and extinguishes some degrees of the contrary quality. But if action be taken for a perfect abolition of the other quality, there is no Reaction. For nothing can perfectly destroy a thing, and be perfectly destroyed thereby. Wherefore that saying of Aristotle, before alleadged in his *B. de Motu Animal. c. 3.* must be understood of this action, and not of the former.

*The definition of Mixture.* And so much shall suffice to have spoken of the mutual action and passion of Elements: we now come to Mixture which results therefrom, which Aristotle in his *De Gen. et corrup. cap. 10.* Thus defines: *Mixture is the union of things apt to be mingled, being first altered.* Now things apt to be mingled, are such as can subsist separate, by themselves, and they are only substances. Hence accidents are neither said to be mingled one with another, nor with their substances; and mixture is properly of bodies, not of qualities: again, such things as are contrary, and can mutually act and suffer; finally such as can give a bulk to the mixt Body.

*whether or no and how the Elements remain in a mixt body?* But here arises no light Question, *How Elements remain in mixt Bodies.* For seeing the things mingled ought to be altered, not corrupted; it seems the Elements remain in the mixt body, but perish not. Contrarily, seeing mixture is not only an heaping or jumbling together of the things mixed, but an Union, so that of many Natures one is made; it should seem that the Elements do perish, and that of them a certain new Nature is made: whereabouts, the opinions of Authors are various. We, rejecting the rest, will follow *Avicenna*, whose opinion is approved of very many most learned Physicians, and seems so evident and firm to *Fernelius*, that in the *Second Book of his Physiology, cha. 6.* he calls the contrary opinion vain and childish, Yea and monstrous, and such he accounts it, as that it stains all the Glory of that Philosopher that holds it. Now the opinion of *Avicenna* is, that the Elements do not only remain in the *Mixt Bodies*, but also retain their forms perfect and entire. For in the first place, seeing Aristotle himself, in the end of his *Book de*



*de Ortu & Interitu*, defines mixture to be, *The union of the things mingled, being Altered*; The very Nature of mixture declares as much; Seeing things which are not preserved cannot be mingled. Nor does the word union oppose this opinion. For *Union is the coupling of things which truly are*, but not of things which are perished. And though of many things one is made; Yet neither is it necessary that those simples should perish, nor is it a bare heaping together, but by a superior form the simples are reduced into one Body. Moreover, since action supposes an act, and in mixt Bodies the Actions of the Elements appear, it must needs be that they are actually in them. Not to speak of others, *Aristotle himself, in the beginning of his 1. de Cælo*, writes that a mixt Body is moved according to the motion of the most prevalent Element. Finally, the resolution of mixt Bodies into the Elements shews the same. For mixt bodies are resolved into the Elements, and *Aristotle himself holds in 1. de Gen. & Corrup. Text 84.* That the things mixed may be again separated from the mixt Body. Which if it may be, they must of necessity actually exist in the mixt Bodies.

Now their opinion is altogether foolish who hold, that the Elements do not return out of the mixt Body, the same in number, but the same in sort; nor is it founded upon any reason, but is only invented to palliate an absurd opinion; rather it is opposite both to reason and Experience. For whereas they hold, that the Elements return out of the mixt Body, by reason of the action of a like Element, whereby they recover that which they had lost in the Mixture; how I pray you in distillations and burnings, can Water and Earth be drawn out of the compound; seeing the fire by acting upon the mixt Body, introduces nothing Watry, nor any thing Earthy: Yea the action of the Fire is contrary to the Water and the Earth, but does not augment, nor perfect the same?

And that which *Averroes* and *Zabarella* do produce concerning the refraction of forms, is a meer figment, and that opinion is sufficiently refuted by the *Latins*, disputing against the opinion of *Averroes*, who hold the forms of the Elements are capable of more and less; nor have they ever brought so much as a probable reason for their opinion, but only simply affirm, that forms have certain degrees, some of which being taken away, the rest may remain.

Howbeit, not only the Concourse and action of the Elements is requisite, to produce a mixt body, but the direction of a superior form must of necessity be joyned. Which thing also *Scaliger* acknowledged, where in his *Exercitation, 307. Sect. 20.* he thus writes, *Unless the four Elements should have a Governour or Pilot, they would vainly and to no purpose toss and be tossed. For what is it that mingles so much Earth with the rest? But there must be in every thing, one thing primarily moved. Now they cannot move themselves to any work, but in Compounds, by a more excellent form, and in things imperfectly mixt, by an external principle, they are moved to a mutual connexion.*

Thus therefore we briefly express the whole Nature of mixture. In mixture the simples must first of all be divided into very smal parts; therefore things Liquid, brittle, fine, are easily mingled. The Elements being thus divided into smal portions according to the Nature of the mixt Body; they do by their contrary qualities mutually act one upon another, and suffer one from another; do heat, cool, moisten, dry one another mutually, and one acts upon another, as on a separated contrary: for they are not as yet united. But because the force of heat and cold is greatest, therefore these things do first temper themselves, and the cold renders the heat temperate and moderate, as far as the Nature of the mixt Body to be produced requires. This tempered heat does afterwards extenuate the moist and dry as the matter, that the parts of the simples may be perfectly mixed, according as the Nature of the mixt Body requires. For heat alone of it self is the Author of mixture; but cold accidentally concurs to mixtion, inasmuch as it moderates the heat.

Chap. 3. Of the Generation and Corruption of Bodies Natural.

But, inasmuch as a mixt Body and the Generation of a mixt body are either one and the same thing, or at least the one cannot be without the other; we must now treat of the Generation of a mixt Body. But, forasmuch as there are sundry sorts of generable and corruptible things, and some are simple, others mixt, we shall first speak of generation in general, *viz.* As it concerns every substance liable to generation and corruption; afterwards, of the sorts of generation, *viz.* The Transmutation of the Elements, the generation of mixt Bodies, and their corruption, which is putrefaction.

The Definition of Generation.

Now Generation as it is taken in General, *Aristotle* defines in his 1. de Gen. & Cor. cap. 4. t. 23. thus: *Generation is the mutation of the whole, no sensible thing remaining, as the same subject.* The Sense of which definition is this; that Generation is a substantial mutation, wherein the specific form of a natural body being abolished, a new one is produced, so that there remains not the same sensible subject of the form acquired, which was the subject of the form lost, and the whole compound is said to be corrupted, and a new one generated. For the whole, in the definition of Generation, doth not signify all the parts of a natural body; for the *prima materia*, or first matter is not corrupted: but the Integrity, Absoluteness, and perfection of a natural body, consisting in its specific form; which is therefore by *Aristotle* sometimes called *Totum*, because it compleats and perfects the whole Essence of a thing. For as the sort of a number is taken away, when one unity is subtracted, and the number of seven ceases to be seven, when one is taken from it, although the other six unities remain: so, by reason of the ultimate and specific form of a natural body, the whole is said to be changed and to perish; so we say, an Horse is perished, though the form only be perished, the Body still remaining.

Wherein the Nature of Generation and Corruption consists.

Herein therefore consists the whole Nature of Generation and Corruption, that the last and specific form be abolished, and another arise, or be introduced, by which the compound generated may differ specifically or as another sort, from the former which was said to perish, when the form perisheth. Hence also it appears how that common speech, That Generation and Corruption is not of the form, but the matter, is to be understood. For the meaning thereof is not, as if all the parts of a natural body were corrupted, or bred anew; for the matter remains the same in all generation and corruption: but that, by the mutation of the ultimate and specific form the compound itself is changed; and receives a new denomination.

Now that this is the Sense of these words, and what is to be understood by the mutation of the whole, these following words of the same definition declare: *No sensible thing remaining as the same subject.* By which words *Aristotle* intimates; that in no substantial Generation the same sensible subject can remain for both forms, *viz.* that which is lost and that which is gained. For though the *materia prima* be preserved: yet is it not sensible: which is true not only in the generation of Elements, and of mixt bodies, but even of the generation of Animals. For when a living Creature perishes, the form which is lost, is the Soul: but that which is the form of a dead Carcass, is an inanimate mixt body, or a congeries or heap of many forms; which constitute many and divers homogeneal mixt bodies; and so these two forms have not one common sensible subject. For that which was instead of a subject to the Soul, was the form of mixture: but the soul departing, those forms of many homogeneal mixtures do no longer supply the place of a subject, but of specific forms, whose subject is the first matter. And although in the generation of a Carcass there comes no new form; yet it is all one, as if there came a new form. For the form of mixture in the living Creature, in respect of the whole live Creature, did hardly supply the place of a form, but rather of a Subject and Matter; since in every mixt thing, the Essential parts have the same respect one to another, that every precedent inferior, is to the following superior, as Matter to Form, and aptitude to Act. But when the Soul is taken away, the form of mixture,

mixture supplies the place of the specifick form, and really performs the office of a form, and gives denomination and specifick being to the mixt body; which it did not do before, when the Soul was present.

Out of the Premises an Answer may easily be made to that Question: *whether besides the first matter, any form which was before in the thing corrupted, do remain in the thing Generated; or whether in every Generation there is a Resolution into the prima or first matter?* For seeing things perfectly mixed, are either parts of living bodies, or other sorts of bodies natural, as precious Stones and metals; and the generation of these things is performed, not only by the Concourse, and action of the Elements, but by the direction of the upper form: again, it doth not alwaies draw and mingle simple Elements, for the formation of a body necessary to it self, but also the first mixt bodies; therefore it is not necessary, that there should be alwaies a resolution into the first Matter.

Also from the Premises all the Causes of generation may be collected. The form is expressed in the definition, by substantial Mutation. The common subject of generation, is the first matter it self; and the immediate subject, are the four Elements of sublunary things. The general and remote Efficient, is the Virtue of the Heavens: the immediate and adequate, is the Generator or Agent, viz. the forms of sublunary things. For they by the first qualities and viral heat, as their immediate Instruments, do make mixt bodies for themselves, necessary for their own preservation, and the performance of their actions.

But the first matter is not the adequate cause of generation: seeing it is a being, meerly potential, and can beget or effect nothing, but only suffer. And therefore the matter is a cause that the Generation may be made; but the Agent or Generator, is the cause that it is actually made. The End of Generation, is the Conservation of the several sorts of Natural things. For since in the sublunary part of the world there is no perpetuity and eternity of individuals or particular things; Nature conserves the Eternity of every sort, by the perpetuity of Generation.

The definition of generation, agrees also to corruption, as manifestly appears out of the last words of *Text 22. c. 4. Lib. 7. de Gen. et Cor.* and appears from the thing it self. For the generation of one thing, is the corruption of another; as is wel said by *Aristotle 1. de Gener. & Cor. c. 3. T. 17.* For, since that which corrupted is not turned meerly into nothing, but the matter remains; and it cannot subsist of it self, without any form; it must be, that one compound being abolished, and one form destroyed, another form should come, to constitute a new compound. Moreover, since two specifick forms cannot be in the same subject (for nothing can be at the same time under several sorts) it must needs be, that when one form comes, the other which was before in the subject, must give way. Hence also came that saying; That Nature primarily intends generation, secondarily corruption. For one thing cannot be generated, unless another be corrupted. For since the intention of the Generator, is to make the Patient like it self; and this it cannot do, unless it first destroy the form therof: secondarily therefore it desires the destruction of another. And this is the Cause of the perpetuity of Generations and Corruptions; viz. Because the matter when it is robbed of one form, receives another; and when it puts on one, it puts off another. Yet it must be here observed, that the Generation of one, is not the corruption of a body of the same sort, but of another of a different sort.

Having thus explained the universal Nature of Generation, let us now speak of the sorts of Generation. The Proportion of the Elements which act one upon another is various: For sometimes one contrary only prevails in strength over another, so as to be able quite to abolish the same, and to turn it into its own Nature; and then there happens the generation of one simple Element. Sometimes the Elements are after a sort equal, or at least their inequality is not so great, that one of them can quite destroy the other, and turn it into its own Nature; and then, by mutual action and passion they weaken one another, and making friends as it were, they grow together, into the Nature of one mixed Body. Now we shall speak in the first place, of the generation of Elements. And although, not only *Empedocles*, and other Ancient Philosophers, but also some late writers, deny that the Elements are turned one into another: yet we shall retain the common Doctrine, which is proved by reason and experience. For we see daily, that by fire other Elements

*whether in Generation, there is a Resolution into the first matter.*

*The Form of Generation. The Subject. The Efficient.*

*The End.*

*Nature primarily intends generation, secondarily corruption.*

*whether the Elements can be changed one into another.*

Elements are turned into Fire; and water, which of its own Nature is moved downwards, when it is set over the fire, turns to Air and mounts of its own accord upwards, which motion belongs properly to Fire and Air. Now the Reason is this: those things are apt to be changed one into another, which are contraries, and have one common subject. And such are the Elements: for they have the first matter for their common subject, and contrary qualities. And therefore they may be changed one into another. Howbeit, the Elements are changed, not in whole, but in part.

And indeed all Elements are apt to be mutually changed, and there is none of them, which may not be changed into another: for as Aristotle saies in 2. de Gen. et Cor. c. 4. T. 24. *Generation is out of Contraries into Contraries, and all the Elements have a Contrariety one to another, because the differences are contrary.* Howbeit, these Elements which agree in one quality, as fire and Air in heat, water and Air in moisture, are more easily and speedily changed one into another: but those Elements which are quite contrary and disagree in both qualities, are more hardly changed one into another. For when two things joynd together are to be changed by their contraries, they resist more strongly, then when one quality only is contrary, and the other like; because by reason of that similitude, the approach of the contrary is more easie. And therefore of two contrary Elements, a Medium is sooner generated, then one of another: and we see that of Fire and Water, Air is bred. For the Medium agrees with both, in qualities.

*Mixture and the generation of a mixt body, differ not really, but only in respect.* And so much of the Generation of Elements. Let us now come to the simple generation of mixt bodies. Now the Generation of a mixt Body and Mixture, of which we spake in the foregoing Chapter, are really one and the same thing: although they differ in respect. For both mixture, and the Generation of a mixt Body, doth signifie a certain progress to the form of a mixt Body, which consists first in mutual alteration, caused by the action and passion of the first qualities; also in the action of the two active qualities upon the two passive, or in the mixture of moist with dry; Finally and chiefly, in the production of the form it self: and therefore both the generation of a mixt body consists in Mixture, and Mixture is contained in the Generation of a mixt Body. For the term union, doth not only signifie a collection of the Elements, and a placing them together; but a production of one Nature, out of several things mingled.

Yet they differ in respect. For since both in mixture, and in the Generation of a mixt Body, the Elements are as it were the term *a Quo*, and the mixt Body, the term *ad Quem*; the term mixture, doth chiefly respect the Elements, for the mixture is of the Elements, and not of the mixt Body: but the term Generation respects the mixt Body it self. For *that* is then said to be generated, and not the Elements. Nor yet can the one be without the other; nor doth mixture in time or Nature precede Generation: both consist in the production of one Nature.

*The definition of the generation of a mixt body.* Now Aristotle defines the Generation of a mixt Body, in the 4. of his *Meteors* Ch. 7. after this manner: *Generation is a simple mutation, by the active faculties, when they have their respect, from the matter subject to every nature.* Now, this is the sense of this definition: the Generation of a mixt Body, is a substantial mutation, made by the two active qualities, acting upon the two passive, as their subject matter, and ruling over them in such a proportion, as is necessary to draw forth the form proper to every mixt Body. For the active qualities are not alwaies in an equal proportion to the passive, but variously proportioned, according to the divers Natures of mixt Bodies, which require sundry temperaments. Nor is the dominion of the active qualities over the passive, so to be understood, as though in every mixt Body, the active qualities did in some degrees exceed the passive; since experience doth testifie the Contrary, which teaches, that some mixt things, are to be termed hot, some cold, some moist, some dry, according to the Nature of the over-ruling quality: but this dominion is only to be understood in respect of the form of the mixt Body, to be Generated. For then Namely, the active Qualities are said to rule over the passive, when the proportion of the former to the latter is such, that out of them they might produce some certain form of a mixt Body. For even that which is hot to four degrees, acts upon that which is moist to six, and thereof makes a certain mixt Body.

That

That Question also must not be here omitted; *Whether in this Case the power of the two active Qualities be equal, and their office and Dominion equal.* Touching which we are to know, that both the Generation of the mixt body it self, and the alteration previous to the form, do proceed of themselves and primarily from heat, and that cold doth no other wise concur, then as it tempers and moderates the heat, and makes it fit to produce this or that mixt Body. For the Generation of a mixt Body does chiefly consist in a perfect mixture of moist and dry, suitable to the Nature of the mixt Body: but this cannot be done, save by attenuation, which makes that all the particles of the moist matter may be exactly united with the particles of the dry; now extenuation of it self is caused by heat, sometimes greater and sometimes less. But cold of it self is not an instrument of generation, but rather of corruption. Howbeit, in a mixt body already generated, and constituted in its essence, even cold also acts of it self, and confers thereon its perfection as it were, and aptitude to its operations. For mixt bodies are congealed and condensed by cold.

Lastly, after the Generation of a mixt Body, it remains that we now treat of the Natural destruction thereof, which is *Putrefaction*: concerning which, so great are the Controversies amongst learned Men, that some late Philosophers and Physicians have filled whole Books with disputes about putrefaction. We, though much might be said thereof, shall briefly discourse thereupon, so much as the Nature of our work will bear. And seeing Putrefaction is opposed to the Generation of mixt bodies, we may easily proceed from the knowledge of Generation to the knowledge of putrefaction. It hath been already said, that the whole Nature of mixture, or of the Generation of a mixt Body, doth consist in a due conjunction of moist parts with dry, which is caused by heat, in a certain degree: and since the Cause of the Generation and conservation of a mixt Body is the same; a mixt body shall so long remain in its Natural State, as there is a due and just mixture of moist and dry, under a fitting dominion of heat: and the Destruction of a mixt Body must proceed from the separation of the moist and dry parts: which must arise from the abolition or abatement of Natural Heat. For the Natural heat diminished or abolished, can no longer retain the dry parts joyned to the moist. Now the Cause which weakens the Natural heat, is the heat of the Ambient Body, which if it be stronger, calls forth the Natural. For the Natural heat being encreased by the ambient heat, loses the proportion it ought to hold to the passive Qualities, and therefore vapors away, and leaves the mixt Body; whereof the moist and dry parts being destitute and having lost their governor as it were, they become separated, and the moist parts are carried with the Heat as its conveyance, into the outside, and so vapours away; and so comes putrefaction, which is only the destruction of a mixt Body, considered as such. I say the Natural destruction, that is, which happens according to the Laws of Nature Universal, which will have all mixt things subject to corruption, and to be at last resolved into the Elements whereof they were made: as violent destruction of a mixt Body is when the whole is changed into one Element, as by burning, or also by overmuch cooling, as some will have it.

All this whole Nature of Putrefaction Aristotle in the 4. *Meteorol. Cap. 1.* hath comprehended in this definition: *Putrefaction is the corruption of the proper and Natural heat, which is in every moist Body, by the Heat which is without the same, Namely, in the ambient Body.* Which Definition contains all the Terms of a perfect Demonstration, and Demonstrates a proper Affection of its proper subject, by its proper Cause. The proper subject is a moist body. For nothing can putrefie, unless it be moist. And therefore all mixt Bodies putrefie, inasmuch as they are moist. The next positive cause is the Heat of the Ambient Body; which is not only Air and Water, but every thing containing, which overmuch augments the internal heat, and disturbs the proportion which it bears to the rest of the Qualities. Its adjunct is the Corruption of the internal Heat, and of the substantial form it self.

From these things thus explained an answer may be made to many Questions. For hence that Question may easily be answered, *Why all things which putrefie become at last cold?* Although in the beginning they were hot. The cause of the former is the corruption of the inbred heat; of the latter, both the external heat also, which encreases the internal, is the Cause; and because the internal heat, the proportion being

*Putrefaction is opposed to the generation of mixt bodies.*

*The definition of Putrefaction.*

*Its subject*

*The next Cause.*

*Its adjunct.*

*Why all things that putrefie become at last cold?*

ing disturb'd which it bore to the rest of the Qualities of the mixt Body, going out, doth more shew it self to the sense. For in the mixture it was so tempered, and joyned in such a league of friendship as it were with the rest of the Qualities of the mixt Body, that it could hardly be perceived by the sense; which League being broken in the Putrefaction, it becomes more sensible, and acts more freely.

*why things putrifying, become at first moist and then dry?* And upon this foundation depends that same distinction of Physicians, whereby they say, that some things are actually Hot or Cold, others potentially: and they say that Pepper, Ginger and Wine, are only potentially Hot, because they are not hot to feel to, but only when they are within the Body, and dissolved by the heat of the Stomach. For the Cause hereof is, that Pepper, Ginger and Wine, although they contain much heat in them; yet the same is so tempered with other Qualities, that it doth not put forth its force, while it sticks in the mixt Body abiding in its Natural condition. But when a man hath taken them into his Stomach, that same harmony of qualities is dissolved and disturbed by the heat of the Stomach, and the Heat of these mixt Bodies is called forth; which doth work more freely and strongly, (the friendship it had with the rest of the Qualities being now broke) no longer as the heat of a mixt Body, but rather as heat now separated, and left to its own Liberty.

*why mixt bodies sooner putrify in hot seasons and places.* And the Cause is the same, why things putrifying become at first more moist, and at last are quite dried up. For the moisture together with the heat vapors out, flows abroad, and goes to the outward parts; Which at last being quite dissipated and evaporated, the mixt Body turns to Dust and Ashes. Also hence a Reason may be given why mixt Bodies in hot Seasons and places do sooner putrify then in cold; and why things very hot or very cold do not easily putrify. The Cause of the former is, that in cold times and places the heat of the Ambient (if any remain therein.) is not so strong as to be able to call out the internal heat: but in an hot time and place the Contrary happens. And the Reason of the latter is, because both a strong internal cold resists the heat of the Ambient, so that it cannot corrupt and call out the inbred heat; and a strong internal heat doth not suffer it self to be overcome by the heat external. Nor can an external weak heat so intend an internal strong one, that it can be no longer fit to conserve the mixt Body. Hence also a great Quantity is less apt to putrify then a small one; because in a great Body there is more heat or cold, which also doth more strongly resist the external heat. Also a thing moved doth not so easily putrify, as that which rests, because it is less subject to the action of the ambient heat.

*why things very cold or hot do not so easily putrify.* Now from what hath been said the Nature of putrefaction is sufficiently apparent: and yet many dispute at large, whether it be only one, or there be divers sorts thereof. We, omitting tedious disputes, do acknowledg only one putrefaction, *viz.* That which is explained, in the foresaid definition of Aristotle. Yet we grant that which there is some diversity in the putrefaction of things, because of the Various Nature and constitution of the mixt Bodies which putrefie. For those things do perfectly and totally putrefie, which are perfectly resolved into the Elements whereof they were made, so that all the other Elements evaporating, there remains nothing at last but Earth: and thus all those things putrefie which have much Earth in them.

*why things very cold or hot do not so easily putrify.* But those things putrify imperfectly and in part, which contain more moisture in them. For seeing the moisture which is more abundant in them cannot be with the heat totally drawn out: only some parts thereof, especially the more thin and subtile are drawn out, and the rest are preserved; and this is termed putrefaction according to part; the Nature whereof is nevertheless the same with that of the putrefaction before defined. For herein the internal heat is corrupted by the external. After this manner Wine putrifies, and the Humor in our Bodies; the three Elements, Air, Water, Earth, inasmuch as they are not pure, but in some measure mixt with other things. The Fire alone does not putrify, for this Cause especially, because nothing is more hot then it, which may corrupt and call out its heat. But whether or no in this imperfect putrefaction the form of the mixt Body

*whether the form be abolished in putrefaction.* do quite perish, and a new mixt thing be produced, or whether only some alteration be made, is a doubtful case. We answer briefly: in every true putrefaction somewhat is corrupted: but of an imperfect putrefaction there are more degrees, one

one greater another less. For sometimes the putrifaction is so light, that some particles only being corrupted, the mixt Body doth still retain its proper form: but sometimes again it is so great, that though the whole mixt Body be not quite resolved into its Elements, yet the whole form thereof is abolished, and the said Body changed into another sort. And therefore all Putrefaction is Corruption, and not Alteration only. For although the Blood which putrifies in the Veins, is not wholly corrupted, but only altered in part: yet those parts which are said to putrifie, are really corrupted according to their substance, and cannot return to their Natural state, but must be evacuated by Purgation: but the others which are not corrupted in their substance, are not properly said to putrifie, but only to be heated by the putrified parts.

Chap. 4. Of Temperament and Coction.

**H**AVING treated hitherto of the Elements, their mutual action and passion, and the Generation and Corruption of mixt Bodies: before we come to the sorts themselves of mixt Bodies, we must add some things concerning temperament and Coction.

As for what concerns temperament, certain it is that it depends upon the mixture of the Elements, and arises from the action and passion of the first qualities: yet what it is, is not so manifest. We, omitting the opinions of *Fuchsius* who not rightly asserts in the 1 of his *Inst. Med. S. 3. C. 2.* That a Temperament is a substance, not an accident, and of others who hold that a Temperament is a bare Relation and Harmony of Qualities, as also of others, which are by other Authors reckoned up; we hold, that a Temperament is one Quality, arising from the mutual action and passion of the first Qualities in mixtion. For the fight of the first Qualities, which is necessary to the Generation of a mixt Body proceeds so far, till they be all refracted and abated, and having cast away certain degrees of Contrarieties, by which they were at extream variance, Friendship being made, as it were, they joyn and grow together into one Quality. And so a temperament is nothing else but one Quality of a simple Essence, which is made up of the remiss degrees of the four Qualities. For as of the remiss degrees of the Elementary forms one simple actual form doth arise, which nevertheless contains them all in its faculty: so out of the first Qualities there arises one moderate and actually simple Quality which potentially contains them all. But we must not say (which opinion as some learned men tell us, is ill fathered upon *Avicenna*) that a Temperament is a certain fifth Quality, diverse from the four first, and superadded to them; but only a middle one, arising from the others abated and conjoyned, and containing them in it.

But since the Elements are in sundry manners mixed, and the first qualities are tempered together in sundry proportions; hence there arise sundry differences of temperaments. For if the Elements and Qualities concur to the mixture in strength and degrees perfectly equal, a temperament is effected, which is called *Equale ad pondus*, Equal in weight; as if in it the degrees of the Qualities were weighed and distributed in an equal weight; also absolute equality, because comparison is not made to any extrinsecal thing. Now this is to be understood of the equality of degrees. For the Elements cannot be mixed in equal Quantity; since the efficacy of Fire is much greater then that of Earth; and therefore if they should concur in equal portions, the Fire would not generate a mixt Body, but only Fire: and experience testifies, that all perfectly mixt Bodies do obtaine very much Earth, by Virtue whereof they become heavy. Though some deny that this temper is to be found in Nature; yet we see no firme Reason to hinder us from holding, that the contrary qualities may meet in the same degree, to the constitution of a mixt Body. Yea and *Galen* saies that this is the Rule of all the rest, and that the rest cannot be known without it, in his *B. de Temperam. C. 3.*

*A temper-  
ament e-  
qual ac-  
cording to  
justice,  
what it is?*

There is moreover as yet another equal temperament, which is called equal *ad Justitiam*, wherein the qualities concur, not in a degree absolutely equal, but in such a manner as is most convenient to the form of the mixt bodie and to the performance of its generations, and which holds a medium amongst mixt bodies of the same sort. For one mixt body of its own Nature is hotter, another colder; one moister another dryer. The temperament of a Lion is more hot then the temperament of a Fish; flesh is hotter then a nerve; a bone dryer then flesh. And although in this manner this temperment may be called equal, *viz.* because that equality is kept therein, which is convenient to every mixt body, and according to Geometrical proportion every one hath his own: yet in respect of a temperament absolutely temperate and equal, it is termed unequal; and that body furnished therewith may be termed intemperate: although commonly that is called intemperate which is departed from the temper which Naturally it ought to have.

*Eight sorts  
of temper-  
aments e-  
qual in re-  
spect of  
justice.*

Now how many sorts there are of this temperament Authors agree not. We hold with Galen, 1 de temp. C. 8. For when only one quality superabounds, and overcomes its contrary, the two rest keep equality; for examples sake, if any mixt body should have five degrees of Heat, and three of cold, and four of moisture, and as many of dry; it should be called a simple temperament. Of which there are four sorts; hot, wherein heat exceeds cold, and moisture and dryness are equal; cold, wherein cold exceeds heat, and moisture and dryness are also equal; moist, wherein moisture exceeds dryness, and heat and cold are equal; dry, wherein dryness exceeds moisture, and Heat and cold are also equal. But when two Qualities exceed the other two, 'tis called a compound Temperament; of which there are againe four sorts, according to the four possible combinations of the four first Qualities; *viz.* Hot and moist; hot and drie; cold and moist; cold and drie. According to these differences a thing is

*How ma-  
ny waies a  
thing is  
said to be  
temperate,  
and not  
temperate*

said to be temperate or intemperate: but after several manners. For a thing is said to be so and so, absolutely or respectively. Absolutely only the Elements are hot, cold, moist, drie; seeing in them only these qualities are sincere and pure. Now by comparison and exsuperance a thing is said to be so, which though it have all the Qualities, yet one excells the rest; so that is termed hot which hath more heat; and that cold, which hath more coldness. Now this comparison is made to four things; either to the universal Nature of all mixt bodies, wherein if you can conceive any thing of an indifferent temper, such as is the skin of a man, especially that on the palms of his hands and the tops of his fingers, (unto which therefore they refer the judgement of all temperaments;) all other things in respect thereunto will be called intemperate, and according to the Quality exceeding this Mean, they shall be called hot, cold, moist, drie; Or the comparison is made to the next kind; as if in the whole kind of Living Creatures you shall conceive some one to be temperate, as perhaps Man is; all other animals shall be called intemperate, the name being borrowed from the exceeding Quality: or comparison is made to somewhat Indifferent, in the same sort; so a young man is said to be hot, and an old man to be cold: or finally, comparison is made betwixt divers sorts, or any obvious individualls. So a dog, in respect of a Lion is cold, in respect of a Fish hot. So Peter compared to Paul is hot: but if you compare him to another more hot, he is cold.

*The defi-  
nition of  
concoction*

And this may suffice to have said in this place concerning temperaments: let us proceed now to concoction, which is a certain perfection and compleatment of the temperament. Now thus Aristotle (in his 4 Meteor. Ch. 2.) Defines concoction. *Concoction is a perfection, by the Natural & proper Heat, made of opposite passives, which are the proper matter to each one.* This definition as every orderly definition of adjuncts or accidents, hath in stead of kind the form, in stead of difference the subject, with the efficient caule: all which are to be considered in this place, that we may attain the perfect knowledg of Digestion or Concoction.

*The form  
of conco-  
ction.*

The Form of Concoction is nothing but the ultimate perfection of the proper temperament of a thing. For then a thing is said to be concocted, when it hath attained that perfection and compleatness, in its qualities or temperament, which it ought to have. And therefore that perfection is here to be understood which consists in Qualities, and not that which is Essential, proceeding from the substantial form. Which also Aristotle signifies in the 12. Sect. Prob. 7. *Concoction is the alteration of the thing concocted.*



The matter or subject of concoction are the two passive Qualities, but especially moisture. And hence it appears, that coction is an affection of a mixt bodie, as it is moist, and that it doth not belong only to the meat of living Creatures, because other things also are said to be concocted, which can never become nourishment for animals. Hence also 'tis manifest, that coction belongs to a thing already engendred and constituted by its own Nature. For nothing is said to be concocted, but that which is already engendred, only it hath imperfection in its temper, which must by further alteration be perfected; which being done the thing is said to be concocted.

As to the Efficient Cause: *The beginning of perfection* (saith Aristotle) comes from the proper heat of the subject, although it be perfected by some outward help. The principal cause is alwaies the proper heat of the thing; although sometimes it be not sufficient, and therefore stands in need as it were of another Assistant, that the concoction may be thereby better and more rightly performed. So Bathes and Plaisters help the Concoction in the Stomack. So Medlars and other Fruits being gathered before they are ripe and laid up, are ripened by their own Heat: yet the Suns Heat contributes much towards their more happy ripening.

This therefore is the manner of the whole business of concoction. When as in a mixt body, already constituted by its form, there is as yet some imperfection in the temperament, and the moisture is not sufficiently mastered and tempered, nor holds a just and exact proportion to the driness and other Qualities: the Natural Heat consumes and excels the superfluous moisture, and that which remains and offends not in quantity, it restrains and limits, and unites it with driness, as much as the Nature of the mixt Body requires; which action is termed coction, or concoction.

And that the Nature of concoction may be the better understood, Aristotle besides the internal End, which is the same with the form, adds also an External one, in these words: *The end of concoction in some things is their Nature, which we call the form as it were & Essence; in others it tends to some subject forme, when the Humidity is become such and so great.* In which Aristotle Teaches, that the External End is twofold; either the form simply and absolutely, which End chiefly appears in the ripening of Fruits, which are then said to be ripe, when the seed is now so perfect, as that it can breed its like: or some form or disposition, to the affording some utility, which consists either in the induction of a new form, or in preparation for the convenient expulsion of things unprofitable. The former use appears in that boiling of the meat, performed in the stomach. For that is therefore ordained, that the meats taken in might by the faculty in the stomach be turned into *chylus*. For such also is the Natural Concoction of flegm. The other appears in the Concoction of putrified humors in ulcers, and elsewhere in the Body of an Animal, which are then concocted and ripened, when they are so laboured by the Natural Heat, as to become apt for expulsion. For since by reason of their great corruption they cannot arrive to any perfect form and profitable to nourish the Body, they are by concoction brought to some form better at least then putrefaction. And thus Concoction doth repress Putrefaction, and puts an End thereunto, and severs the corrupt humors from the profitable, and renders them fit to be euacuated without hurt to the Body.

Things therefore are said to be concocted, when the matter of coction, which is chiefly moisture, shall be overcome by heat and bounded thereby, and have received its fitting thickness. And therefore Urines, Dung, and all the excrements of our Bodies in like manner, being rightly digested, are a signe of Health. For they declare that the Heat hath its full power in our Bodies: and that it is so much as to be able to restrain and duly to tame and keep in order all the humors. And for the same Cause, all things being digested become thicker and hotter. For Heat which bears the Rule in concoction, doth both Heat and Resolve the thin Parts. Which is also confirmed by Experience. For Apples, Pears, Grapes, and all other Fruits, before they grow Ripe are colder then they are afterwards: and Milk, Seed, Quittour in Ulcers, and Filth gathered in the corners of the Eyes, are thicker when concocted then before. Howbeit, we must here take notice, when it is said, that things Concocted are thicker and hotter then Unconcocted, that one thing must not be compared with another of a distinct sort, or with it self after it hath changed its species; but the same sort of thing being unconcocted, must be compared with it self concocted.

To

The defini-  
tion of  
crudity.

To Coction is opposed Crudity, or indigestion, which is by Aristotle in 4. Meteor. thus defined: *Crudity is an imperfection of the passive Qualities, through the defect of proper heat in the subject. And the defect of heat is cold.* From which definition it is apparent, that in Crudity all things are quite contrary to what they are in Coction, saving the subject, which is one and the same. For the Form was there perfection, and here it is imperfection; there the efficient Cause was heat, here want of heat, or Coldness. And therefore those things are generally to be called Crude, which have not as yet obtained those degrees of perfection in the Qualities or Temperament, which they ought to have; and in which moisture abounds, and by reason of the weakness of Heat cannot be rightly mastered and Limited.

Coction  
is not an  
univocal  
kind.

Having explained the Nature of Coction and Crudity, let us now come to their Sorts. Where it is first to be observed; That Coction is not an univocal kind, but of the number of those which are called *Pros Hen*, to one, and that therefore its definition doth chiefly agree to the principal and primary sort (which is the manner in defining those things which are said of some one) but a little change being made, they may also be accommodated to the rest. Now the primary sort of Coction, and which can perhaps alone perfectly bear the name of Coction, is ripening, which it self also nevertheless is not equally applied to all the sorts contained there under. For properly *Ripening is the Concoction of that Aliment which*

Ripening  
is in the  
Pulp of an  
Apple, Pear,  
or any other  
fruit.

*is in the Pulp of an Apple, Pear, or any other fruit.* But for more ealie understanding sake, Aristotle applies Maturity, or Ripeness, only to fruits; though it be common to all Animals, Plants, and Seeds when referred to Generation. Now then Maturation is said to be made, when the Seed which is contained in the Pulp of the fruit is so Elaborated, that it is able to beget its like. For at first, when there is as yet a superfluous moisture remaining, the Seed is not yet fit for Generation: but when the humidity shall by the Natural Heat be partly consumed, partly better terminated the Seed becomes fit for Generation. Again Figuratively, Flegm, quitor, and other Humors in our Bodies are said to be Ripened, when they are by the Natural Heat so digested, as either to become fit to nourish, or if they cannot nourish, that at least they may be disposed to Evacuation. Now, by ripening, flatulent things become Watry, Watry things become thin; thin things become thick. For at first the spirit, or flatulent matter is digested by heat; afterwards, the Watry Humor is further digested, and its thinner parts are resolved.

What im-  
maturity  
is?

To Maturity or Ripeness is opposed Immaturity or Unripeness, which as Maturity is also twofold: one properly so called, another figuratively. For immaturity properly so called is the rawness of the nourishment which is in the Pulp of an Apple or other fruit, by Reason of the Penury or ill proportion of the Natural heat. For when the Heat is so little, or the Humor so plentiful, that the Heat cannot exactly master the moisture, there arises immaturity, and then the Seed is not fit for Generation. And therefore all unripe things are windy, waterish, and their Humors thin and cold, unfit to nourish. And afterward Figuratively, Catarrhs, Spittle, Quitor in Ulcers, and Urin are termed crude. Also Milk unboiled is termed crude or raw; as also Tiles and all Earthen Ware, is termed raw, before it is baked.

Another sort of Coction is *Boyling*, which Aristotle in the fourth of his *Meteors* Ch. 3. thus defines: *Elixation or Boyling, Generally, is the Concoction of somewhat Indeterminate in an Humor, caused by a moist heat.* For boyling is thus made. A fiery heat being received in a Watry moisture, doth moisten the thing to be boyled, opens its pores, and makes them Wider, and so draws the moisture of the thing to be boyled from the Centre to the Circumference; and the rest of the Humor which remains, it digests, Tames, and Terminates; and therefore boyled things have less Native moisture, and more of that which is forreigne. And for this cause, Cooks that would Roast Meats carefully, do first perboyl them, viz. that some of that Humor and Excrements which are within, may be first drawn out, so that the rest may be by roasting more easily consumed.

From the premises it appears, that those things only can be boyled which have moisture, which by the fiery heat which is in a Watry moisture may be overcome. And that those things cannot be boyled, which either are Earthy, and have in a manner

manner no moisture, as Stones, Bones, &c. Or which have indeed some moisture, but which is so condensed and Joyned with an Earthy dryness, that by a moist heat it cannot be called out and Vanquished, as Woods, Metals, &c. And for this very cause, the flesh of old Animals is hardly boyled tender, in comparison of yonger; and Beef is harder to boyl then Hens-flesh: because the former are more dry, Earthy, solid and compact, and have their moisture more tenaciously fastened with their dryness, so that it cannot easily be called out by a moist heat. Also Woods, Metals &c. though improperly, are said to be boyled. For though they are not so softened as things really Boylable: yet some of their moisture is drawn forth, and communicated to the Water; which, the tast the Water receives by their boyling in it, doth witness. Also boyling is attributed to a moist Body that hath little dryness in it, as to milk, new Wine or Must, and other things, *viz.* When by boyling some parts of them do vapor away, and the remaining parts do receive some change in their temperament and tast.

To boyling is opposed imperfect boyling, which is called *Inquinatio* and *Flacciditas*, which is defined by *Aristotle* to be, *The Inconcoction of that which is undetermined in a Body, by Reason of want of Heat in the moist thing which compasseth the same about.* For this *Inquinatio* or *Flaccidity*, is properly nothing else but a boyling begun, *viz.* when the Heat which is in the Watry moisture is indeed so great, that it can in some measure act upon the thing to be boyled: but is not so strong, that it can perfectly Boyl the same, but either by cold or overmuch moisture in the thing to be Boyled it is blunted and overcome, that it cannot perfect its work; which kind of imperfect Concoction oft happens in Aged and Sick People, whose Heat doth in some manner alter the meats, but cannot perfectly digest them.

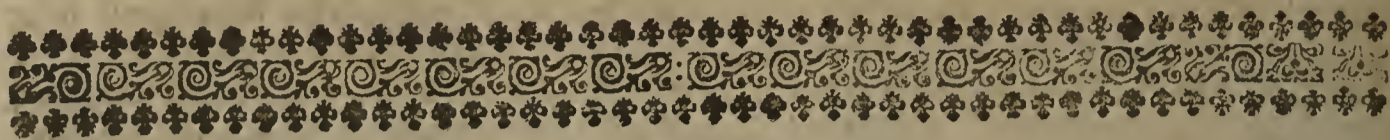
The last sort of Concoction, is *Optesis*, roasting; *Which is a Concoction caused by a dry external Heat.* For if in a mixt body the abounding humor be consumed and tempered by a dry external Heat it is called a Roasting. Now roast meats are without indeed dry, but within moist with a moisture of their own, and more moist then boild meats themselves. For the dry heat withers the external parts, and straitens the pores, that the internal Humor can find no way out. Now roasting and boyling are chiefly caused by Art, and these names do chiefly belong to them, as being because Artificial best known to us. Yet the same things are also done by Nature. For the Concoction of Aliments in the bodies of Living Creatures, and especially that in the Stomach, is boyling: also the same may not unfitly, in Hot and Dry Bodies, be called roasting.

To roasting also is opposed *Semiustulation*, Toasting, or raw-roasting. Now bad roasting is caused through want of heat, which either is little of it self, or not so great that it can possibly overcome a great abundance of Humor, and therefore it perfects not the begun roasting. *And so much touching Concoctions.*

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THE

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# THE FOURTH BOOK.

## Chap. I. Of Meteors in General.

Mixt Bodies twofold.

Having spoken hitherto in General of the Elements the principles of Natural Bodies, and their mixture; of the Generation of Natural Bodies and their corruption: order therefore requires, that we should now treat of the several sorts of Natural Bodies. And seeing that mixt Bodies are twofold, perfectly and imperfectly mixed; and the imperfectly mixt are the Meteors: we must now come to that part of Natural Philosophy, which all the Ancients (as *Aristotle* in his 1. B. Meteor. C. 1. tells us) called *Meteorologia*, the Doctrine of Meteors.

A Meteor what is it?

Later writers do here indeed raise a scruple, and some deny that a Body imperfectly mixed and a Meteor are one and the same thing; and they say the name of Meteor is of a larger extent, since there are many Meteors which are not Bodies, such as those things which happen only as an apparition as Thunder, Lightning, Earth-quakes: others again conceive that the term Meteor is only to be given to bodies imperfectly mixed, and therefore they exclude those things as Thunder &c. which have no subsistency, out of the Number of Meteors; since all things which make up the subject of Natural Philosophy, and are parts thereof, must be in the number of Natural Bodies. But this Controversie may easily be compos'd. A Body imperfectly mixed must be somewhere explained in Natural Philosophy, and indeed most fitly next after the Elements: and therefore tis said to be the subject of that part of Natural Philosophy. And seeing the same affords matter for Meteors, that part of Natural Philosophy is called *Meteorologia*, the Doctrine of Meteors. For though in it are also explained those things which are not Natural Bodies, as hath been said; yet those very things are either the Adjuncts or Effects of Bodies imperfectly mixed. Hence use hath obtained, that under the term Meteor, both Bodies imperfectly mixed and their Adjuncts and Effects should be comprehended. And so the subject of this Doctrine is *Meteoron* a Meteor, that is, *Somewhat raised out of the Earth and Water by force of the Stars and the under-ground Fire, and bred for the most part aloft in the Air.* For the word *Meteoron* in general doth signifie a thing sublime, Elevated, and hanging as it were up on high.

The Difference of Meteors.

And by aloft or on high we understand, not the Heaven, but all that space which reaches from Earth to Heaven, which place is called upwards, or above. Yea and since *Meteoron* signifies somewhat Elevated and suspended on high, even those things also which are made in the Caverns of the Earth, of exhalations there raised up, are comprehended under this Name. For all things contained under this name are not of one kind, as hath been said before. Hence some divide them into Hypostatical and Emphatical. They are most conveniently distinguished into three Ranks. For either the Nature of a Meteor consists in the changing of an exhalation into some other thing, which happens in fiery Meteors, Rain and such like; or in motion, as in Winds, Earth-quakes; or in the Reflexion of Beams, as in the Rain-bow.

The Efficient cause of meteors.

Most do hold the efficient Cause to be Heaven, and the Heaven and the Sun are the chief cause which raises exhalations: but they are not the only cause, but heat also

also concurs and the subterranean fire; and in the Generation of Metals and Minerals many exhalations are raised, as is known to those that search after Metals; and Winds and other Meteors are bred no less in the Winter, when the Sun beams are weak, then in the Summer.

The remote matter, are not only the four Elements, especially the Earth and Water, but also mixt Bodies, out of which opposite exhalations are wont to be raised. The immediate matter is a twofold kind of exhalation, raised out of them being heated. For the Heavenly Bodies, especially the Sun, and the Subterranean heat do excite and raise up a twofold kind of Exhalations: whereof the one which is termed *Atmis*, that is a vapor, is hot and moist, raised out of the Water or moist ground, being of as it were a middle Nature betwixt the water and Air, so that it may easily be changed into either Element. For it is moist in the highest degree, but heat is therein remiss, and some degrees of coldness, or portions of Water carried up therewith, do remaine in it; and as *Aristotle* saies in the 1<sup>st</sup> *Met. Ch. 3.* A Vapor is as it were potentially a Water. But the other Exhalation is called a Fume, or a Smoaky Exhalation; and it is Hot and Dry, raised out of the Earth, and especially the drier parts thereof, heated and attenuated by force of the stars; of a middle Nature as it were betwixt Fire and Earth. For this Exhalation is exceeding dry, and moderately hot; for it retains some degrees of the Earths coldness, or rather some parts of the Earth it self Elevated with it. And therefore *Aristotle* in the same place saies, that this Fume is potentially, as it were, Fire. Now there are chiefly two sorts of Fumes, the one of which is termed *Ecpblogosis* a flaming Fume, which is raised out of a Fat matter and is apt to take flame: another which is raised out of drier ground, and doth not so easily take Fire, but rather turns to Winds and Blasts. These two kinds of Exhalations though they are of a distinct Nature, and both in respect of their Heat, driness, Levity and Original differ one from another; (because a vapor is Cold, Heavy, Moist, raised out of the Water; but a Fume, Hot, Light, Dry, raised out of the Earth:) yet for the most part they are bred Joyntly, and both together, Because in most places the Earth is mixed with Water: whereupon that which of its own Nature is Heavy, by help of the other lighter, is lifted up and raised on high; although when they come to the middle Region of the Air they are separated, and the Fume is raised higher, but the vapor settles beneath. And these two Exhalations as they are commonly called are the matter of all Meteors; whence also it is that they are called Bodies imperfectly mixed; either because they do not consist of all the Elements, or because in them the forms of the Elements are kept perfect and intire, and do not incorporate into the form of one mixt Body. For which Cause also such kind of Bodies cannot long last. Yet it is wont many times to happen, that Atomes also of bodies perfectly mixed are mixed with these Exhalations; yet so as that these Exhalations are not informed by the forms of perfectly mixt Bodies, but only touch the said mixt Bodies.

The place where Meteors are ingendred is chiefly the Air. For it according to the divers Regions whereinto we have shewed it is divided, doth afford place to divers Meteors, as we shall afterwards declare. For even those also which are said to be ingendred in the Earth, are properly ingendred in the Aire contained in the caverns of the Earth. Howbeit in the Sphere of Fire; and especially in the Lowest part thereof, it must not be denied, but that Fiery Meteors are generated. Also upon these, *viz.* the place and matter; depends the chief distinction of Meteors. For some consist of an Exhalation, others of a vapor: some are produced in the upper, others in the lower Region of the Air. We shal begin with those which arise from an Exhalation, and among them with those which are commonly termed fiery and inflamed Meteors.

### Chap. 2. Of Fiery Meteors.

**T**He greatest part of fiery Meteors are bred in the upmost Region of the Air. For when Hot and Dry Exhalations do ascend thither and are there inflamed, sundry fiery Meteors are ingendred, which differ according to the various disposition of the matter, the diversity of inflammation, their magnitude, Figure, Motion and Duration:

Duration: of which though peradventure more sorts might be reckoned up, whose Names are borrowed from the shapes which they represent in their burnings, yet I shall recount the chiefest of them. Now many reckon the *Via Lactea* and Comets amongst fiery Meteors, but of them we have spoken before.

Also very many fiery Meteors do arise, differing only in the posture of the matter; the multitude and shape they represent whiles they burn; which also are to be explained. And that we may begin here: if an Hot and Dry Exhalation, not very thick and Fat, but subtile, stretched out in length and breadth, do take fire in the upper Region of the Air, there appears a burning and shining *Flame*; sometimes with so much brightness, that it doth a little dispel the darkness of the night. Some call this Meteor, *Burning stubble*, for it represents heaps of stubble suddenly set on Fire.

*A burning flame how ingendred.* *Skipping Goats.* *Skipping Goats* so called, do appear, when the Exhalation is drawn out in length rather than in breadth, having parts not equally disposed, or distinct Masses, Joyned together by thin and rare Exhalations; or they have on the sides certain threds as it were and bristles annexed. For when this is inflamed, the Fire suddenly leaps, either out of the subtile and thin part of the Exhalation into another part thereof; or it runs out into the sides and those Bristles or Appendixes aforesaid, and by and by runs back again; and so it seems to dance, like Goats wantonly Skipping.

*Burning brands.* *Burning Brands* are, when the exhalation is drawn out in like manner, rather in length than breadth, having its parts nevertheless equally disposed. For if this be set on Fire, it represents a burning Fire-brand or Beam. And these Beams do not move to and fro as Links or Torches, but are quiet, and shine in one and the same place. The *burning Lance or Dart* commonly so called, seems to be the same Meteor with the former. For by these Names a Meteor is designed, which is bred of an Exhalation or Fume, drawn out at length, and having parts of equal thickness, which being set on Fire doth burn all together, and shews the image of a Dart or Spear.

*A burning Spear or Dart.* Nor doth the Perpendicular or Pyramidal Fire, so called, differ much from this, being ingendred of an Exhalation drawn out in Length, and Lighter in its upper part, Heavier in its lower. For being set on Fire in its upper and lighter part, it represents a Pillar set bolt upright; and its lower and heavier part resembles the Basis thereof. Like unto this is the *burning Candle or Torch*; Which consists also of a dry Exhalation, drawn out in length alone, and equally thick.

*The burning Pillar.* For this being inflamed at one end, and in some measure shining upon the other part not inflamed, it represents a burning Candle or Torch.

*The Candle or Torch.* *Shooting Stars.* *Running Stars*, as *Pliny* in the 2. of his Natural History, Cap. 37. calls them: the *Coursing of Stars* (as *Seneca* Phrases it, in the 1. Book of his Nat. Quest. Ch. 14.) *Flying Stars* as some call them, and *falling or shooting Stars*, because they appear in the shape of falling or flying Stars, do happen two manner of waies. First of all when an exhalation in the upmost Region of the Air, drawn out in length, is torn, distinguished and spread abroad into many particles as it were. For the first part being inflamed doth speedily communicate the Fire to the other, the Second to the Third, the Third to the Fourth, &c. After the same manner as one Candle lighted doth easily light again another newly blown out; and so it makes shew of a shooting Star. Again, when an Exhalation subsists in the middle Region of the Air, and either by Antiperistasis of the cold Air is inflamed, made lighter and so raised on high, and shews like a flying Star; or being by the coldness of a cloud compressed and Squeezed, it conceives Fire, and moves downwards, for the most part sidelong, and violently; and then a Star seems to fall from Heaven. Also a third manner may be added, *viz.* When an Exhalation drawn out in length, of equal thickness, and apt to burn, is set on Fire. For this burning all on a sudden, and the flame speedily passing from one part to another, it makes the appearance of a shooting or flying Star. For we must not give credit to the dotage of the *Epicureans*, who taught, that Stars did really fall from Heaven. For, to use the words of *Seneca*, in L. 1. Quest. Nat. Cap. 1. if this were true, there would have been ere now no Stars left in the Heaven. For there is no Night wherein many shooting Stars appear not. And yet the Stars of Heaven appear in the same place they were in before. They are all as big as before. When many shooting Stars appear, they

they foretell Winds to follow. For they argue store of dry Exhalations which are matter for Winds: whereof *Virgil* in the 1. Book of his *Georgicks* or *Husbandry*:

*When Stars in Heaven do seem to Fall, and make  
Through Nights darke Aire, a long and Firie Tracke,  
'Tis Sign of Winde.*

The *Flying Dragon* is ingendred in the middle Region of the Air. Now this Meteor is made, when an Exhalation not too clammy and hot, meets with a cold Cloud, and is thereby driven back, and so either by motion or by *Antiperistasis*, in its upper part, where it is lighter, it is set on Fire, and seems to vomit Flames and Sparkles; but in its middle part where it is Thicker, and is bowed, it Represents a Belly: and in its lower part which is Narrower and Straiter, it Resembles a Taile.

In the lowest region of the Aire is ingendred the *Ignis fatuus*, or *Willie with the Wispe*, near fat and moist soiles, pooles, Church-yards, places of Publique Execution where Malefactors are buried, where are store of clammy and fat Exhalations. For they being set on Fire, either by *antiperistasis* of the cold Aire of the night, or by motion, do appear like burning candles, and are diversly moved according to the motion of the Air; and therefore they are called walking lights, and sometimes they seeme to go before a Man, and then again to follow him. For when such as travel in the night would come to these Fires, the Air before them being driven by their motion, these Fires being also moved with the motion of the Air do go along before and fly from them: but when they run from the said Fires; the Air behind their backs following them, the Fires do also follow. These Fires do many times draw Travellers out of their way, and make them fall into Ditches, Quag-mires, and Rivers: because wayfaring people, supposing that these Fires are Candles shining in the next Villages, do make towards them, and leaving the right way fall head-long into the next Rivers and Pooles they come at; Or by these Fires being generated about Watry Places, and there seeking their Nourishment, they are seduced into the said Waters. And it is hardly to be denyed, nevertheless, but that sometimes the fraudulent Illusions of the Devil doth concur in the Case, Who continually studies the Destruction of Man-kind, and seeks al occasons to do harm.

Also of a light Exhalation in the same manner are Bred these Meteors called *Helena, Castor and Pollux*, which are wont commonly to be seene of Mariners at sea, in the time of a tempest: and if two appear, they are called *Castor and Pollux*; if one alone, 'tis called *Helena*: and one is counted unlucky, but two a signe of faire weather. For so *Plinie Lib. 2. Nat. Hist. C. 37.* These Stars are of grievous importance, if they come single, and drown the ships, and if they fall into the Hole, they burne them up. But if they come two together they are good Signs and tokens of a prosperous voyag, by whose coming they say the direfull and threating *Helena* is chased away: and therefore they attribute this Divinity to *Castor and Pollux*, and set their Images on the Ship sterne as tutelary Deities whom they invoke at Sea; as may be seen in the *Acts* of the Apostles, *Ch. 28. v. 11.* But these things are taken rather from Heathenish superstitions then physical Causes. That appears more true, that when these Meteors are moved up and down with an unstable motion, they foreshew Winds and Tempests; and when in the time of a Tempest they fall down into the Ships, or stick to the Masts, they are a sign of faire wether and a Calme. For now they signifie that the blaits of the Winds and the Tempests do abate. Howbeit concerning the Star *Helena*, thus *Cardan* writes in his 2 B. of *Subilties P. 69.* Of the same kind wellnear is the Star of *Helen* about the Mast of a Ship, which when it falls melts even Brasse-Kettles, and is a certain Sign of Ship-wrack. For it happens only in grievous Tempests, and it cannot but Breed in a most gross Aire, nor be gathered in the Ship save by great force of Winds, so as to be set on Fire, and therefore it portends immediate Destruction. The same Author in the same plece, endeavours to shew a Reason why these Stars appearing double promise safety to the Saylor, howbeit 'tis scarce of any moment.

Fire cleaving to the Haires or Garments of men.

Hitherto also pertains the Fire which is sometimes seene on Mens hairs, and Garments, and on the Hairs of other Creatures, and upon other Things. This arises from a Subtile and Fat Exhalation, dispersed through the Air, and sticking to the Haires or Clothes of Men, or out of the sweats of Animals of an hot Constitution, or heated with vehement Motion, set on Fire by *Antiperistasis*, or by violent Motion. some such thing happened to *Ascanius*, of which *Virgil* in the 2 of his *Æneids*.

Hexameter verses.

See o'th top of Iulius Head, a glistering Lustre,  
And all about his Locks a Flame, without any burning.

*Livie* Relates such a like thing of *Servius Tullius*, Lib. 1. Dec. 1. And *Valerius Maximus*, Lib. 1. Cap. 6. Also *Livie* writes in his 3. Decad. Lib. 5. That when *Lucius Martius* was making an Oration a Flame sprung out of his Head, which he felt not, and begot him great Favour among the Soldiers standing about. Most are of Opinion that these Fires do signifie the breaking out of some great Honor or Dishonor, and that they have been alwaies taken as signs of good or bad Luck, as the Histories and Examples aforesaid do testifie. And therefore some deny that they are alwaies to be referred to Natural Causes. That is a Remarkable Passage related by *Cardan*; that a Certain Man came home to his House after one a Clock in the Night, and when he put off his Cloake, a Sparkle flew from the Cape thereof; and when he tooke his Cloake againe and laid it off, it Sparkled againe, so that he was double affrighted; and within 15 Daies he was by his Enemies accused of Witch-craft, and sought for, to be tormented and punished: but by the advice of his Friends He underwent a voluntary banishment.

How thunder is Caused.

Also from the same dry Exhalation Thunder Lightning and Thunder-bolts do arise. Touching Thunder there are sundry Opinons of the Ancients, as we may see in *Aristotle*, L. 2. Meteor. C. 9. *Plutarch de placit. Philosoph.* Lib. 3. Cap. 3. *Seneca in Quæst. nat. Lib. 2. Cap. 17. 18. &c.* *Lucretius. Lib. 6.* Nor are late writers of the same judgement concerning the same. For *Bodin* conceives that Thunder and most other Meteors, do not arise from Natural Causes, but rather from the Power of God, or the Devil. *Aristotle*, whose Opinion is thought to be more probable then the Rest, doth conceive that Thunders are thus generated: When a twofold Exhalation hot and drie, is raised together, and thickned into a round Cloud in the middle Region of the Air: and the Cloud being thickned by Reason of the coldness of the place, especially in the upper part thereof, and the hot Exhalation being shut up therein, and besieged on all sides by the cold, it fights with the cold, and seeking an egress, it runs this way and that way, shaking the sides thereof; or also breaking through the same it makes that noise which we call Thunder. An Example whereof is seen in Guns; when the fiery spirit, proceeding from the Coale-Sulphury Nitre, (to use the words of *Scaliger* in *Exercitat.* 11. Sect. I.) cannot be contained in the Room it was in when it was Gun powder, it violently seeks its passage, and suddenly breaks out, making a noise like Thunder. Which happens also in Wood and Chest-Nuts, when they are put into the Fire, containing in them a hot Expiration. For the said Exhalation being rarified, and not finding a place to containe it self, it breaks out of the wood and Chestnuts with a Noise.

Chymical operations declare the generation of thunder

Howbeit Chymical Operations do afford light to this Doctrine, which do not only declare the Cause of Thunder more particularly & clearly; but also shew that the aforesaid Noise is caused not only by the matter shut up and seeking an Egress, but also by the sudden breaking of the Air, caused by the Motion of Bodies, mutually abhorring and flying one from another. For by the aforesaid Operations it is easie to see, that as oft as a part of inflamed Sulphur is added to Nitre, a mighty Noise is Caused. Which also is to be seen in Gun-powder, and in that Preparation of Nitre, which they call *Sal Prunelia*. Nor doth the common sulphur only worke this Effect: but the Sulphur also of Minerals and Metals, when Nitre is added thereto, as appears in the Calcination of Antimony with Nitre: but especially in *Aurum Fulminans*, or Thundering Gold, so called, which being set on Fire, strikes with greater force and Noise then Gun-powder, only it moves downwards. Nor is it unknown, that of Nitre, Sulphur, Quick Lime, and Bitumen mixtures are



are made, which being sprinkled with moisture, or wet with spittle only, are set on fire. Now that force depends not on Sulphure alone, or Nitre alone, but on both mixed together. Sulphur indeed quickly takes flame, but burns slowly: but Nitre is not easily inflamed, but being once set on Fire, it burns quickly away and in a moment as it were. And therefore it is from Sulphur that Gun-powder so soon takes Fire; but that it burns up so suddenly proceeds from Nitre, and all the force thereof proceeds from the said Nitre. From whence it is not hard to judge of the Generation of Thunder. For when in the Summer time Sulphurous and Nitrous Vapors are invisibly raised up by the heat of the Sun, especially when the South-winds blow; and afterwards either by the opposite Winds, or by the coldness of the middle Region they are united and condensed, it comes to pass, that they are there inflamed, and hence proceeds the Thunder and Lightning.

Whence it appears, that it is not altogether untrue, that Thunder or somewhat like it may be also made without clouds. For Histories witness that Thunders have been heard the Sky being clear: and *Pliny* relates *Lib. 2. Cap. 51.* That there was a man smitten with a Thunder Bolt, on a clear day; and other have observed the same. Which Thunders may well be thought to have been bred of a spirit and a dry Exhalation, contained in the Caverns of the Earth, and breaking out with great violence. Which thing is made more credible by what *Seneca* relates, *Quest. Nat. Lib. 2. C. 30.* after this manner: Once upon a time *Ætna* was full of fire: it poured forth an Ocean of burning Sand. All the daylight was darkend with dust, and the People were frightened by the suddain approach of night. At the same time tis reported there were very many Thundrings and lightnings: which were caused by the concurrence of dry bodies, and not of clouds; for it is not credible there were any clouds, the Air being so burning hot.

Thunder  
may also be  
made with-  
out Clouds

Also concerning Lightning there is some diversity of opinions, as may be seen out of the places fore alleadged. Most retain the Opinion of *Aristotle*, who held that Lightning was an hot Exhalation driven out of a cloud, and set on Fire chiefly by vehement motion, and casting forth a shining Light.

Lightning  
what it is?

And although the Thunder be before or as soon as the Lightning, yet the Lightning is seen before the Thunder is heard; *viz.* Because the sight is quicker then the hearing, and visible representations of things are more spiritual, and more fit for sudden propagation, then audible. An example whereof we have likewise in such as cleave Trees in the Woods, where we see the blow light, before we hear the sound. And in Guns, where we first see the Fire before we hear the Report.

Why the  
Lightning  
is seen be-  
fore the  
thunder is  
heard?

A Thunder-bolt differs not much from Lightning; for it is an Hot and Dry Exhalation, more compact then Lightning, suddenly breaking out of the Clouds with great force and violence. And therefore it is not alwaies dispersed in the Air, as most other fiery Meteors are, but is carried often to the Earth: both because it is darted out of the Cloud with great force and violence, as also because it consists of a matter well compact and cleaving together: yet *Pliny* tells us (in his *Nat. Hist. Book 2. Ch. 55.*) that it never sinks into the Earth above Five foot. Hence *Seneca* in *Quest. Nat. Book 3. Ch. 57.* Lightning which only shines, and the Thunder-bolt which is darted down, are made after the same manner. But the former is of less force, and hath less nutriment. And to say what I think in a word: a Thunder-bolt is Lightning compact and Vigorated.

A thunder-  
bolt.

That these things may be explained from nearer principles: the Lightning and Thunder-bolt differ only in the disposition and plenty of the Sulphur and Nitre. For the more plentiful and subtile the Nitre is; so much more vehement is the blow: and because of the abundance of Sulphur, there is more appearance of fire. Hence a Cause may be rendred why it lightens sometimes with Thunder, and sometimes without. For the reason hereof is not, because the Cloud is spongy or compact, sometimes stopping the passage of the Exhalation, and other whiles giving the same a free Egress: (for the Clouds are not so thick as to be able to stop in the Lightning: ) but because there is sometimes good store of Nitre, other whiles but little joynd with the Sulphurous Exhalation; therefore sometimes vehement Thunder, other whiles little or none is heard.

The Na-  
ture of the  
thunder-  
bolt declar-  
ed from  
Chymical  
Principles.

The Thunder-Bolt therefore is a fiery and thin Nitro-Sulphureous spirit, and not a stone as the common people imagin. For the wonderful power and force of the

Thunder-

Thunder-bolt, of which we shall speak anon, must not be ascribed to a stone, but to a Body much more thin and subtile. And if any man will hold, that a most solid Stone may sometimes be bred in the Clouds of Exhalations thickned and coagulated, and be cast down with the Thunder-bolt or Lightning as a bullet shot out of a Gun, I shall not contend with him; yet I think such a thing happens but seldom.

I conceive it comes more frequently to pass, that by reason of a Thunder-bolt falling upon the Earth, the same and what ever matter is apt thereto, is melted as it were by Fire, and out of that fluid matter such a stone is formed; since it is otherwise a well known thing, that Iron and other Metals may be suddenly melted with a Thunder-bolt.

The effects  
of thunder  
bolts.

The Effects of Thunder-bolts are wonderful. For by it Silver hath been melted in mens Purfes, and the Purfes no way hurt or harmed: the sword hath been melted, the Scabbard remaining intire; all the Iron hath melted and run down a Post, the Wood unhurt; the Bones in live Creatures have been mashed to pieces and the flesh not toucht; and *Martia* a Roman Lady had the Child in her Womb kild with a Thunder-bolt, her self unhurt, as *Pliny* tells us in his *Hist. Nat. B. 2. Ch. 51.* In a word the Thunder-bolt hurts all hard and solid things sooner then such as are light and Spungy. The Cause whereof *Aristotle* saies to be (3. *Meteor.*) because it sooner goes through light and Spungy Bodies, then to be able to hurt or burn them. But in such things as are thicker, while it staies a little seeking a passage which it cannot easily find, it doth the more hurt. And why the Hoghead being broken by a Thunder-bolt the Wine stands congealed, the reason is, because the heat of the Thunder-bolt condenses the external parts of the Wine, that the Wine stands congealed and shut up in a Skin as it were. Yet *Seneca* tells us that this standing of the Wine doth not last above three daies, *Quest. Nat. L. 2. Cap. 31.* That also is to be noted concerning the wonderful power of a Thunder-bolt, which *Meuererus* relateth in *Com. Meteorol. p. 140.* How that a certain Minister in the way from *Leipsich* to *Toga*, was so suddainly taken out of the sight of all men by a Thunder-bolt, that he was never seen more.

Whether  
some things  
are safe  
from thun-  
der-bolts?

*Pliny* tells us that the Bay-tree, the Sea-Calf, and an Eagle are Thunder-prooffe and cannot be smit by a Thunder-bolt. *B. 2. Ch. 55.* Some add the Hyacinth Stone, and other coral. Yet most men Count these things but Fabulous, and late authors observe that the Laurel or Bay hath been Thunder Smitten: and *Scaliger* in *Exercit. 113.* disputes against the assertion of *Cardan* touching the Hyacinth. The motion of Thunder-bolts is commonly aslope or slanting: because the Fire of its own Nature tends upwards, and the force whereby it is cast out of the cloud drives it downwards. And hence a cause may be rendred, why Thunder-bolts do frequently smite high Mountains, Towers, Temples, Tall-Trees: because seeing Thunder-bolts are commonly moved aslant, the highest things are most Obvious to them; and are therefore more often hurt by them.

The moti-  
on of a  
thunder-  
bolts.

At what  
time of  
year thun-  
der bolts  
are most  
frequen?

In Winter and Summer Thunderbolts are rare; in the Spring and Autumn more frequent, as *Pliny* tells us, *Lib. 2. Nat. Hist. Cap. 50.* Yet later writers say they are most frequent in Summer, and seldom in the Spring and Autumn; and to their Opinion experience gives witness in our parts; for the hotter the weather, the more Lightnings, Thunders and Thunder-bolts we have. For in great Heats very many hot Exhalations are raised aloft, fit to ingender Thunder-bolts, and through the cold of the middle Region of the Air they are shut up in Clouds, and out of them violently driven down.

The differ-  
ence of  
thunder-  
bolts.

As to the difference of Thunder-bolts, *Pliny* divides them (in 2. *Book Ch. 43.*) into Predicting and Brute, perswaded rather by Heathenish Superstition then any Natural Reason. That is a more convenient division of Thunder-bolts, which *Seneca* brings in his 2. *B. of Natural Questions, Ch. 40.* The kinds of Thunder-bolts (saies he) are the Borer, the dissipater, the Burner. That which bores is subtile and flamy, flies through the straitest passages, by reason of the sincere thinness and pureness of the flame. That which dissipates is conglobated, and hath mixt with it the force of a fiery and stormy spirit. And therefore that kind of Thunder-bolt returns and escapes through that hole where it entred in. The force of this Thunder-bolt being spread far abroad breaks what it smites, but doth not pierce through it. The third kind, which burns, hath much Earthiness in it, and is more fiery

fiery then flaming. And therefore it leaves great marks of burning which abide in the things smitten. Indeed, No Thunder-bolt comes without Fire, but we call this properly fiery, which imprints manifest signs of burning. That which burns and makes brown, doth burn three manner of waies: for either it blasts only and hurts slightly, or it burns, or it kindles.

To the Meteors whose Nature and Generation hath been Hitherto explained, may not unconveniently be adjoyned the *Phasmata* so called, such as are, wide gapings in the Skies, Ditches, Bloody redness and other Colors in the Skies appearing. For these appear various by reason of the light of Stars or Meteors received in a thick Air, or Exhalations, differing in plenty, Density, and Position. For as a flame appears in sundry Colors, by reason of the various permission of Fire and Smoak: even so the light of the Stars or Exhalations enflamed, according to the divers dispositions of the matter wherein it is received, doth present to our Eyes sundry Colors and Shapes. For when that which receives the light is very compact and dark, there appears somewhat that is obscure and darkish; if it be not so compact, there is an appearance of a Sky Color; if yet less compact, it appears purple Color'd. And therefore they say a Gaping in the Sky is caused two manner of waies. First, When the light of the Moon, or another Star, or of some Exhalation enflamed (which is I conceive the more frequent cause) falls into a Cloud beneath it, which is compact in the middle, and spongy in the sides. For so the thicker part in the middle, which the Light cannot pierce into, expresses a certain deepness remote from us a great way: but in the outmost parts through which the light passes, it seems nearer to us. For every thing that is black, dark and obscure, although it be as near as that which is white, yet it seems further off then it: for white things do more work upon the sight. And therefore painters also being to express a thing depressed and remote, do use a black Color or that which is near to black; but to express a thing raised and eminent, they use white. After the same manner also Ditches are made. For in them there is only more depth, then in the foresaid Gapings. Of other Colors and Figures appearing in the Air, the Cause is the same. For according to the various disposition of Clouds in their several parts, in respect of thickness and thinness, the shapes of divers Animals are represented, of Mountains, &c. They say that a Gaping is made after a second manner, when a thin exhalation burns above some Cloud, and attenuates the said Cloud in the middle, more and more, so that it seems to be divided into two parts. Which being done, the Exhalation it self appears all on Fire, and the Heaven being as it were opened, seems to burn. Yet probable it is that sometimes such Prodigious Apparitions are by almighty God placed in the Sky, to Denounce some Impendent Calamity, and Experience teaches as much.

### Chap. 3. Of the Winds.

After the Fiery Meteors, we are to treat of Winds and Earth-Quakes. Now although of old sundry Men have had several opinions concerning the Nature of the Winds; and that Opinion chiefly was most Famous and common, which holds that Wind is the Agitation of the Air, or as *Seneca* defines it, *Quest. Nat. Lib. 5. Cap. 1.* Flowing or agitated Air: yet that these and other Opinions are of no validity, *Aristotle* shews in *B. 2. Meteorol. Ch. 4.* But *Aristotle* himself held thus concerning the Generation of the Winds; that all the Water which falls down in the showers is totally distributed into the Earth, and the Earth hath in it self much heat and Fire; and the Sun doth not only draw that moisture which lies in the upper parts of the Earth, but also by its heating Faculty dries the Earth it self; which Humor being drawn aloft in vapors, is driven back by the coldness of the middle Region of the Air, and agitated and moved athwart.

For the Matter of Winds, according to the *Aristoteleans*, is an Exhalation hot and dry: of which thing they produce these signs. For in the first place Winds do very much dry. Again as *Cardan* saies in his *16. de Subtil. p. 792.* (and experience confirms the same,) red Clouds scattered all over the Sky, or a red Moon, or the Sun setting amongst red Clouds, signifies Winds to follow; only because they argue

argue that many Hot and Dry Exhalations are Elevated into the Sky. Howbeit the matter of Winds is seldom a pure Exhalation; and some winds are drier then other some, because two sorts of Exhalations, as was said before, are commonly drawn joyntly out of the Earth; and again, because they are mixed with Exhalations and Vapors, through which they pass: and therefore also the Qualities of severall Winds are different, as shal afterwards appear, by reason of the vapors they bring with them out of the places through which they blow.

*The Efficient cause.* Now what should be the Cause of the Motion and Agitation of Winds, authors differ, as may be seen in *Francisc. Piccolhomineus, Lib. de Meteor. Ch. 22. Collegium Conimbric. de Meteoris, Tract. 6. C. 3.* And verily here is no smal difficulty and obscurity. But most Men hold, that dry Exhalations being carried up to the middle Region of the Air, or thereabouts, are by the coldness thereof driven back; and because by their own Nature they are light and endeavor to mount upwards (but by the violence of the cold Air they are driven down again,) therefore they are forced to move Athwart or Cross the Air. For just as Smoak ascending out of a Chimney, if it meet with Wind is beaten down, and passes obliquely this way and that way al abroad: so they think it no absurdity to say, that an hot Exhalation meeting with the coldness of the middle Region of the Air, is driven back there-by.

*Aristotles opinion examined.* Now as we do not wholly reject this opinion, since experience it self doth witness, that after Rains Winds are raised in the neighbouring places, vapors being raised out of the Earth moistened with showers; yet some things are to be added and observed concerning the same. For first, though that same violent motion of Winds be chiefly to be attributed to Exhalations: yet the Air it self doth encrease that motion, which being moved by the Exhalations is it self agitated, and forcibly carried this way and that way. Even as when it is moved by ones Hand, by a Whip, or Fann, we perceive it makes somewhat which resembles Wind.

Moreover, although Winds are hardly bred without an Hot and Dry Exhalation, since rarely one kind of exhalation ascends without another: yet nothing hinders but that Cold and moist Vapors may be the matter of Winds; and experience teaches us that there are many cold Winds, and many Winds moist.

Thirdly, 'Tis indeed credible, that out of the Earth moistened with showers many Exhalations do ascend; but Credible it is not, that all the matter of Winds arises from the surface of the Earth, and that the Earth within the compass of ten Foot deep, more or less, can send forth such store of Vapors as will serve to make Winds, which oftentimes out of the same Quarters do most vehemently blow, divers daies together; especially when the Earth continues moist even when the Winds do blow: but without all question the greatest part of Winds do break out of the hollow Caverns of the Earth. For in the Winter Season, when all the Surface of the Earth is hardned with Frost and Cold, yet nevertheless more and more vehement Winds are then raised, then in the Summer time; and Winds arise out of Rivers and Lakes, yea and Storms arise out of the Sea it self. And although some think it improbable, that Winds are raised out of the bottom of the Water, by the working of the Fire which is in the Bowels of the Earth, yet Mariners have oftentimes found it so to be, to their great danger and dammage. For this is that *Æolia* (which *Virgil* describes in his 1. Book of the Travels of *Æneas*,) out of which, as he saies,

*Huf-puf Winds make all to an Head, and where the Gate's open,  
Out they Rush, with a blustering blast, and Blow the Land over.*

Fourthly, Although I will not now dispute this point, whether Vapors and Exhalations raised aloft, are driven back by the coldness of the middle Region: yet nevertheless certain it is, that they when they break out of the Caverns of the Earth, they are not destitute of all force and motion; and that not only an Air arises out of Pools, Floods and lakes, but even out of the Calm Sea oftentimes storms of Wind do arise. Now the Winds in the mean while do receive this force at that time, either from the multitude of Waters which break into the bowels of the Earth, and thrust forth the Air and Vapors there shut up; or from the Fire contained in the

the Caverns of the Earth, and resolving the Waters and other subject matter into Vapors: to which may be added some Huge Fragment of Earth falling down into some vast Cavern of the Earth, and thereout violently expelling the Air. Howbeit, amongst these Causes, the chief seems to be the under-ground heat; and many things argue that it is no less effectual to raise Winds, then the Heat of the Sun. For, as hath been lately said, they break out of Rivers, Lakes, and the Sea also in the Winter time, when the surface of the Earth is hard with Frost. And that same instrument which Chymists use instead of bellows to blow their Fire, doth not a little declare this business. They have a round hollow Globe of Copper, which being filled with Water and close stopped, there is a small hole on one side or a Pipe with a small passage: and the said Globe being filled with Water is laid on a Chafing-Dish of Coals, and the foresaid Pipe is instead of bellows turned towards the Fire which they would blow: when the Globe grows Hot and the Water begins to rarifie, there is a perpetual Wind blowing forth, which blows the foresaid Fire like a bellows, til all the Water in the Globe be consumed. To all which causes nevertheless one seems fit to be added, *viz.* The contrariety of those small particles, whereof the Exhalations which are the matter of Winds do consist. For these particles (as appears by many Chymical operations, wherein for the same cause the Vessels are violently broken, while they abhor and fly one from ther) do raise such a violent motion.

Howbeit, The motion and posture likewise of the Stars, and especially of the Planets, doth also contribute to the Generation of exhalations; which being in this or that part of Heaven constituted, or in conjunction with others, or having mutual aspects; they move sometimes this matter, sometimes that, sometimes in one place, sometimes in another, and variously drive and force the same.

The number of the Winds is by various Authors variously reckoned, as may be seen in *Aristotle*, in his 2. of *Meteors*, Ch. 6. in the Author of the *Book de Mundo* dedicated to *Alexander* Ch. 4. *Seneca* in his *Quest. Nat.* L. 1. C. 16. *Pliny* in *Hist. Nat.* Lib. 2. Cap 47. *Gellius*, Book 2. Ch. 22. Who also differ somewhat in the Names and Situations of the Winds. Thus we shall Muster them. All grant that those are the four Cardinal or Principal Winds, which blow from the four Principal points of the Horizon, or the four corners of the World. For from the Equinoctial Sun-rise blows the East-Wind; from the Noone-sted blows the South-Wind; From the Equinoctial Sun-set, the West-Wind; and from the Pole Arctick blows the North-wind. The Ancients contented themselves with the notice of these four Winds: the Age following added four more. For, because the Sun doth not alwaies rise and set in the same place, but the Equinoctial Sun-Rise and Sun-set from whence the East and West winds blow, are different from the Solstitial Sun-Rise and Sun-set; and the Winter Sun-Rise and Sun-Set is also different from them: they therefore added yet four Winds more, blowing from the four points of the Intersection of the Tropicks and Horizon, or from the points of the Summer Sun-Rise and Sun-Set, and the Winter Sun-Rise and Sun-Set. For that which blows from the Summer Sun-Rise, they called *Cacias*; That from the Winter Sun-Rise *Vulturnus*; that which blows from the Summer Sun-Set, *Corus*; that from the Winter Sun-Set, *Africus*. To these Posterity added yet other four, which blow from the Poles of the Zodiack, and their opposite points; or from the sides of the Poles and the Polar Circles, or from the points marked by them in the Horizon; so that every Cardinal Wind came to have two collateral or side winds. And they called that betwixt the North and the Summer Sun-Rise *Thrascias*; and that betwixt the South and Winter Sun-Set, *Libonotus*; that betwixt the South and Winter Sun-Rise, *Phenicias*. And this is the most usual number of Winds among Authors. Later Navigators have amplified the number of the Winds to thirty two. For they divide the Horizon into eight parts, to which they attribute eight Winds; which they call principal, *viz.* those which blow from the four cardinal points of the Horizon, or corners of the World, and such as blow from the points exactly in the middle of those. To these they add eight others, holding the middle places betwixt the principal, and call them the middle or half Winds: to these they add sixteen more, which they insert in the middle space betwixt the principal and the middle, and call them Intermediate or Quarter Winds.

The number of winds un-  
usually ob-  
served.

The number of the winds increased by late Navigators.

I shall here recount the chief of them, which follow one another in this order, from East to South; from South to West; from West to North, and so from North to East again. From the Equinoctial Sun-Rise blows *Subsolanus*, the *East-Wind*; from the middle point betwixt the East and the South, blows *Euronotus*, the *South-East-Wind*; from the South blows *Auster*, the *South Wind*; in the middest betwixt the South and West is *Notozephyrus*, the *South West Wind*. From the Equinoctial Sun-Set blowes *Zephyrus*, *Favonius*, the *West Wind*: betwixt the West and North blows *Thrasiozephyrus*, the *North-West Wind*; from the North, the *North Wind*; and betwixt the North and East, the *North East Wind*.

To these if we shall add eight and insert them in the middle among the principal, (which were also used by the Ancients, and blow from the Summer and Winter Sun-Rise and Sun-Set, and which the sailors call middlewinds or half Winds,) we shall then have sixteen Winds worthy of observation. For betwixt the East and the South-East there is *Vulturnus*, or the East-South-East Wind; betwixt the South-East and the South there is *Phenicias*, or the South-South-East Wind; betwixt the South and the South-West there is the *Libonotus*, the South-South West wind; betwixt the South-West and the West there is *Africus*, the West-South-West wind; betwixt the West and the North West is the *Caurus*, *Corus*, or West-North-West wind; betwixt the North-West and the North blows the *Circius* or North-North-West wind; betwixt the North and the North-East blows *Boreas*, *Aquilo*, or the North-North-East wind; betwixt the North East and the East blows the *Cecias*, or the East-North-East-wind.

Contrary  
winds.

The chief thing observeable in these Winds is the contrariety. Now those Winds are most contrary one to another which are most distant one from another in place. Now those are most distant in place which are Diametrically opposite one to another, or by a Line drawn through the Centre of the Horizon. Hence the East is opposed to the West, the South to the North; the Winter Sun-Rise to the Summer Sun-Set; the Winters Sun-Set to the Summers Sun-Rise: and therefore the Winds also which blow from these parts are opposite one to another. So the East-South-East wind is opposite to the West-North-West; the South-East wind to the North-West; the South-South-East, to the North-North-West; South-South-West to the North-North-East; the North-East to the South-West; the East-North-East wind is opposite to the West-South-West wind.

The winds  
blow in a  
certain  
Method.

And here it is to be observed, that these winds observe a Rule in blowing. Those which are contrary, because they are Diametrically opposite, cannot blow at one and the same time, but the stronger of the two suppresses the force of its opposite: or if it happen that they blow together, it is with mighty contention and causes an hideous storme. Now, this order the winds do commonly observe, that when one falls that which is next it doth rise; or the contrary to that which ceases doth begin to blow: Moreover in contrary Lines contrary Winds do for the most part blow: concerning which see *Aristotle*, *Lib. Meteor. 2. C. 6.* *Pliny in his Natural History*, *Book 2. Ch. 47.*

The tem-  
per and  
Qualities  
of the  
winds.

Again, Here is to be noted the Temperament and Quality of the Winds. For though they all agree in matter, and consist of an hot and dry Exhalation: yet since that is seldom raised up alone, (but that for the most part out of the Sea and the Earth watered with Rains and Snows these two Exhalations are drawn together, & afford matter to the Winds;) moreover that they pass through places Hot. Cold, Dry; therefore there is also a great difference of Winds in respect of the places from whence they arise and through which they blow. For the Winds have not only the Qualities of those places from whence they arise, but their chief qualities they have from the places through which they pass.

*Hippocrates* in his *Book de Aere, Aqua, & Locis*, divides all the Winds into Hot and Cold, because the force of these qualities is greatest: whom *Aristotle* following in his *2. Meteor. Cap. 6.* divides all Winds into North and South Winds, even in respect of Heat and Cold also. To the Northern he adds the Western Winds, and to the Southern the Eastern. The North-Winds are the coldest of all other and Dry; for they arise from Snowy cold places, and pass through places out of the Sun's way and far from the Heat thereof. With these agree the West Winds. For these are cold Winds, because they pass through places not much heated by the Sun. To the North-Wind the South-wind is opposed, an hot wind, which passes through

through the Sun's road, and through places heated by the Sun: in *Libya* indeed it is dry, because the moist vapors are there consumed by the Sun: but to us it is moist, because it comes over the Mediterranean or Mid-land Sea. The Eastern Winds are Hot and dry. For the Sun is carried long over those places, through which they come.

The East-wind is Hot, Dry, temperate, Sweet, Pure, Subtile, Healthy, especially in the morning: and therefore it brings no Venemous blasts. The East-South-East because nearer the South is moist and cloudy, and therefore when it blows, all things do seem to be bigger then indeed they are, as *Aristotle* hath it in the 26. Section of his *Problemes*, Problem 56. The East-North-East, is inconstant and somewhat cool. It drives not the Clouds away, but draws them to it self; whence the Proverb: he draws evils to himself as the East-Nor-East Wind draws the Clouds. The West wind melts the Winter Snow and Frosts, being of an Hot and moist temper, making the Herbs and flowers to grow; and therefore 'tis thought to have its Name in the Greek *Zephyros*, as if you would say *Zoen Pheron* bringing Life.

The West-South-West, is Cold, Moist, Rainy, tempestuous. Hence *Virgil* called it *Creber Procellis* in the first of his *Aeneids*, full of Storms. The West-Nor-West, is Stormy, Snowy, Hailing, Cold. Therefore it, and the North-wind, are the coldest winds of all.

The South-wind is moist, Hot, Thundering, Pestilent, engendring Clouds and Store of Rain, making the Air thick and Cloudy.

The South-South-West is a temperate wind, Hot, Rainy, and sometimes Thundering.

The South-South-East wind is Hot and Moist.

Wherefore the South-wind, the South-west wind, West-South-west winds are hot, but of these the South-wind is Hottest, Hurtful and Pestilent.

The South-South-west is more moist then Hot. Howbeit, consideration must be had of the Climate and the place.

The North-Nor-East wind is Cold and Dry, the Author of Cold, cutting the Clouds, straitning our Bodies and shutting their Pores: making the Humors more pure, and Pulging the pestilential Air.

The North-Nor-west is the Author of Snow and Hail.

The North-wind is Cold and dry, without Rain; hurting Flowers, Fruits and budding Vines. And therefore the North-Nor-East, North and North-Nor-west wind do Purge the Air; and if they be not vehement cold, they make it clear and fair weather; but especially the North-Nor-East and the North winds; and the North-Nor-East brings Hail, and the North-wind brings Snow. And Generally all winds from the North and West are drier then from the South and East.

Hence some winds are healthy, others unhealthy. But in general the Southern winds are of all other most unwholesome. For they cause moisture and putrefaction: and therefore when it blows, neither Cellars, nor Houses, nor Libraries, nor Granaries should be set open. The South-wind is more violent in the Night, the North-wind in the Day: the South-wind on the Sea, and the North-wind on the Land.

A short and moderate South-wind makes the Air clear; but a great and lasting South-wind Clouds the Air, and is wont to be more furious at the End then at the beginning: and therefore it brings more Rain at the Conclusion, then at first: but the North-Nor-East wind doth the contrary.

Those winds which come through Populous places, as Cities full of people, and where a great Army hath been long incamped, through Stinking and Venemous places, are hurtful; but those which come through healthy places, as pleasant Meddows, woods, and along running waters, are wholesome, for they are Seasoned with the Steams of Flowers, Leaves and Herbs. More observations concerning the force of winds are to be read every where in the writings of Physitians, and in *Pliny* in the place fore alledged; also some things may be brought out of *Aristotle* touching this subject, *Probl. Sect. 26.*

And these are the common winds which blow every where all the world over. There are also other winds peculiar to some places. The former are termed com-  
Provinci-  
al winds.

mon to all places, not because so many blow in all places; for there are some Regions where those common winds cannot come, by reason of High-Mountains and other Causes: but because, no where there are found any more. And the latter are termed Provincial winds, because they go not beyond a certain tract of ground and abide in the place where they were ingendred not being able to blow further: because they are bred of a smal Quantity of matter, which failing, they also do fade away. And such are commonly those winds which are called *Subterranean*, which come out of Caverns of the Earth, and from Exhalations bred in those Cavities which are nearest the Surface of the Earth. Or because they are particles of the common winds, separated from them by the height of Mountains, deepness of Valleys, or the Heat or Cold of the Place. Of which see *Seneca. Quest. Nat. B. 5. Cb. 19. Pliny* in his Natural History *Lib. 2. Cb. 47. Gellius Book 2. Cb. 22.*

There are also universary winds, which return every year at set times, and they are chiefly three: The *Onitbiai* or Bird-winds, the *Prodromoi* or forerunners, the *Etesiai* or Anniversary winds Particularly so called. The Bird-winds called also the Rose-winds, are a sort of Westerly winds, which blow gently every year in the Spring Season, when the Swallows and other Birds returne to our Parts, and when Roses flourish. The *Prodromoi* or Forerunners, are Northern winds which come eight daies before the rising of the Dog-Star, so called because they proceed the *Etesian* winds. The *Etesian* winds are so called from *Etos Annus*, as if you should say Anniversary winds Particularly so called, because they keep their course most certainly every year, two daies after the Rise of the Dog star, and blow forty daies together; now they are Northern winds, pleasing and healthful to man and beast. For by their blast they moderate the Heat, break the violence of the Summer, and defend us from the violence of the hottest months. They rise at the third hour of the day, and therefore they are called sleepy winds and Dainty Nice winds by the Mariners, as *Seneca* tells us, *Nat. Quest. Lib. 5. Cb. 11.* and at night commonly they leave blowing. Authors conceive those winds are bred by great heat, melting the Snows yet remaining on the Northern Mountains. For 'tis likely, that the Lands disburthened of the Snow and uncovered do breath out more freely. And therefore they do not last beyond the Dog-daies; because after them all places are bared, or at least very few do continue covered with Snow.

The winds do somtimes raise great Tempests, and are exceeding turbulent; the chief whereof are *Ecnepbias*, *Typhon*, and *Prestor*. The generation of the wind *Ecnepbias* is thus described by *Seneca* in his *Lib. 5. Quest. Nat. Cap. 12.* when a great inequality and dissimilitude of Bodies, sent out by the Earths vapor, doth ascend aloft, and some of these Bodies are dry, others moist, from so great a discord of Bodies fighting together, when they are gathered into a Globous Body, 'tis like that some Clouds are made hollow, and that *Fistulous* spaces are left in them, in manner of hollow strait Pipes. In these spaces a thin spirit is intercepted, which desires a greater space, when being smitten and cuf together in its narrow passage it grows hot, and so become wider, and cuts asunder its inclosures, and breaks out into a Wind, which is really stormy, coming down from aloft and falling vehemently and fiercely upon us, and making it self way by force and fighting. This wind is called by the Greeks *Ecnepbias*, because it comes rushing *Ec ton Nephon*, out of the Clouds.

But if the said Exhalation be divided into parts, and breaks either out of divers Clouds, or out of divers parts of the same Cloud, it causes a Whirl-wind. For, because the wind seeking Egress meets another, and is forced as it were out of a wide into a narrow place, it is alwaies driven to one side where it may find a passage, and makes a wheeling morien; by and by being conglobated and mixed with some part of the Cloud, it is carried Head-long, and being repulsed and beaten back by the Earth carries what ever it meets with its whirling motion, aloft into the Air; it is the chief Plague of Mariners, as *Pliny* saies in *Lib. 2. Nat. Hist. Cap. 48.* bowing and breaking, not only their masts but the very Ships themselves.

But if the said Exhalation be of an hotter Nature, and by *Antiperistasis* or Motion be set on Fire, and carry the Flame along with it, 'tis called *Prestor* from burning. *Seneca* calls it the Fiery whirl-wind, *Quest. Nat. Lib. 5. C. 13.* This doth not only overthrow, but buru al that doth stand in its way: and herein only it differs from a Thunder-



a Thunder-bolt, in that it hath more Wind, and less Flame; but in a Thunderbolt there is more Flame and less wind. *And so much for Winds.*

## Chap. 4. Of the Earth-Quake.

**A**ristotle relates the differing opinion of Authors touching the Earth-Quake, (which the Greeks term *Seismos*;) in his 1 B. of *Meteors* Cap. 7. Seneca Lib. 6. *Quest. Nat.* from Chap. 5. to 21. Plutarch in his 3. *de Placit. Philosoph.* c. 15. Pliny B. 2. *Nat. Hist.* c. 79. Gellius B. 2. *ch.* 28. from whence we may see how careful the Ancients were in searching out the Cause, why that which is the only immoveable and fixed thing in the world, which sustains us and all things on it self, upon which Cities are built, which some have called the foundation of the World, doth sometimes reel and stumble. We, desirous to observe Brevity, omitting the examination of other Opinions, shall only lay open the Truth.

Seeing the Earth is of it self immoveable, nor can be moved by any thing which Externally goes about the same, as winds or waters, (against the Motions and most Vehement Tempests whereof the Earth hath formerly stood and doth still stand immoveable: ) 'tis to be thought, that it is moved in Earth-quakes from somewhat within it self. Now in the Caverns of the Earth are included Waters and two kinds of Exhalations. Now although that *Gellius* tells us, Lib. 2. *Cap.* 8. that the most Ancient Greeks were of Opinion; that the Earth was moved by the Floods and Violent Motions of Waters abounding in the Caverns of the Earth; (and therefore they call *Neptune* the Earth-shaker: ) yet waters being not very apt to move, nor disposed to most swift and violent Motions cannot be accounted the Cause of Earth-quakes. Which is also confirmed by what *Scaliger* relates in his 38 *Exercitation.* There is saies he in the Westerne part of the Island of *Hispaniola* a Mountain of huge Height, which hath many hollow Caves within it, whereinto Rivers are tumbled down with so great a noise and roaring of the waters that they are heard five Miles of, yet no Earth-quake is caused thereby. And the like Judgment we are to make of moist Vapors.

*Waters are not the Cause of Earth-quakes.*

The Cause therefore of an Earth-quake must needs be hot and drie Exhalations. For hot and dry Spirits are fitting to raise Motions most swift, Violent and Vehement, which is also apparent from Thunder, Thunder-bolts, Winds, Whirle-winds, Storms, and Guns: and every hot thing doth of its own Nature tend upwards. Also there are other Tokens hereof. For Histories bear witness, that for the most part, after an Earth-quakes a great abundance of winds and spirits have broken forth, and have cast Stones, Ashes, and other Obvious things out of the Caverns of the Earth; yea and the most Earth-quakes have not ceased till those winds included have made an Eruption: which *Aristotle* tells us did happen about *Heraclea* of *Pontus*, and the Island *Hiera*, in the 2 of his *Meteors*, *Chap.* 8. Moreover, most Earth-quakes happen, when the Sea is Calme and the Air free from winds; *viz.* When all the matter of Winds is contained in the Caverns of the Earth. You may finde more signs in *Aristotle*, in the Place fore-aldged.

*The true Cause.*

Now some hold, that these Spirits are either bred in the Caverns of the Earth by the Heat of the Sun and of the underground Fire; or that being bred without, they enter in; or that they are driven thither by the *Antiperistasis* of the cold Air; or that when two contrary Winds do blow at once, the one being vanquished by the other doth pass into the Caverns of the Earth which it meets with; or to avoid Vacuity, when the waters go out, the Exhalations insinuate themselves into the hollow parts of the Earth. But the first amongst these Causes is either the chief or only Cause. Now the Spirits which shake the Earth are contained in the profound Caverns thereof. For those which are in the Cavities next the Surface of the Earth, seeing they can easily find an Egress, do not move the Earth. Now these Blasts are moved, because they have no place in the Caverns of the Earth fit and large enough, or because they are pressed by the Waters which flow to and from the Sea; or because they are shut up by the *Antiperistasis* of cold, and gathering force, and their heat being Augmented, they are Attenuated and Rarified; which also may be performed by the *Subterranean* or Under-ground Fires.

From

Two man-  
ners of mo-  
tion of the  
Earth.

From the Premises therefore it appears, that an Earth-quake is caused, when hot and drie spirits are Praternaturally shut up in the Caverns of the Earth, and seek their way out. For, not finding the same, they move this way and that way, and by their great force and violence they shake the Earth. Now the sundry manners and various fashions of Earth-quakes proceed from the greater or less Quantity of Exhalations; from the divers figures of the Caverns; from the longness or shortness of their distance from the Earth; from the sundry manners of the Exhalations breaking forth; which the Author of the Book *de Mundo Cap. 4.* and others do reckon up. Yet all of them may be referred to two, whereof one may be called *Tremor* a trembling; which is caused, when much Spirit is spread out Long-waies and Broad-waies: the other *Pulsus* a beating or thrusting, when the Exhalation is disposed rather long-waies. For it seeking Egress lifts up the Earth much after the same manner as the Arterie is lift up in the Diastole or widening of the pulse.

Universal  
Earth-  
quakes  
are not  
natural.

From what hath been hitherto said, it appears, that the whole Earth cannot be shaken at once. For the Spirits shut up in the Caverns of the Earth have no proportion (to speak of) to the whole Globe thereof, nor have so much strength in them. And therefore, if there be any universall motions of the Earth, they ought to be referred rather to the infinite power of God, then to Natural Causes. With the Earth-quake is ioyned a noise, caused by the vehement Motion of the Spirits running to and fro in the Caverns of the Earth, and smiting against the sides of the Earth; which noise somtimes goes before the Earth-quake, and is a sign thereof suddenly to follow; somtimes it accompanies the same, and it is various, according to the Quality of the matter receiving, and the form of the Cavities, or passages through which it goes.

How long  
the Earth-  
quake  
lasts.

The duration of an Earth-quake is not one and the same alwaies, but divers, according as the Earth doth more or less resist, or gives an easie or difficult passage to the winds; or as the Spirits themselves are plentiful or scanty. For few Spirits are sooner discussed and sooner get away, but store of Spirits abide longer; also when there is a wide passage for them to go out, they go out apace; but when the passage is shut up or is very narrow, they get out more slowly and continue their Bustling longer. So *Seneca* in *Nat. Quest. Lib. 6. Cap. 30.* Relates that *Campania* trembled continually, for divers daies together. And *Livy* in *Decad. 4. Lib. 4.* Writes thus: In the beginning of the year, when *L. Cornelius*, and *Q. Minutius* were Consuls, there were so many reports of Earth-quakes, that Men were weary not only of the thing it self, but of the many Solemn daies appointed because of the said Earth-quakes. And the same Author in his *4 Decad. Lib. 5.* tells us, there was an Earth-quake for forty daies together; yea and *Aristotle* in *Lib. 2. Meteor: Cap. 8.* and *Pliny* in the 2. of *Nat. Hist. Chap. 8.* tells us that Earth-quakes have somtimes lasted a year or two years together, and that they have returned at certain Times and Seasons.

The won-  
derful ef-  
fects of  
Earth-  
Quakes.

The Effects truly of Earth-quakes are wonderfull and horrible. For many times, (as *Seneca* in *Lib. 6. Nat. Quest. Cap. 1.* Speaks,) it doth not only swallow up single Houses, Families or Cities, but it overthrowes whole Nations and Regions, and somtimes overwhelms them with Ruins, other-whiles covers them in a deep Gulf, not so much as leaving any appearance of them: so that the Earth is spread over most Noble Cities, not leaving any marke of their former Existence: which happens when the impulse of the Spirit, the Caverns of the Earth are shaken and fall in. And somtimes indeed, the Cities and Houses are not swallowed up in the Cavities of the Earth, but the Earth raised up in a tumor, they fall down flat. Histories are full of such calamitous accidents. In the Reign of *Tiberius Caesar* 12. Cities of *Asia* were in one Night overthrowen with an Earth-quake as *Pliny* relates in the 2. B. of his *Nat. Hist. Cap. 84.* He also relates that *Crete* a Mountaine was broken by an Earth-quake, *Book. 7. Cap. 16.* *Theodoretus* tells us in the 2. Book of his *Eclesiast. Hist. ch. 25.* how the greatest part of *Nicea* was overthrowen. Of the overwhelming of *Helice* and *Buri* *Seneca* writes in *Hist. Nat. Book 6. Ch. 23. 26. 32.* And *Ovid* in the 15. B. of his *Metamorphosis.*

Many times also in the Sea a Gulf hath been opened, and the waters swallowed up, as Rivers on the Land, so that the Fishes and Ships have stood on dry ground. Contrarywise, many times the Earth swelling on high hath not settled again, producing Mountains on the maine Land, and Islands in the Sea: whereupon also somtimes the Sea hath been

been raised aloft like a Mountaine, and hath afterwards fell in upon the Neighbouring Lands. Such an Earth-quake *Socrates* speaks of in the 2. Book of his Ecclesiastical History, Chap. 3. For the same Cause the Courses of Rivers have been sometimes changed by Earth-quake, viz. a Tumor or swelling of ground being raised up in the midst of the former Channel. Sometimes new Rivers have broken forth, the ways being opened through which the underground Waters are carryed. Sometimes Fire and Ashes are cast out by an Earth-quake: sometimes a Venemous Spirit is belched forth, which proves baneful to Man and Beast. *Seneca* tells in B. 6. Nat. Quest. ch. 27. of a Flock containing Six hundred Sheep, all kil'd by an Earth-quake. Many other mischiefs also an Earth-quake brings with it, all which were contained in that one Earth-quake which happened under *Theodosius*, which is described by *Euagrius* in the 1 B. of his Ecclesiastick Hist. Chap. 17.

And we may wel believe, that Earth-quake bring not only present mischiefs, and that the danger is not alwaies in the motion, but that there is as great or greater foretold by Earth-quake; and *Pliny* saies wel, Lib. 2. Nat. Hist. cap. 84. that *Rome* was never shaken with an Earth-quake, but it was the sign of some Event to follow. And very many Histories Testifie, that the same hath happened in other places.

And therefore look what the Romans did of old, who when they felt an Earth-quake, or heard tidings thereof, they made Proclamation that the people should keep Solemn daies for that Cause, as *Gellius* tells us, B. 2. chap. 28. much more should we, when such Calamities are present or impendent, call upon God by Prayer. For that which the Romans feared, (as the same *Gellius* records, in the same place,) viz. lest by naming of one god instead of another, they should engage the People in a false Religion, and therefore they durst not in their Edict, as was the usual manner, Name or appoint to what god the People should sacrifice; that have we no need to fear, to whom that God is known, who being angry, the Earth trembles and the Foundations of the Hills are shaken, 2 Kings. ch. 22. ver. 8.

### Chap. 5. Of the Clouds.

**W**E have Hitherto explained those Meteors which are bred of an Hot and Dry Exhalation; we come now to those which are bred of a vapor in the middlemost and lowest Regions of the Air. In the middlemost Region are engendred Clouds, Raine, Snow and Hail.

A Cloud is engendred when vapors being raised aloft, either by heat which they have received from the Sun, or other heating causes, or by hot Exhalations mixt with them, are assembled in the middle Region of the Air, so that they cannot be penetrated by the sight. For a Cloud is nothing else but a vapor raised up in the middle Region of the Air, and there compacted; which appears hereby, in that in the lower Region of the Air, when vapors and Exhalations are raised out of things which boil or burn, they represent Clouds; and because they that walking beneath see Clouds upon Mountains, when they ascend to the tops of the said Mountains, they walk through the Clouds as through Mists; and because as soon as the said Exhalations are condensed they remain no longer Clouds, but turn into Rain.

Touching the Height of Clouds, Authors are at variance. Some conceive that the Clouds are not above three miles distant from us; yea and that some of them are not above half a mile high. Others write that no Cloud is above nine miles distant from the Earth. *Vitellio* is of opinion, that the vapors ascend 52000. paces, or 13. German miles. *Cardan* in his book de Subtil. Lib. 4. p. 205. reprehends *Vitellio*, and avers that the highest which vapors mount is 772000. paces, or 193. German miles. Howbeit, 'tis like enough, that the height of the Clouds is not alwaies the same, but various, according to the variety of the matter, places and times: Yea, and we often see with our Eyes, that at the same time and in the same Region, one Cloud is higher then another, and that one goes above another. I my self have seen two clouds carried with contrary motions: and one moving above the other, towards the East; the other moved under the other, toward the West. Also experience shews that clouds are not so high, as some imagin. For the tops of some Mountains reach above the clouds. For the Mountains *Olympus* and *Athos* are so high that Ashes left upon their tops all the year long have neither been blown away by Winds, nor washed away with Rain. And such as have stood on the top of *Vesuvius* have observed that some clouds were just as high as the Mountaine, and some much

How a  
cloud is  
engendred:  
what a  
cloud is:

The height  
of the  
clouds:

much lower. To which that agrees which *Zabarella* writes in his 8. *Chap. de Regionib. Aeris*. I went faith he, to the top of *Venus Mount*, which is the highest in the Territory of *Padua*, and there I found the Air clear all day long; but beneath, about the middle of the Mountain, I saw the Clouds, which hindred me from seeing the Valleys: and in the Evening being come down from the said Mountain, I found that there had been a great Rain that day, below, whereas it Rained not at all on the Mountains top. *Francisc. Piccolhomineus* de Meteor. C. 11. saies the same, how that Men living upon high Mountains, or Travailing thereupon, do see the Rains below them in the Valleys; whereas they themselves are in clear weather; and he saies the same happened to himself travelling over the Alpes and the Apennine Hills. And any man may observe the same in Mountainous places.

*The Colors of Clouds.* The Colors of Clouds are various, according to the various disposition of the matter receiving the Beams of the Stars, and especially of the Sun, which *Pontanus* thus describes.

*Hexameter verses.*

*The white Cloud's not very thick, and mixt with a thinspred Vapor,  
Through which the Sun with his raies doth break to the inside.  
The black Cloud is ful of a thick dark Smoak and a Vapor,  
Not at all to be pierced through, by the Beams of the Sun-shine.  
In a Purple Cloud's much beat; and Good Store of Humor  
In the blew colord Cloud is bid, which lustily Raineth.*

### Chap. 6. Concerning Rain.

*What Rain is and how 'tis bred?* Some Clouds are termed barren, which are white and Transparent, and do rather by agitation of the Winds turn into Air then showers: others fruitful, which being moister then the former, are fit to engender Rain. For Rain is nothing but a Cloud, Cooled, Condensed, and turned to Water. And Rain is bred, when the vapors which make a Cloud are yet more condensed, and turned into Water; which being heavier then the Air falls down of its own accord in drops. For Rain is made after the same manner as hot vapors upon the walls of Baths, or in the Winter in hot stoves. upon Globes of Glass, Iron or Tin jugs that are cold, are turned as we see into Warry drops.

*Diversity of Rains.* Now there is some diversity of Rains, proceeding from the variety of the Clouds, and of their place, which is somtimes higher and somtimes lower. For when the Cloud is High, Unequal, Spungy and Barren, and few smal drops fall like Dew, they are called *Psecades* heat-drops. But if the Cloud be more near and compact, and the drops fall down thicker, 'tis called *Imber* a shower. Finally, if the Cloud be yet thicker and suddenly condensed by a greater cold, and greater drops fall more thickly, 'tis called *Nimbus* a strong shower. Yea and somtimes whole Clouds are so condensed by a sudden cold, that the waters descend not drop by drop, but come down in streams, and destroy Towns and Cities: and then they say a Lump of a Cloud is fallen down.

*Prodigious Rains.* Also there are *Prodigious Showers* so called, such as we read of every where in Histories, *Tit. Livius* relates in *Decad. 3. B. 7.* that it Rained Milk, as doth *Pliny* also in *B. 2. Nat. Hist. C. 56.* and *Livy* tells us that it Rained Blood, *Decad. 3. B. 4. Decad. 4. B. 10.* and *Pliny* in the place forecited. Also that it Rained Flesh *Livy* tells us in *Decad. 3. B. 3.* and *Pliny* in the foresaid place. That it Rained Stones in many places *Livy* relates, *Dec. 1. B. 7. Dec. 3. B. 1. 234. 6. 9. 10. Dec. 4. B. 5. 68. Dec. 5. B. 1, 2, 3.* That it Rained Earth the same *Livy* informs us, *Dec. 4. B. 4. 57. Dec. 5. B. 5.* *Pliny*, in the forecited place writes, that it hath somtimes Rained Iron, Wooll, and Bricks. Authors telus that Fishes have somtimes fallen down in Showers of Rain: and those Frogs and worms which are seen after Rain are by some thought to have fallen down with the said Rain. Yea and some relate out of *Avicenna* that once on a time a Calf fel out of the Sky.

*Their Causes.* Most of these Prodigious Rains are to be ascribed to Superior Causes, viz. To God warning Men of Evils to come; and to the Devil, indeavoring by such Prodigies to draw men into Errors and Superstitions: yet some of them may also be referred

referred to Natural Causes. True Bood and Milk cannot Naturally descend in showers; since they are bred only in living Creatures. Yet nothing hinders but somewhat like them may fall down, *viz.* When by the Sun-beams a vapor is drawn out of a red or white Earth, or is aloft so digested, that it may shew such a color, and being afterwards resolved into Rain may resemble Milk or Blood. And that smal Stones may be made by a great heat of store of dry Exhalations in the Air, is a matter sounding like Truth.

As for those kind of living Creatures which may otherwise be bred of Putrefaction, such as Frogs, were must hold, that either they are ingendred of some matter in the Earth moistened with showers (which seems to many men most probable) or that they lie hid in the chinks and Caverns of the Earth, and by the falling of the Rain are called out as it were and so leap forth. But incredible it is that more perfect Animals which are generated only of Seed, and great Stones should be bred in the Air: but likely it is they have been caught up by whirlwinds in one place, and thrown down in another. Now there are certain signs of Rain as of other Tempests, which would be too long to reckon up in this place, and long Catalogues of the same are set down by others. But the principal may be seen in *Plinies 8. Book Nat. Hist. C. 35.* And in *Virgils 1. Book of Husbandry.*

### Chap. 7. Of Snow and Hail.

OF the same matter with Rain is Snow also made. For Snow is bred of a Vapor raised to the middle Region of the Air or somewhat lower, or of a thin cloud before it is turned into Water and Rain, congealed by vehement Cold, and torne into parts or flakes, which descend like soft Wooll, sometimes greater, other whiles lesser, according to the vehemency of the Cold. Now Snow is bred in the Winter time chiefly, because the cold is then strong and vehement, so that it is able not only to condense vapors into clouds and Rain, but also into Ice. For Snow as *Seneca saies, Quest. Nat. Lib. 4. cap. 3.* is nothing but a kind of Ice bred in the Air.

Now Snow is white, because 'tis ingendred of a Spungy transparent cloud. And that which is transparent, after it is terminated, doth next of all become white, because that color is most of kin to transparency. This appears in Chrystal or Transparent Glafs, and clear Ice; whose surface if a man render uneven, so that it is no longer transparent, or break and grinde it into smal parts, in room of transparency whiteness is produced. It happens sometimes, that, when the lower Region of the Air is a little hotter then ordinary, the Snow as it falls down doth melt when it comes there; and so, that which is Snow above, is Rain below. And therefore frequently when it Rains in Valleys, it Snows upon the high Mountains. And for the same cause on the highest Mountains, when there is no Snow to be seen on the Plain ground, there hath been Snow lying, even in the middle of the Summer. Touching the good which Snow doth to fruits and Trees, read *Pliny his 2. chap. of the 17. Book of his Natural History.*

Besides Rain and Snow, of Clouds also there is bred Hail. For Hail is nothing but congealed Rain; and it is bred, when a Cloud is dissolved into Rain and descends, and in its coming down by extremity of cold 'tis congealed into little round Balls. Now Hail is congealed, not only in the middlemost, but also in the lowest Region of the Air. Which may hence be gathered, because sometimes Chaf is found congealed in Hail-stones, which Chaf as it was coming down the cold also intercepted, and shut up in the congealed Water. If the cold be remis a certain imperfect and soft kind of Hail is bred, of a middle Nature betwixt true Hail and Snow, which they term *Granula*, and resembles smal Sugar-Plums, and this falls chiefly about the End of Winter. Before the falling of Hail, for the most part great and terrible sounds are heard in the Air, which are caused by the great contest of Heat and Cold in the Clouds. Hairs, and Chaf, and other things which are sometimes enclosed in Hail-stones, have been carried aloft by the Winds, and congealed together by the Cold.

And whereas sometimes strange Figures are said to be seen in Hail, it is partly to be ascribed to the Fancies of Men, who looking intently upon the Snow, do conceive

T

How snow is bred?

The color of Snow why white?

Hail what it is, and how and where Generated.

manytimes there are strange shapes in there Hail.

therein Sundry Images, as they do in the Clouds; and partly to the divine Power, which may imprint certain resemblances in the Snow, whereby men may be admonished of some faults in their life and Conversation.

Chap. 8. *Of a Mist, Dew, Hoare Frost, Honey and Manna.*

**A**lso of a Vapor some Meteors are Generated, in the lower Region of the Air, which must also be mustered. And to begin with a Mist, the Author of the *Book de Mundo*, in his fourth Chapter thus describes it: *A Mist is a certain dewy exspiration, not apt to turn to Water, thicker then the Air, more spongy then a cloud. 'Tis bred either of the beginnings of a cloud being rarified, or of the Reliques of a cloud.* In which words he determines that a mist is a certain vapor, thicker then the Air, thinner then a cloud, hovering over the Earth, bred of an Exhalation growing thin, which should otherwise have been the matter of a cloud; or of the thinner parts of a cloud, unfit to ingender Rain, and remaining after it. And therefore a Mist is a token of Fair weather to follow. There is also another Mist, which consists of thicker vapors, exhaling out of the Earth, which also by Reason of their thickness, and the smal heat in them, cannot be carried aloft, but settles in the lowest part of the Air; and so they cause a darkness; and if by the heat of the rising Sun they be discussed and extenuated, they intimate fair weather; but if they be drawn up all together into the Air, being there congealed by the coldness thereof they become matter of Rain.

*The Dew where and how ingendered.* Now Dew is made of a smal Quantity of a thin vapor, which because of the weakness of the heat reaches no further then the lowest Region of the Air, and indeed below the upper part thereof, and being by the cold of a temperate night turned into smal drops of Water, it sticks to Plants and other things. For the dew is chiefly found on the Leaves and Flowers of Plants, especially where they are smooth and thick; and sometimes also in other parts of them, as also upon Stones. For though it falls alike upon all places below; yet either by reason of their frequent pores, and roughness, or by their heat, it is drunk up and dissipated. On high Mountains there is no Dew bred; and sometimes also it rises not above two cubits, and only the grass is moistned thereby, but things a little higher remain dry. Dew therefore differs from Rain, only in the paucity of the matter, the place where it is bred, and the weaker heat whereby it is congealed. Now Dew is Generated chiefly in the Spring and Fall: but in the Heat of Summer and Cold of Winter it is not bred. For the Heat consumes the matter; and the cold suffers not the Vapors to be raised. Also it is not Generated, but when the Sky is calme and clear; because when the Sky is troubled and agitated with winds the vapor is dispelled, and cannot be congealed into Dew. Likewise Dew never falls but in the morning and Evening. For in the day time it is consumed by the Suns heat, and degenerates into a very thin and light Spirit, so that if an Eg-shell be filled with Dew, and the hole stopped with Wax, or other Glew, and it be then exposed to the Sun, the Eg-shell will mount aloft;

*The Nature of dew explained by the Chymists.* the Dew being changed into a most thin vapor and spirit, which ascends upwards, and carries the Eg-shell with it. The Chymists teach, that Dew contains in it the most subtile part of Nitre and Volatile Salt, which is contained in the surface of the Earth, and therefore it is used to make Extracts.

*Hoar-frost how ingendered.* Hoar Frost doth not very much differ from Dew; for Hoar Frost is bred, when a thin Vapor in a smal Quantity is lift up from the Earth, and cannot rise high, but by the vehement cold of the night it is congealed, before it turns to water. Therefore, look what Snow is in the middle Region of the Aire, that is Hoar Frost in the lowest Region; and what is Rain above, is Dew below.

*what honey is, and how it is bred?* Also Honey is to reckoned as a kind of Dew, touching the generation whereof this is the common Opinion: that with the Vapors which are drawn up in the day time out of Waters and Moist places, for the most part, Hot, Fat, and subtile Exhalations are lifted up, not only out of the Earth and Water, but also out of Plants and other things, which being throughly mixed with Earthy Watery and aery parts, and concocted by the heat of the Sun in the day time, and then by the moderate cold of the Night condensed, they stick upon Plants like Dew. And that

that Honey is nothing else but a juyce, consisting of Exhalations and vapors, mingled and digested in the Air, by the Heat of the day, and congealed by the nights Cold, and so descending in the manner of Dew.

Which opinion as it is not quite to be rejected: so it seems not satisfactory of it self. For if the Dew be easily elsewhere dissipated and discolled by the morning beams of the Sun: How comes it that Manna and Honey are not also dissipated. Also manna and Honey differ not a little from Dew; nor hath Dew of it self any Fat or Clammy parts. And therefore this also seems fit to be added: that out of Plants a certain juyce and Native Vapor doth distil or breath out, which nevertheless is dissipated by the day-heat of the Sun: but it is at night mingled with the falling Dew, which hinders it from being dissipated, and grows with it into one Nature. From whence 'tis easie to shew a Cause, why there is more Honey gathered at this or that time of year, in this or that constitution of the Air.

And therefore though all Honey is sweet of it self; yet sometimes both its Taste and Smell is changed, according to the Nature of the Plant from which it is gathered: and therefore it is sometimes Venemous, when it is gathered from venemous Plants. Whereof see *Pliny Lib. 21. Nat. Hist. Cap. 13. Dioscorid. B. 2. Cap. 74. and Book 6. Cap 8.*

This same Honey is twofold, Manna called also Air-Honey, or Dew-Honey, and which in a special manner is called Honey. For Manna is a Honey or Dewy Humor, mixt of a vapor and the Subtile and Fat Exhalations of Plants. and by the temperate coldness of a clear night congealed; sticking upon Plants, Stones and other things near the Ground; which at first is more liquid, and afterward the thinner parts resolved it becomes harder, and having attained its consistency, it is coagulated into certain grains. For although some hold, and among them *Christophorus a Vega Lib. 2. de Art. Med. Sect. 3. cap. 11.* That Manna is the work of certain small bees resembling large Gnats, from which Bees sitting in swarms upon the Trees the Manna drops down like sweat: yet most likely it is, that these small Creatures are rather drawn thither by the sweetness of the Manna, then that they make the same. There is much bred in the East, because of the purity of the Air and a certain moderation of heat and cold in those parts. 'Tis not bred in cold places: there is little bred in Italy, save in *Calabria*, from whence it is carried as a commodity into other parts.

Now whether that Manna wherewith the Israelites were fed fourty years in the Wilderness, was the same with this of ours, Authors vary. *Vallesius* in his *B. de Sacra Philosoph. chap. 57.* and other later writers hold it was the same kind of thing. Many things said of that Manna of the *Hebrews, Exod. 16. Numb. 11.* do also agree to this of ours: yet herein *that* disagrees from ours, because thereof, (beaten or ground.) Cakes or Cracknels were made. For our Manna is not of such a hardness. But however herein all agree, that many things which hapned touching the *Hebrews* Manna cannot be attributed to Natural Causes, but only to the infinite power of the most good and great God.

But vulgar Honey differs little from Manna, and the matter of both is one and the same, save that the matter of Manna is thicker, more compact and Earthy; but that of Honey more subtile and more digested. For Honey is a certain Dew, gathered by Bees, and receiving alteration from the little bladders they have within them, and afterwards stored up by them in little cells in manner of a pure Liquor, wherein afterwards it works like new Wine; and is by its Natural heat concocted, and grows thick, as *Aristotle* relates in his *5. de Histor. Animal. Cap. 22.* and *Pliny* in *Nat. Hist. L. 1. Cap. 13.*

Honey is chiefly gathered by Bees both wild and domestick: Yea and Drones also and other insects, being much of the Nature of Bees, do gather Honey, out of all Herbs which have hollow flowers like Cups, and out of others wherein there is any sweetness: which is done without any detriment to the flowers. You have more of the Nature of Bees and Honey in the same place of *Aristotle*, and in *Plinies B. 21. Nat. Hist. from chap. 5. to the 16.*

Two sorts  
of honey.

Whether  
our manna  
be the same  
which the  
Israelites  
had.

Common  
honey what  
it is, how  
differing  
from man-  
na, & how  
generated.

## Chap. 9. Of the Rain-bow, False Suns and Moons, strakes in the Sky, and Circles about the Moon.

**A**fter Clouds and such things as are of them ingendred, there remain to be handled certain things appearing in them, called *Phantasmata*, apparitions; such as are the Rain-bow, the Halo or bright Circle, and other like Images. And to begin with the *Iris* or Rain-bow, which they say hath its Name *ab Eirein* to tel, because it foretels Rain or Fair weather, (and therefore it is by Poets termed *Junos* Messenger,) It is a bow of three colors, in a Dewy cloud, caused by the beams of the Sun or Moon opposite to the said Cloud, and therein refract and reflexed.

What the Rain-bow is?

And that it may be better understood what the Nature of a Rain-bow is, all the members of the definition must be weighed. The subject of a Rain-bow is a dewy vapor, or a Dewy Cloud, which is beginning to be resolved into drops or Rain; but it is not yet Rain, only it is condensed into little drops like dew or the Water which a man blows abroad out of his mouth half shut. For a continued Cloud is not the subject of a Rain-bow; but those parts thereof which do no longer hang together, but being by the cold straitened and condensed are every where distant one from another, divided into very many smal drops, which are like little Looking-Glasses, and are of a middle Nature betwixt a perfect Rain and a Cloud.

The subject of the Rain-bow.

Now that the Rain-bow cannot be made in any continued vapor, but that it may be generated in many little round Bodies, is demonstrated from the rules of Opticks concerning the Nature of reflection. We shall only here produce what experience teaches. Let a man stand with the hind part of his Head to the Sun, and with his mouth or other instrument let him throw water into the beams of the Sun, so that the Water may lose its continuiry, and be resolved into very many very smal drops: which being performed, a Rain-bow as it were will appear in those little drops, which represent the rorid Vapor. The same may be observed when the Water is scattered by Oares, or falling violently upon a stone it is scattered into the Sun-beams. And though the rorid Cloud, which is the subject of a Rain-bow, is no longer continued; yet to us it appears continued, by Reason of the Vicinity of the parts, and its overgreat distance from us.

The efficient cause of a Rain-bow

The efficient Cause of a Rain-bow, are the beams of the Sun and Moon, broken and reflected in these drops. And that reflexion is altogether necessary to the making of a Rain-bow, hence appears; because both the incident Raies and the refract do go into the part oppolite to the lightsome Body, nor do they pass on to the part seen by the lightsome Body; nor to the sight, which is averse from the lightsome Body in such as behold the Rain-bow, can they come, unless they be reflected. Therefore in the same manner, as we see in looking-Glasses the Images of things behind us, even so the raies of the Sun or Moon are reflected in those little looking-Glasses.

Howbeit, 'Tis necessary that there be also refraction. For when as a Ray of the Sun or Moon comes to the first drop of the Vapor, it pierces the same being through nearness of the Sun not yet much condensed, yet so as that it is refracted. From thence going to another hindermore drop, which is thick enough, it is presently reflected, if no other drop of a rorid vapor stand before the same: but if any such drop stand in the way, the beam is first refracted, and afterwards so refracted it is reflected to our sight. Also many Raies are refracted in many obvious drops; and while they fall in, and pierce through divers thinner drops to one thicker, in which they are reflected; then by such a like drop they are again reflected. For every Ray, as wel the incident as the reflect, is twice refract in such a drop. First, Towards a perpendicular line, when it enters the drop; because it falls out of the thinner Air into a thicker Rorid Vapor: afterward, 'tis disjoyned from the perpendicular; when it goes again out of a thick drop into the thin Air.

The Rain-bow therefore is bred, when some rorid Cloud is in making, and begins to be resolved into very many smal drops, and to be condensed into Water: Which



Which drops are yet nevertheless more thin, and not quite turned into Water, so as to fall down. For if the Sun or Moone shine just opposite thereupon, the lucid beams being variously refracted in these drops, and reflected to our sight in form of a Pyramid, their light being confused and mixt with the Heat and shadow of the drops, they present unto our sight a coloured Bow.

Now most Rain-bows are caused by the Sun, few by the Moon. And therefore Aristotle tells us, that in the space of fifty years there were but two Moone Rain-bows seen. For to the making of a Moon Rain-bow, besides a fitting vapour, 'tis requisite that the Moon be in the full; otherwise its beams are too weak; also that it be near the Horizon: all which do seldom fall out. In the Year 1599 foregoing, at Mid Summer, after great Thunder, Lightning, Thunder-Bolts and Rain in the Night, betwixt the North and East we saw a remarkable Rain-bow, which might compare with some Sun-Rain-bows, in the Brightness and Beauty of its Colours. Now why only the Sun and Moon make Rain-Bows, the Reason is, because the beams of these Stars only can reach Cross the Horizon to the Clouds, and be from thence reflected; those of the Sun because they are most strong; those of the Moon because they are near at hand. But the Beams of the other Stars are either too weak or too far off. Or if they be so strong as to be able to reach cross the Diameter of the world to the Clouds: yet are they not so strong as to be reflected to our sight. For reflect Lights are weaker then those that shoot their Beams directly, according to the Rules of Opticks.

*A Sun & Moon Rain bow.*

*Why the Rain bow is made only by the Sun and Moon.*

Now why only the Colours and not the Image of the Sun or Moon appears in these Looking-glasses, there is a Threefold Cause. First, because the Cloud is not a continued Body, but resolved into very little drops or Optick Glasses. For in so smal Glasses the Images also are very small, which being afterwards reflected are so weak, as that they appear not distinct, but confused. Againe, the Raies are of themselves weakned before they come from the Luminous Body to the sight. Finally add hereto the blackness of the Cloud. For the roid vapour, because it begins to be resolved into water, assumes a certain blackness and Watry Colour, which being mingled with the Light, makes that the Image of the Sun or Moon cannot distinctly appear, but rather a Colour.

*Why only colors and not the image is self of the Sun and Moon appear.*

Now the diversity of Colours in the Rain-bow springs from hence, because some raies enter more deeply into the dewy Vapour, and are reflected by the remoter droplets, others are reflected from meaner vapours and resting in the surface of the Cloud, by which are made divers reflexive pyramides, having bases equally distant. Now the Colours are three, red which is the upmost, or outmost, and is bred of the greater splendor, and the raies of that reflexive pyramid, whose basis is of all others nearest our sight: and therefore its Raies are also strongest. Now because the Light is bright shining, and the Water blackish, the Colour appears neither white nor black, but a reddish Colour betwixt both. The next Colour is a Leek-green; which is the middlemost in the Rain bow, this is caused by the Raies reflected from a more deep part of the vapour; and therefore it inclines more to blackness. For the Raies also themselves are weaker, because reflected from a place more remote; and that vapour because it is farther from the Sun, is more compact, and comes nearer to the Nature of Water then the former. Hitherto also the shadows do very much contribute, which are shed from the former droplets on smal glasses upon the hindermore, with which the raies reflected from the hindermore are mingled. Of which we have an example in the colours that are in the necks of Doves, arising from the Sun-beams. For these colours are bred from the shadows that being sent from the Feathers are mingled with the Suns light. The third is the Purple, which is the internal, and arises from the Raies reflected from a place yet more remote; and for the same reasons why the Second is blacker then the First, the Third is blacker then the Second.

*The Colors of the Rain bow.*

And although there may be more then these three Colours in a Rain-bow; yet because for the said Reasons the Blackness is more and more increased; after the third no Colour can be perceived: and not only the reflected Raies are so weak that they cannot reach to our sight; but the Light also is so darkned by the Blackness of many shadows, that it is hardly discernable by the light. Now the fourth Colour which they call yellow, and is seen betwixt the first and second, is no new Colour, but arises from the Neighbourhood of those two. Now the

Lunary

*The Moon Rain bow whiter then that of the Sun.* Lunary Rain-bow is whiter then the Solar: because the Light it self of the Moon is paler then that of the Sun; again, because the shadows which are by the foremore drops cast upon the hindmore are not so obscure and dark, as those cast by the Light of the Sun. For the shadow of a stronger Light is blacker, and contrariwise. Add also hereto the darkness of the night. For that which is of its own Nature Blackish, if it be set by a more black thing, it appears whiter.

But why the Circumference only of a Circle appears and not the whole and entire Body thereof, the cause is: forasmuch as that part only of any irradiated Body is seen, from which the Raies are reflected to the same centre of sight, according to equal Angles, and of a radiated cloud nothing is seen but what is carried by Raies collected in the same point of the Axis wherein the sight is. But these do only make a bow, as the Teachers of Opticks do at large demonstrate.

*why the Rain bow never makes a perfect Circle.* Now why the Rain-bow never makes a perfect Circle, but either a Semi-circle, or an Arch less then a Semi-circle; and that it is a Semi-circle when the Luminary is in the Horizon, but an Arch less then a Semi-circle, when the luminary is above the Horizon; & that the Arch is so much the wider, by how much the Luminary is nearer the Horizon; and so much the lesser by how much it is nearer the Meridian; the reason thereof is, because the Centre of the lucid Body, of the sight, and of the Rain-bow, are alwaies in one and the same right line. And therefore the Centre of the Luminous Body being placed in the Horizon, in the opposite part of the Horizon will be the Centre of the Rain-bow, and so there will be a Semi-circle above the Horizon. But when the Sun is elevated above the Horizon; the Centre of the Rain-bow is on the other side depressed; and therefore that Segment of the Circle which is beneath the Horizon is greater because it contains the Centre, and that above is less. For we see only those things which are above the Horizon. And by how much less of the Diameter of the Rain-bow is above the Horizon, so much the greater is the Circumference of the Circle; and a Semi circle is half of the lesser Circle of any Arch whatever that is greater, which proceeds from the Refraction of the beams: because about the Sun-rise the Air and vapors are thicker, which afterwards by the directer beams of the Sun are attenuated. And therefore the Rain-bow which is seen through a thicker Medium, appears also larger. But I pass over these and other things which might be said of Rain-bows, seeing they cannot be rightly explained without optical demonstrations and many Diagrams, which must be here for brevities sake omitted. They may be seen in *Aristotles 3. de Meteor Ch. 4, 5.* the writings of optical Authors, and in the learned Treatise of *Johannes Fleischberus, de Iridibus*, wherein he comprehends the Doctrine of *Aristotle* and *Vitellio* concerning Rain-bows, and augments the same with necessary demonstrations.

*Fals Swas.* Of kin to Rain-bows are the false Suns, or other Suns placed by the true Sun. Now the *Parelios* or false Sun, is the Image of the Sun, received in a Cloud continued, compact, equal, ready to turn to Water, in its forepart Transparent and Polished as it were; in its hinder part dark and terminated, and placed obliquely by the Suns side, and reflected thence to our sight. For look as if a man should set a Looking-Glass slanting by the side of any thing, he will twice see the Image of the thing: so if a Smooth cloud like a Looking-Glass be set asslant beside the Sun, there will appear divers Suns. But *Pliny* writes that to his time there had never been seen more then three at once, *Hist. Nat. B. 2. Ch. 31.* Howbeit they report that six were seen at *Papia*, before the War. Now these false Suns seldom appear, because there is seldom found a cloud that hath such a disposition and such a Posture to the Sun.

*The Paraselene or fals Moon.* After the same manner is caused the Paraselene or false Moon, which herein only differs from a *Parelios*, that the former is an Image of the Sun, this latter of the Moon. Now the Images of these two Stars only are reflected to us; because their Raies are the strongest. Yea and a false Moon never appears but when the Moon is in the full, when her Light is most plentiful and strong.

*Rods, and straks in the Sky.* Hither also are to be referred the *Virgæ* or Rods so called, which are as it were certain lines and long Pillars, which appear of divers colors, in an uneven cloud, placed on one side of the Sun, arising from the beams thereof refracted. For such straks are ingendred, when an uneven cloud, which hath some parts thicker and as it were of a waterish Nature, and others thinner, is placed beside the Sun. For when the Sun-beams fall thereinto, they cannot pierce equally because of the diversity of the

the parts; nor do they appear contiguous, but rather disjoyned, and in the hinder parts, through which they penetrate, refracted; and so they represent divers colors: after the same manner as the Sun-Beams coming through chinks into a close Chamber, they represent lightsome Lines. Now the colors are not the same, but various according to the divers disposition of the parts wherein the Raies are received, which in thinner parts appear more light and white, in thicker more black and dark. Now these Rods or Strakes do appear for the most part, when the Sun rises or when he sets, but never at Noon tide; for then his Beams are so strong, that they easily attenuate and pierce into thickest Vapors.

Finally, There is seen in the Clouds the *Halo*, which is by the Author of the Book *de Mundo* thus defined, *Cap. 4. Halo* is a shining Circle, under the Sun, Moon, or other clear Star, appearing just betwixt us and the Star, made by the Beams thereof there refracted. For this same Circle is made when the stronger beams of some Star fall into a cloud equally spongy, which in regard of the Spunginess can indeed pass through, yet are refracted therein because of the thickness of the Air, and being refracted to even Angles they make a Crown. Now in the Center of the Crown the Star appears which is the cause thereof; because the straight Raies are stronger, and do more attenuate, Rarefy, and Illuminate the cloud. Now this kind of Crown appears most commonly a nights. But the vehement heat of the Sun dissipates the Vapor, and makes it more rare, so as it is unfit to refract the Sun-beams, by which means such a colored circle might arise. Now the Sky must be calm, that the *Halo* may be seen. For a cloud moved and variously agitated can neither retain an equal disposition of parts, nor present a certain color by the refracted Raies.

*Halo the Circle about the Sun, Moon &c.*

### Chap. 10. Of Fountains.

But that we may at last finish our Doctrine of Meteors, let us speak somewhat in the last place of Fountains and of the Sea. The opinion of *Aristotle* is commonly known touching the original of Fountains: how that Air and Exhalations in the Caverns of the Earth do by the coldness of the place lose their heat, grow thick, and are turned into water: after the same manner as in the middle Region of the Air, of vapors condensed, Rain is ingendred; which afterwards descending, and from many places gathered into one, and there flowing out become a Fountain: whose continual running is maintained by new Air daily succeeding in the Room of the former to avoid Vacuity, and afterwards changed into Water.

*Aristotle his opinion of the original of Fountains.*

But in good deed if we understand this Opinion of his concerning all Rivers, it is not true. For though we should grant that some Water may be made of Vapors condensed in the Caverns of the Earth, and that this may haply give beginning to some Fountains: yet we cannot be brought to think, that so much Water is this way generated, as to supply all the Fountains and Rivers that run upon the Earth. For since it is apparent, how great a Quantity of Air is required to make a little Water, and how much space those vapors take up of which a little Rain is bred; where will there be so many and so large Caverns, wherein so many Vapors, and so much Air, can be collected for the production of so many and so great Rivers? Also a reason of the perpetual Course of Rivers can hardly be rendered according to this opinion; seeing there is not alwaies the same plenty of Vapors. Much less can a Reason be given why many Fountains Issue from the tops of the highest Mountains.

Let us therefore rather embrace that opinion which is the most ancient of all, which the Preacher in *Eccles. 1. v. 7.* comprehends in these words: *All Rivers run into the Sea, and the Sea Flowes not over; the Rivers return to the places from whence they came, that they may flow again;* And let us hold with very many most learned men, that Fountains and Rivers as they run into the Sea, so have they their Original from thence. For otherwise the continual running of Rivers cannot be made forth, nor a cause be given, why the Sea receiving perpetually so many Rivers runs not over: or how Fountains come to arise from the tops of highest Mountains. And unless

*The true opinion.*

*why the Sea flows not over.* unless the Rivers had their Original from the Sea, it could not be but the Sea must run over. For the Rivers have some proportion to the Bulk of the Sea, seeing some of them are poured with such violence and in so great plenty into the Sea, that for the space of many miles together they afford in the Continent sweet Waters to the Mariners, amidst the Sea Waters. Nor can the Sun or Winds consume so much thereof as doth flow in; but the Sea repairs its detriement which it receives in common with the Rivers from the Sun and Wind, out of the Air, in the Nights. Also many Fountains have many things common with the Sea. *Pliny* writes in *Nat. Hist. Book 2. Ch. 103.* of Jupiters Fountain in *Dodona*, that it was alwaies dry at Noon; and from thence the Water encreased, till at Mid-night it overflowed, and after that it decreased by little and little. And he relates in the same place, How that overagainst the River *Timavus* there was a small Island in the Sea, with hot Fountains in it which Ebd and flowed as the Sea. Nor doth *Plato* seem to have been averse to this Opinion, who in his Dialogue called *Pbædo* writes, that there is an hollow place in the Earth, into which all Rivers run, and out of which they run back again.

*why Fountains arise from the tops of highest Hills?* Hence also a cause may easily be rendred, why Fountains arise on the highest tops of Mountains. For since the Globe of the Earth is round, and the store and weight of the Sea Water is great: it may easily by its weight thrust the water which flows through the veins of the Earth into the highest Mountains. And whereas the Fountain waters are not Salt, though the Sea is Salt, and that they have great diversity in qualities, springs from hence; because the Sea Water being strained through many turnings and Veins in the Earth, loses its saltness, and receives other qualities out of the Caverns of the Earth through which it runs and flows. Now the difference of Fountains is great; for some are used instead of drink, and others for Physick. The former are more simple, the latter more compound.

*Mineral waters what? They are twofold.* Metalline or Mineral Waters are those, which have in them the spirits or smallest particles of Minerals, Metals, and Subterranean Juyces, and differ from other ordinary potable Waters, in Smel, Taste, Color, and therefore are not used for drink, but only as Physick. Now these Waters are of two kinds; some have in them the very Bodies of Minerals and Mineral Juyces, such as are Salt Waters, vitriolated Waters, Alum Waters, out of which the water being boiled away, Salt, Vitriol, and Alum are drawn; nor may they conveniently be used as baths. But some contain in them the Spirits of Metals, and therefore in regard of the very great active and penetrating Faculty which they have, they are Medicinally used, both to drink and to Bathe in; such are the hot Baths, the acid and brackish Waters.

*whence metalline waters have their virtue.* Now whence these Waters have their faculties, Authors are not agreed. Some conceive they have their Virtue from the Minerals and Metals through which they flow. But this is not likely to be true. For since the Bodies of Metals are so compact, the Water which flows over them cannot so easily draw in their Forces; and if Mineral and Metalline Waters did thus gain their Virtues, we should have more of them. This indeed is true, that Minerals, as Vitriol, Alum, and such like, are corporeally mixed with the Water; and therefore they are separated from the Waters by boyling: Howbeit those Waters wherewith the Minerals are mixed only Bodily, do not gain those Virtues which the true Mineral Waters have, out of which the Metalline Bodies cannot be separated. But Metals cannot communicate their Faculties to Waters, only by the Waters running over them.

And Experience doth witness that many springs breaking out of high Hills do bring out with them Gold, Silver, Copper, Iron, Tin, Lead, *Lapis Lazuli*, the Armenian Stone; and yet they have no faculty of any of those Metals which they carry and drive forth, but may be drunk as ordinary Waters.

Moreover if those Waters should gain their Virtues only by washing the Metals in their Course; the Virtues of the next Veins through which they flow had been long since exhausted: whereas nevertheless these Waters have had the same Virtues for many Ages together, and do still retain the same. Moreover out of those metalline Waters no Metals can be drawn forth, either by distillation, boyling or any other way.

Most likely therefore it is, that those waters take their Virtues from the first matter of the Metals, which is a subtile, Fluid, and spirituous substance, not yet compacted nor coagulated into a solid Metalline Body. For these Spirits of the Metals are mixed with the waters, and communicate all their Virtues to them. For as out of Vitriol, Sulphur, Yea and Metals themselves, by force of Fire spirits are drawn, which being mingled with water do communicate their Virtues thereunto: even so Nature also, in that great Circulatory the Earth, in the generation of Metals produces spirits, which being mixed with neighbouring Waters and such as run by, do bestow their Virtues upon them.

Nor doth a less difficulty occur in searching the Cause of hot Baths. Some attribute the Cause to the Suns heat, others to winds gathering hot Exhalations into one place: but without any probability. Others think they have their heat from the *Lapis Calcarinus* or Chalk Stone so called. But neither is this probable. For the *Lapis Calcarinus* doth not heat water unless it be first reduced into Lime by Fire. And suppose that those Stones were Calcined by the Fire under ground, yet could not that heat be perpetually continued. For after that the Lime-stone is once soaked in Water, it will afterward no more become hot.

*The Cause of the heat of Baths.*

Others therefore do more probably deduce the cause of the heat of Baths from the Fire which is in the Bowels of the Earth, and that the Waters do either run through those hot places underground, or that in the way they are joyned to the Fire and flame, or that they run so long near or over the Channels of Fire, as to grow hot thereby; or whiles the Earth is made hot by subterranean Fires, many Vapors are from thence lift up, which at last in some wide place turn to water, and some where or other seek their way out. Which they declare by this example. Let salt water be mixed with Potters Clay, and make a round Globe of the said Clay, hollow within, whereinto put a Pipe, and stop the hole with Clay whereinto the Pipe is put; then put the Globe upon the Fire, with the Pipe from the Fire. When the Globe Waxes hot, hot Salt Water will flow out of the Globe through the Pipe.

Howbeit, some there are, who though they allow this manner of generation in many places; Yet seeing in all places where there are hot Baths there are not signs of any Subterranean Fire; and moreover there are Baths found, whose heat vanishes away, if you dig a little to find their original: wherefore they conceive it probable, that some hot Baths are caused by two or more metalline Waters, which are cold to the touch, of their own Nature, but upon their meeting together they grow hot by the Repugnancy of Spirits. An example whereof is seen in spirits of Vitriol and Oyl or Salt of Tartar; also in *Aqua fortis* and Tartar, Butter of Antimony and Spirit of Nitre: which though to the touch they are cold: yet if they are mixed they grow hot; and that in such a measure, as if suddenly you pour Oyl of Tartar upon *Aqua fortis* wherein Iron hath been dissolved, it will not only boyl but take flame: which also will happen, if you suddenly pour a quantity of spirit of Nitre upon Butter of Antimony so called. And therefore they conceive it rational, that when two springs consisting of a mixture of such Repugnant spirits do meet and mix together, that the water should by that means wax hot.

Now concerning the Sea, Authors are wont in the Doctrine of Meteors to handle two questions principally, one concerning the Saltness of the Sea, another touching its Ebbing and flowing. Touching the Seas saltness the opinions of the Ancients were many, which *Aristotle* refutes in his 2. *Meteor. Cap. 3*: We in this point follow *Aristotle*, and hold that the Sea water is not Salt of its own Nature, but that it becomes such by the admixture of some Salt thing; which also is seen in Ley. Which also may be gathered from that which *Aristotle* in the forecited place, and *Pliny* in *Nat. Hist. Lib. 31. Cap. 6*. deliver, how that hollow balls of Wax let down by Nets into the Sea, and empty vessels stopped, they gather into themselves fresh Water. For many Earthy Salt Exhalations do both fall into the Sea in showers, and flow thereinto with Rivers: also the Sun exhals out of the Sea the moister and sweeter parts of the Water, leaving behind the more heavy and Earthy. And therefore on the top the Sea is saltier, then towards the bottom, because the Sun doth more exhale the sweet parts out of the Surface: also the Sea is saltier in the Summer then in the Winter, and more in the Eastern and Southern parts then elsewhere; because in those places the Sun beams are stronger.

*The Cause of the Seas Saltness.*

The Ebbing and flowing of the Sea how caused?

As to the Ebbing and flowing of the Sea, there is very great difficulty, chiefly caused by the very great variety which is in the said Motion. For in some places there is no such motion, or it is scarce discernable: in other places it is so great, that vast shores lie bare, and there are places to go over dry, which were before covered with Water: in some places the motion is slow, in other places so quick, that in the space of an hour or two many miles will be covered with the Flood, and as many bared by the Ebb, so that men can hardly run fast enough to save themselves from the fury of the Tide coming in. Nor doth this motion keep the same time in all places. For the most part, it flows six hours and Ebbs as many. Yet in some places it flows seven hours and Ebbs five: in others, it flows four hours and Ebbs eight. In which Variety nevertheless there is this regularity, that the Ebbing and flowing together last but twelve hours. In very many places the greatest floods are at full moon; yet in some places they happen at new Moon. Touching which variety of this Motion, you may read in *Cardan, Lib. 2. Subtil. p. 168. Scaliger in Exercit. 52. Caspar Contarenus in Lib. 2. de Elementis. Collegium Conimbric. de Met. Tr. 8. Cap. 4.*

Now touching the Cause of this motion there are so many several opinions, that you can hardly tel which to assent unto. Wherefore not without Cause *J. C. Scaliger* in his *52. Exercit.* thus writes: *My common saying which I use every where, That we know nothing, is most seasonable in this disquisition touching the Motion of the Sea.* And a little after. *Who will not say that Philosophy her self can but stutter in this point? When he shall see almost in the same shoars, that it is high-water at Calicut when the Moon is full, and at the shoars of the River Indus, when the Moon is new. This is a point of subtilty which thou oughtest to have searcht into, O Cardan; which if thou canst unfold unto us, I will consent that thou be counted the god of Philosophers. You will ask me, what say you to the matter? I did nothing but expect to hear from you. But seeing you appear not in this Point, I dare not so much as expect myself. And therefore if so great a Philosopher doth here confess his own Ignorance, what can we promise after him save to reckon up the opinions of some Authors.*

*Julius Caesar Scaliger* therefore attributes the force hereof to the Moon, and divides half the Heaven which is turned about in twelve hours, into two Quadrants, and that during the one the Waters do follow the Moon to the middle of Heaven six hours, and as many more they fall back, being driven by the repulse of the shoars. But whether the encrease of the Sea be caused by rarefaction, or by addition of new substance, he dares not determine; only he saies, the Sea Waters do follow the Moon, and that they are suspended thereby as the Iron by the Loadstone. And herein most Authors are agreed, that the Motion of the Seas Ebb and flow depends upon the Moon, and that it is terminated in twelve hours. And that because the Moon doth not alwaies rise in the same place, nor is also alwaies at the same time carried above the Horizon, therefore the Ebbing and flowing doth not observe the same time. Now that this motion depends on the Moon, besides what hath been said, this seems also to be a sign, *viz.* That the Flood comes every day an hour later; because the Moon returns to the same place in about the space of twenty five hours. Now *Scaliger* in the same place endeavors to render a Reason of that variety, of swiftness, and Cessation in some places, and of other things seen in this Motion; from the various Scituation of places, the highness and lowness of the shoars, the greatness and narrowness of the Sea, the even Plainness of its Course, or the many turnings, windings and straits, and the Nature and depth of the bottom.

*Contarenus* conceives, that when the Sea flows the waters are rarified and so swell and are on all sides poured out to the shores; and that in the Ebb the Waters are condensed and contracted into themselves and so leave the shoars; and that the rarefaction proceeds from Heat, the force of which heat depends upon the Moon. And to explain the time of this motion, he divides the Heaven into four equal parts, with the two greatest Circles, the Meridian and right Horizon, upon which when the Moon ascends towards the Meridian, the water swells and is peured abroad; for then the beams of the Moon have greatest force: but when the Moon is moved from the Meridian to the occidental Horizon, the water flows back again, and gathers it self into it self, because of the weakness of the Raies of the Moon. But why, when

when the Moon is moved from the Occidental part of the Horizon, unto that part of the Meridian which is beneath the Horizon, the Water should swell again, and afterwards decrease when the Moon goes from the Subterranean Meridian to the oriental Horizon, he saies he can find no probable cause himself, nor can see any made out by others. Also he professes the Cause is to him unknown, why in some places there is no Ebbing or flowing of the Sea.

*Taurellus* holds thus: The Sea disburthening it self into the inmost parts of the Earth, is the cause that the Waters with great violence flow from all the shoars round about to that Gulph or inlet. For there where the Sea empties its Waters into the Cavities of the Earth, there also it is depressed and falls, that the other Waters may from all parts creep thither, which (the Caverns of the Earth being filled) being gathered from all sides into one place, according to the Largness of the Sea and the force of the Waters it is raised aloft, and afterward settles by degrees, and returns to the shoars formerly forsaken, an addition also of Waters being made from the Rivers. Thus the whole bosome of the Sea is filled with Waters, til the upper Cavities of the Earth being emptied they require more Water of the Sea, to swallow up after the foresaid manner.



THE  
FIFTH BOOK.  
*Of Minerals and Metals.*

Chap. 1. Of Earths:

After Meteors, we are next to discourse of Bodies perfectly mixed. Now Bodies perfectly mixed are of two sorts: some lifeless, others living, The lifeless are Metals. For by that word all things bred in and digd out of the Earth are understood, as appears by the preface of *Dioscorides* to his Fifth Book. Late Writers call them in general Minerals: because the Quarries and Pits whence they are digd are termed Mines.

Now concerning the Nature of all these kind of things, this is first to be known; that many men conceive, that these Minerals and Metals contain nothing in them besides Elements, and that they are only simply mixt bodies: but herein they are mistaken. For their operations are of a far other Nature, then that they can be deduced from the Elements alone. And therefore *Scaliger* saies rightly in his *Exercitation* 137. *Sect.* 20. That every forme of a perfectly mixt Body, although it is no Soul, (as for example that of an Adamant) is a first Nature far different from the four Elements. And in his *Exercitat.* 101. *Sect.* 14. he reprehends *Cardan* for beleiving, that only by the mixture of the Elements it can come to pass that the Load-stone can draw Iron. For even these things have also, that I may so speak, their Seminary forms and Virtues, put into them by God at their first Creation; nor were they made after the Creation of the world, by the various conflict of the Elements, but were created by God; and by those forms they are perpetuated,

*whence Minerals have their forms?*

ted; and from those forms proceeds not only the forming of their Bodies, (which is no less admirable then in some plants,) and their wonderful Virtues, but also their Propagation and Perpetuation. For the form of Minerals and Metals can multiply it self; and those Bodies have in their Creation a power given them by God to multiply themselves in a fitting matter and a convenient place. Which even Nitre doth teach us. For though out of Nitrous Earth the Salt be once extracted by boiling: yet out of the Mother of Nitre, as they call it, new Nitre is generated; and that not once only, but very often; which our Salt-peter men now a daies know very well. Nor was it unknown to the Ancients, as appears from *Pliny*, B. 31. Cap. 10. where he writes; that the froth of Nitre was made, when the Dew had fallen, the Nitre Mines being Pregnant, but having not as yet brought forth. By reason of which form it comes also to pass, that though in these Minerals there is a mutation in their external form, so that they are reduced into Pouders, or Liquors, or Glasses: yet they nevertheless easily returne into a Metalline Body; because their internal form continues safe and sound, as may be seen in Mercury, Antimony, Lead and other things. And therefore when the Question is touching the Generation of Minerals and Metals; it is not enough to have recourse to those Vapors mentioned in the Doctrine of Meteors, but there is need of more determinate and Specifick principles.

Now what these are, cannot in general be wel explained. For there is great variety of Minerals, which must first be propounded. Now they are by others otherwise divided. I think fit in this place to retain the division of *Albertus Magnus*, who makes three kinds of them, Stones, Metals, and Middle Natur'd Minerals; by which Name he comprehends all the rest, which have a certain middle Nature betwixt Stones and Metals.

And that we may begin with the last kind, it contains many things under it; Earths, Stones, Sulphurs, Bitumens, and some things mixt of these, coming nearer the Nature of Metals. As for what concerns Earths, we do not thereby understand the simple Element, nor yet that Earth which is every where plowed up by Husbandmen, and which is fit to sow Corn and to set Herbs in: which though it be not simple, yet it comes nearer to the Nature of the Element of Earth, then the Metalline Earths do. Although here also is great variety, and some ground partakes little or nothing, another partakes much of a Metalline Nature. Now that many grounds partake much of Minerals doth hereby appear, in that when they are burnt they send forth a Sulphureous Vapor, as Metals and Minerals are wont to do. But by earth in this place, we understand a Body digd out of the ground, which partakes of a Mineral Nature, and which (water being thrown on it) dissolves, and turns to Clay.

Potters  
Clay and  
Argilla.

Among these kind of Earths the most vulgar is Argilla and Potters Clay; which is a Clammy Earth, and breaks not when it is molded, nor chops when it is dried. There is also great variety hereof, according to which the Vessels differ, which are made not only for Kitchin uses, but for other House occasions, and for the use of Gold-Smiths that melt Metals, and for Chymists. For of every kind of Clay all Vessels cannot be made, and one sort will endure the Fire better then another: also one sort will be molded more delicate, thin and fine then another. Whence the excellency of Potters Clay is estimated.

Marga,  
Marle.

After Argilla and the several sorts of Potters Claies comes *Marga* or *Marle*. Now this is a Fat Earth, being as it were the fatness of the ground, and the name comes from the High-Dutch, and 'tis called *Steinmarck* as if you would say the Marrow of Stones; and it is found shut up amongst Stones. Now there are sundry kinds thereof; *Pliny* reckons six, White, Red, Dove coloured, Clayish, Stoney, and Gravelly. And of each of these there are again many different sorts. 'Tis found in many parts of Germany, and among them the *Marle* of *Rochlich* is most famous; which they use in the stead of Bole-Armeniack.

To Earths also belongs *Creta* Chalke, by which name also Earths are understood, which are used to Polish, Clense, Rub, Paint and Colour. There are many kinds thereof, yet because it is chiefly digd up in the Island of *Creta*, therefore all sorts have borrowed their Name from it.

There are also many other kinds of Earth, which are used partly by Physitians, partly by other Mechanical Artists, which differ in Rarity or Spunginess, in Clamminess



miners, in colour, taste and use. And as to their Medicinal use; some binde cool and dry, as the Eretrian, Samian, Lemnian, Armenian: some with their astringent have a certain biting quality, either from Nitre, as the Chian, Selinusian, Cimolian, and *Pignitis*, which are Absterfive or Scouring; or from Alum, as the Melian Earths, and the Clay of many Baths, which are good for the Gout and Malignant Ulcers: or they have in them some quantity of Bitumen and of Sulphur. Also there are some Earths which give a black Tincture fit to make Inke, as *Calcitis*, *Mysi*, *Sori*, and *Copperas*.

The most renowned among these Earths are *Terra Lemnia* and Bole-Armeniack. The former is so called from the Island wherein it is found. Also it is called *Terra Lemnia Sigillata* or sealed Earth, from the Seal imprinted thereupon. *Galen* avers that he saw with his own Eyes a certain hill near the City *Ephesiades*, wherein no plant grows, the soil being as it were burnt up, of a red colour, out of which the Earth is digd. Also that there were three differences thereof: that one was of a red colour, but not staining the hands, being the most excellent of all, which the Priest might only touch, as a sacred thing; and he sealed it with *Diana* her signet, which was the Picture of a Goat: the other was red Oker which did colour the hands of the touchers; the third was used to scour Cloathes, because of its cleansing faculty. Those who at this day sail to the Island of *Lemnos*, do say that it is gathered in the Dog-daies in a moorish ground, that it is signed with a certain Seal and sent to the great Turk, and that therefore it is hard to come by, and not publickly sold. But these sealed Cakes have not all the markes of the old *Terra Lemnia*. Now the old *Terra Lemnia* had an excellent Faculty to resist the Plague and Malignant Diseases.

Bole-Armeniack or Earth of *Armenia* was brought out of that part of *Armenia* which is next to *Cappadocia*. It was of a pale colour, would quickly be reduced to fine powder like as Chalk will, being held in the Mouth it would melt like Butter: it was drying and binding; and therefore it was used for the *Dysentery*, the looseness of the Belly, and spitting of Blood; for Catarrhes, and Ulcers of the Lungs: also it was good against the Plague.

Moreover there are many other Earths, *Eretria*, *Samia*, *Selinusia*, *Chia*, *Cimolia*, *Pignites*, *Melia*, *Rubrica*, and *Sinopica*, Precious Earths so called most of them from the places where they were digged. Of which see *Pliny* Book 35. Ch. 16. and 17.

And indeed the Ancients used such Earths as were then known to them, and were brought out of neighbouring places; and seeing we have hardly now any certain notice of many of them, and the Quarries of the Ancients by injuries of time and the change of Empires are either unknown or exhausted, and every where in other places and in our Countries the like Earths are found: it is better to ascribe the Virtues of these Earths to the kind then the place, and to value every one according to its own Nature, and to try the Vertues of Earths by Experiments.

For there is in *Hungaria* *Bolus Tockaviensis*, which *Crato* in his Epistles tells us that it will melt in the Mouth like Butter, and hath all the signs of true Bole-Armeniack, and is very good against Catarrhs; and he prefers it far before the Bole-Armeniack which we have at this day, yea before that which was brought the Emperor out of Turkey. He saies he found by experience that it help many of the Plague at *Vienna*.

Moreover there is the *Terra Sigillata* of *Silesia*, which is preferred before the *Terra Lemnia* and the Turkish Earths which we have at this day. For it is now proved by many experiments, that it hath rare Virtues against the Plague, Malignant Feavers, the bitings of Venemous Beasts, the looseness, and the Bloody flux. The Chymists call it *Axungia Solis*. The finder out thereof was *Johannes Montanus* a *Silesian*, who published a Writing or Treatise concerning the same, how that Gold was changed by the ordination of God and Provident Nature into a most excellent prepared Medicine, especially good against Poisons, no less then those Medicaments which are made with great Cost of Hungarian Gold. And if that be true, I wonder why it is dissolved rather with Spirit of Vitriol then Spirit of Salt.

There is also found another about *Lignitium* and *Gold-berg* in *Silesia*, which the Chymists

Chymists term *Axungia Lunæ*: and in many other places other such Earths are found. And therefore, as I said before, these kind of Earths are not so much to be esteemed according to the places, as their own peculiar Natures. And because they have all their Virtues from Minerals and Metals, when we would judge of the Virtues of any sort of Earth, we must consider with what Mineral or Metal it hath affinity. And now we proceed to other things of this kind.

### Chap. 2. Of Salts.

**A**S concerning Salt, there are many kinds thereof. First, There is common Salt: which again is threefold: digd Salt, Sea-Salt, and that which is boiled out of Salt Fountains. Now what the original of Salt is, is not so manifest. 'Tis commonly said to be engendred of a watry and thick Earthy Juyce mingled together. *The Original of Salt* But this doth not sufficiently explain the matter, nor is the cause rendered why it is found only in some certain places. The more probable opinion and most likely is, that Salt as other minerals and Metals, was at the beginning of the World created in the Earth, wherein it still Preserves and Multiplies it self, by a faculty placed therein by the Creator. For if the simple Elements, in so many Mutations and Vicissitudes of Sublunary things, do preserve and multiply themselves, and so remaine entire, from the beginning of the world to this very day: I see no cause, why we should deny the same power to these Bodies. For that which was before said of Nitre, is true of common Salt. And therefore it is not bred in all places, but in those only where that spirit, (or Seminary principle, if I may so call it,) is present; as Nitre is bred only in that Earth, in which there is the Mother of Salt-Peter. And from the principle of Salt, in the Caverns of the Earth, where there is no great store of moisture, *Sal Fossilis* or digd Salt is bred. And according as that matter which by the Principle and spirit of Salt is coagulated into a Body, is purer or impurer: so this digd Salt is bred purer or impurer, and some is blackish and dark colourd, other some is white and transparent like Chrystal, which is called *Sal Gem.*

But if the said principle of Salt be mixed with much humidity and Waters sliding through the Caverns of the Earth; Salt Fountains, out of which Salt is boiled do thence arise. Some indeed conceive that Salt Fountains arise from the Sea. But the Sea Water doth not contain so much Salt in it as many Salt Fountains do; which experience doth teach. Nor let any man say, that the Waters while they flow through the Caverns of the Earth do exhale, and are consumed by the underground Heat, and that so some Fountains come to be Salter then the Sea. For if this were so, the Salt Fountains which are farther from the Sea should contain more Salt in them then those that are nearer, which nevertheles agrees not with Experience. Others conceive that Salt Fountains proceed from waters which run through the Caverns of the Earth containing much digd-Salt in them. But, though this cannot be absolutely denied; yet the question is whence that ground Salt hath its Original and Durability. For if Fountains were made Salt only by their Waters flowing through ground-Salt, they would not last so many Ages; but the ground Salt being melted into the Waters would be consumed, but especially those Fountains would not alwaies afford a like quantity of Salt, seeing the Salt being melted by the running by of neighbouring Waters would be washed away. Therefore we must of necessity add the Spirit of Salt, the primary principle of the Generation of Salt.

Sea-Salt is made of the Sea water, the Heat of the Sun consuming the Watry moisture. And if the Heat of the Sun be not sufficient, it is perfected by Fire: and to make it whiter and purer, it is purged by Solution and Coagulation. There are also certain Lakes, which by the Heat of the Summers Sun, turn to Salt, whence we have the Tarentine and Phrygian Salt.

*The use of Salt.* The chief use of Salt is to Season Meats, and all the Spice in the world will not make meat pleasant, without Salt. It Heats, Dries, Scours, and consumes superfluous moisture, and therefore preserves from putrefaction. And although it defends from Putrefaction, yet is it not good in putrid Feavers; not only because it is Hot, but because it dries too much.

Beside

Beside Salt used in food, there is another ground-Salt, called *Armeniacus* or *Ammoniac Salt*, cal'd so from *Anmos* the Sand, because it is found under the Sand congealed into plates, in the *Cyrenaick* Countrey. It was of a blackish color, and ill tasted. And therefore it is now adiaies out of use; and *Sal Gem* is used in stead thereof. But that *Sal Armeniack* which is commonly now so called, and which the Chymists use, is made by Art. It is made of five parts of Mans Urine and one part of common-Salt, and half a part of the Soot of Wood, boiled together til the moisture be consumed. That which remains is sublimed, dissolved again and coagulated.

This Salt is extremely volatile, and renders all fixt things volatile, and therefore Chymists use it in the Solution and Sublimation of Metals. And in Plants and Animals, since there is found both a fixt and Volatile Salt, the Volatile is frequently by the Chymists called *Sal Armeniac*. Concerning Salt see *Pliny Lib. 31. Nat. Hist. Cap. 7. and 9. and Dioscorides, Lib. 5. Cap. 85.*

Thirdly, Nitre also it self belongs to the family of Salts, and it is bred in a peculiar kind of the Earth, upon Walls and Rocks, where it sprouts out like white down, and therefore 'tis cal'd *Sal-Petra Salt-Petre*, that is Salt of the Rock. Also they relate that it breeds of it self in *Asia*, for it drops down in Caves and is gathered and dried afterward in the Sun. The Lydian is the best, which is known to be true by its lightness and crumbling, and color almost Purple. This sort is called *Aphronitrum*, as if you would say, the froth of Nitre. Also it was bred of its own accord in *Macedonia* among the Ancients, by the Coagulation of Water, and they cal'd it *Cbalasticum*, being white and pure, and the likest to Salt. By Art and boiling it is extracted out of the Nitrous Earths. Now this same Salt is of a wonderful Nature. For to sight it appears white; to the touch cold: yet it contains in it a Spirit exceeding Red, Hot, and extremely apt to take flame, and perfectly of a Fiery Nature. All the strength of Gun-powder proceeds from Nitre, only *Brim-stone* makes it speedily take fire: yet because all the Sulphur is not inflamed as it were in a moment, but successively and by parts; but Nitre after it hath once taken Fire suddenly and forcibly burns all away, (and because being set on Fire it cannot be contained in the Room wherein it was before; and besides the Nitre and Sulphur are as it were Enemies:) hence comes that same thundering force of Gun-powder. The Chymists take Nitre well purified before and purifie it yet further, by casting into it when it is melted over the Fire divers parcels of Sulphur; and this they call *Nitrum Preparatum* and *Sal Prunella*, because it is of rare use in burning Feavers, especially those wherein the Tongue and Throat is inflamed, which inflammation is called *Prunella*. Concerning Nitre see *Pliny, in Hist. Nat. Book 31. Chap. 10.*

Fourthly, Of the Family of Salts is also Alum, called by the Greeks *Stupteria*, because of its vehement astringency. For all sorts of Alum do Heat, Bind, purge putrid Ulcers, dry up moisture, quel proud flesh, and therefore it is used in many Medicaments ordained for Ulcers. It is found in its mines, and is extracted by boiling. And where Alum is bred, there commonly is found Vitriol and Sulphur. And as it is boiled it contains much fattiness in it, which cannot be separated but by mans Urin, which being poured thereon, it makes it fall to the bottom. *Dioscorides* reckons three kinds thereof; *Digd-Alum*, *Round Alum*, *Liquid Alum*. There are now more kinds known. The first is *Alumen Rupeum* or *Roche*, *Rock-Alum* or *Roche-Alum*; which Greek word *Roche* serves the greatest part of Europe to signifie a Rock, as *Scaliger* saith in *Exercit. 104. Sect. 6.* Also they call it *Ice-Alum* because 'tis congealed in the form of Ice; and *Roman Alum*. This is most used in stead of the Natural sorts, and is made in the Roman Territory, of a certain Stone burnt. *Scaliger, in the place forecited*, shews all the manner of the work. Then there is *Alumen Saccharinum*, made up like a Sugar-Loaf, of *Roche Alum*, the whites of Eggs and Rose-water, for Women to beautifie their Skins. *Alumen Squamosum* or *Alumen Scajola* (for *Scaja* and *Scalia* signifie a Crust or Scale, *Scaliger Exercit. 104. Sect. 7.*) 'tis made of a Scaly Stone, transparent like Glass, which being burnt divides into plates, and grows white like Plaster. Moreover there is a sort of Alum made of Lees of Wine, burnt in the Fire. Also *Alumen Cavinum*, made of the Ashes of the Plant *Kali* or *Soda*. But these are rather Artificial and Compound Salts of Plants, such as Chymists do at this day make, of all sorts of Plants.

Plants. To the kinds of Alum is referred also *Lapis Amiantos*, *Alumen Plumosum*, Featherd-Alum; which nevertheless is not properly Alum, nor hath it the same faculties with other sorts of Alums. It grows in Mineral Quarries, interwoven as it were amongst the stones; being so fixt that it will bear the Fire; whence some term it *Linum Vivum*. Concerning Alum see *Pliny in Nat. Hist. Lib. 35. Chap. 11.*

*Vitriol* Fifthly, Amongst the Salts there is *Vitriol* so called from its Glassie clearness, and by the Greeks *Chalcantbon*, by the Latins *Atramentarium* Blacking, because Skins and other things were therewith died black. This kind of Salt is of an admirable, and perfectly fiery Nature, and contains in it a burning Sulphur; and therefore it performs more then other Salts, in the dissolving, colouring and generating of Metals; and the spirit thereof changes Iron into Copper. Now it contains in it two spirits, the first white, of great and known use in Physick; the other red; and in the Earth at last remains the fixed Salt. Now *Vitriol* is either Natural, Congealed in the Caverns of the Earth, or dropping therefrom; or else Artificial, which is boiled out of certain Vitriolous Stones, or out of a rusty kind of Earth, or out of an Ash-colour'd Earth, speckled with green and red Spots, which nevertheless makes no difference in the essence of the thing: even as Salt digd out of the Earth, and that boiled out of Salt Fountains differ not essentially. Other differences are rather to be observed, whence also the difference of virtues depends. For although all *Vitriol* do partake of the Nature of Brass, and therefore vitriolated Water changes Iron into Copper, which is practised in *Hungaria* and at *Goslaria*: yet some partakes more of the Nature of Brass or Copper, and other of the Nature of Iron; and therefore some is of a Blew, other of a Green Colour, and that either a deep Green or a light Green. The Blew partakes of the Nature of Copper; the Green, of Iron. And that is best which is of a deep and pleasant colour, and transparent. The Cyprian, Roman and Hungarian are commended; nor is that a base sort which is found in some parts of *Silesia*. The best now adaies is made by Chymists out of Copper, of a delicate Azure colour: which they term *Vitriolum Veneris*. There is also white *Vitriol* so called. Now *Vitriol* heats and is astringent, consumes moisture, contracts the flesh, dries, and preserves moist flesh from corruption. The Ancients also gave it inwardly, to kill Worms and to resist the Poison of Toad-stools. But now, as was said, a spirit is drawn out of it, which is more safely given, and hath a rare faculty to dry and resist Putrefaction; and therefore it is profitably used in putrid Feavers and Pestilences. See of *Vitriol*, *Pliny Lib. 34. Nat. Hist. Cap. 12.*

### Chap. 3. Of Bitumen and Sulphur.

**T**He Third kind of Subterranean Bodies or Minerals we told you were Bitumen and Sulphur in their severall sorts; *viz.* All such things as are Oily and Fat, and are therefore easily mingled with Oyl; whether they be liquid or dry. And that somewhat may be said in general touching the original of them all; 'tis commonly held, that these kind of bodies are bred in the bowels of the Earth, of an Hot and Dry Exhalation. But what was said before of Earths and Salts, the same must now be said of the sorts of Bitumen and Sulphure, and afterwards of Metals; that we deny not the mixture of the Elements in these things; but seeing there is no specifick Form of any Natural Body, which had not God for its author in the first Creation of the World, we must needs hold, that these things have not begun to be after the Creation of the world, by Reason of the Various concurrence, Eight, and mixture of the Elements; but that they were made by almighty God at the beginning of the World, and that they received from the same Author this mixture which they have, with their specifick Form, and a power to multiply themselves, and to change fitting matter into themselves. Whence it is, that though there are no where wanting Elements that may be mixed; yet cannot Bitumen and Sulphur be bred in all places, any more then Salts and Metals; but there only where the specifick Form of Bitumen and Sulphur is found; which when new Bitumen and Sulphur is ingendred, is the principal Cause and Directrix of the mixture of the Elements. And therefore though we grant that such Bodies consist of Elements: yet we deny that they have their Forms from the Elements, but here also make use of

*The original of Bitumen and sulphur.*

*Where Bitumen and sulphur are generated.*

of that passage of *Scaliger* formerly cited, out of *Exercitat.* 137. *Sect.* 20. that every form of every perfectly mixt Body, as of an Adamant, though it be no Soul, is a fifth Nature, far differing from the Elements.

And although we grant that the Matter of Bitumen and Sulphur are Elements: yet are they only the remote matter: but the immediate matter and whereof all sorts of Bitumen and Sulphur do partake, is a simple similiary Body apt to take flame, and fat, and which may in general be termed Bitumen and Sulphur, as you please: where with afterwards when the Salts concure, especially that of Nitre, Waters and other things, either Spirituous or Fluid, or Dry and Earthy Metallick Concretions, (the formative principle directing all to some certain form) thence are made sundry sorts of Bitumen and Sulphur. Now Bitumen and Sulphur are bred in the Earth, or in this Globe consisting of Earth and Water. For although some such thing sometimes falls out of the Aire: yet was it first drawn up in form of an Exhalation out of the Mines into the Air, where being coagulated it falls down again. Now when it is ingendred in the Earths Caverns it is voided forth either into the Sea, and is there cast ashore; or it flows out of the Earth, either alone or with Fountain Waters, or it is digged up. And there is scarce any Region in the World, wherein some sort of Bitumen and Sulphur is not found. Now aptitude to take flame is proper to all Bitumen, and after it hath once taken flame, to burn fiercely, and if Water be sparingly poured on, not to be extinguished but to burn more furiously. The Reason whereof is, because such Bituminous substances, after they conceive flame, do not only take flame on the top, as Wood and other things, but they do totally take fire and break into flame. Whence it comes to pass, that though the outer surface be wet with Water; yet the inner part which also flames receives not the wet, but rather gathering it self into it self it grows more strong, dissipates its Enemy Water, and flames more lustily. And hence also it comes to pass, that some mixtures of Bitumen do burn under the Water it self. And the burnings of certain Mountains, Territories and Waters, do proceed from Bitumen and Sulphur. Now all Bituminous Bodies have the Faculty and Heating and Discussing; and therefore Fountains and Baths that have Bitumen and Sulphur in them are profitably used to dissipate cold Humors, in Palsies, Epilepsies, and such like Diseases.

And there is a great variety of such Bituminous Bodies. Yet they are all reduced to two kinds, whereof one is liquid, which flows like Oyl, the other coagulated and condensed. And again there are many sorts of both. The Liquid, which go all under the Name of *Asphaltum*, are *Naphtha*, *Petroleum*, Liquid Bitumen peculiarly so called, or Native liquid Pitch.

And *Naphtha* in the first place is the liquid part of Babylonian Bitumen, being Hot, Dry, and of a Nature perfectly Spirituous and Fiery; which hath so much Affinity with Fire, that the flame will leap to it at a distance, and it may easily be set on Fire by the heat of the Sun. And therefore *Plutarch* in his *Alexander*, writes, that *Naphtha* was by some called *Medeas* Medicament with which she smeared the Crown and Vail of the Daughter of *Creon*, and so burnt her. What if *Hercules* coming to the Altar to sacrifice, with a Garment smeared with *Naphtha*, his Garment caught flame, and so he was burnt; and this was the blood of the Centaure *Nessus*, of whom the Poets Fable? Of whom *Ovid*, *Metamorph.* L. 9. *Fab.* 3.

It is question'd amongst Authors, whether *Naphtha* should be called by the Name of Bitumen, or Sulphur, or Oyl. But seeing these Names are not alwaies used in the same manner, you shall not offend, whether you call it an Oyl, viz a Native Mineral Oyl, or a most delicate Bitumen. Indeed, it is a bituminous Spirit; and it seems to be to Bitumen as Spirit of Wine is to Wine, and Spirit of Turpentine to Turpentine. The most pure and excellent kind of *Naphtha* is white: yet they report that there is also found a Yellowish, and also a black sort.

By Reason of its extream aptness to take flame, 'tis hardly used about any thing: otherwise among all the sorts of Bitumens, it is most Hot, Dry, and piercing. And therefore it may be used as an Oyntment to discuss cold Humors, also for Cholicks sleepy Diseases, Apoplexies and Palsies. Concerning *Naphtha* see *Dioscorides*, *Lib.* 1. *Cap.* 85. and *Matthiolus* and others that have commented upon *Dioscorides*.

*Petroleum.* Next to *Naphtha* is *Petroleum*, as if you would say *Petra Oleum*, Oyl of the Rock, because it distils out of Rocks, with a very strong smel. It is a Bituminous Oyl not so subtile, nor so spirituous as *Naphtha*; and therefore it neither takes flame at a distanc, nor so suddenly. 'Tis of a various colour; the best is white; the worse Yellow, Red, Black. Hitherto belongs liquid *Succinum* and Liquid-Ambar, which are nothing but certain sorts of *Petroleum*. It is found in many Regions. In *Italy*, in the Country of *Mutinum*, it drops out of the Rocks, white and Red, of a very strong smel; in *Sicily* it swims upon their fountains, and they cal it *Oleum Siculum*, and use it for Lamps instead of the Oyl, and also *Pliny* commends it for Scabby Cattle. But it is found in very many places besides; nor must we esteem it from the place, but according to its Nature. It is al of an heating drying faculty; by reason of the thinness of its Essence it penetrates, and discusses excrementitious Humors, and therefore it is good against the Palsie, and Cold pains and Diseases of other parts, especially the Nervous parts.

*Liquid Bitumen.* In the Third place is liquid Bitumen, so called by translation of the general term to one special sort; it is thicker then *Petroleum*, which they mingle with Tallow, to Smear the Axletrees of Coaches and Carts. If black Pitch be mingled therewith, it serves also to Pitch Ships and is called *Pissasphaltus*. Now these three, *Naphtha*, *Petroleum*, and *Bitumen Liquidum*, seem to differ, not in original, seeing they agree for the most part in one Root, but in the thinness of their parts; so that the thinnest and most spirituous is termed *Naphtha*; the middle and Oylly sort, *Petroleum*; and the thicker and more dreggy is called *Bitumen Liquidum* in a special manner. And the difference of these Bitumens may easily be observed in the distillation of Ambar: wherein, that which is thickest and remains at the bottom resembles the Fitchy Bitumen; the Oyl resembles the *Petroleum*; and the most subtile part resembles *Naphtha*, and like it doth also snatch the flame to it self.

*Maltha.* Finally, Amongst the Bitumens is *Maltha*, although it seems not to be meer Bitumen, but a Liquor thereof mixt with a Clayish slime; of which *Pliny Lib. 2. Nat. Hist. Ch. 104* makes mention: in *Commagenes*, saith he, a City of *Samosate*, there is a Lake which sends forth burning slime or mud, which they cal *Maltha*. If it touch any solid thing, it sticks to it: Moreover, being touched, it follows them that go from it, &c. To smear and daub Walls, it serves instead of Chalk or Lime. *Vitruvius* tels us it was used to build the Walls of *Babylon*. *Lib. 1. Cap. 5.*

*Halos anthos flows of Salt, or Sperma Ceti.* Also there are many kinds of Concrete and Coagulated Bitumen. The first is *Halos anthos* the Cream of the Sea or of Salt, commonly called *Sperma Ceti*; it being as it were the Froathy Fatness of the Sea. It is no part of the substance of the Sea, but a certain matter that flows in from elsewhere, which may nevertheless contract somewhat from the Sea, especially saltness. Whether *Halos anthos* and *Sperma Ceti* be one and the same thing, is here no place largely to dispute. See the Commentators upon *Dioscorides* Book the 5. Ch. 88. Only this I must advise you of, that this Name is given a Medicine, now sufficiently known, from a false opinion, that it is the Sperme slipt out of the Womb of the Shee-Whale: whereas indeed and in truth it is a fatness of the Sea; and therefore some call it, not amifs, *Ambra alba* and *Succinum Marinum*, white Ambar and Sea-Ambar. The rare efficacy of *Sperma Ceti* in dissolving Clotted Blood is known to the common people: it is also profitably given to attenuate thick Humors in the brest, and it is good for such as have the Tislick.

*Ambar Greece.* Moreover among these Bitumens is *Ambra Odorata*, *Ambra Grisea*, Ambar Greece [that is Ambar gray, or gray Amber, for *Greize* and *Greizely* signifie gray, though now obsolete.] Now the Name of Ambar is vulgarly used for all the kinds of *Succinum*. In a special manner the Arabians by this Name understand a certain most Odoriferous Medicament, which the Latines call *Ambarum* and *Ambracane*. *Hermolauus Barbarus* first cal'd it *Succinum Orientale*, Eastern *Succinum*. And although the question about the Nature and Original of Ambar Greece is most intricate: yet their opinion is most probable and founded upon the most Reasons, who will have it to be a kind of Bitumen. For it is a certain fat substance, most Odoriferous, found in the Sea, especially in the Indian and *Æthiopian* Seas, or on the Sea shores, which is the best of all other, and most precious; sometimes harder, other whites softer, for the

the most part brittle, yet so that under the Teeth and Nails it may be wrought and drawn out like Mastick. The colour sometimes is uniforme, and hath otherwhiles yellowish or white specks interspersed. And although it be found in the Sea, yet is it not bred in the Sea, but is a kind of Bitumen or Oyl flowing out of its fountains, and being on the top of the Sea exposed to the Air it is Condensed and Coagulated like *Succinum* or white and yellow Amber. And the Histories of the Indian Voyages do testify that in some places of *India* a most noble Oyl or Balsam flows out of certaine Fountains. That same most grateful and pleasing smel springs from a most noble kind of Sulphur. Yea, *Crato* writes that it is Sulphur, or that there is Sulphur in Ambar Greece. It hath a rare faculty to Roborate the Animal and Vital faculties: and therefore it is good for the Brain and Heart, and makes all the senses more lively. 'Tis good for old Folks, and cold Natures; it is profitable against swoounding fits and Melancholly.

The Vir-  
tues of  
Ambar  
Greece.

After Ambar Greece, follow *Succinum*, yellow Ambar, which the Greeks call *Electron*, the Arabians *Carabe*, also *Ambra Citrina* yellow Ambar (in way of distinction from the foresaid Ambar which is called *Grysea* or *Chrysea*) also *Gagates* and *Vernix*. That is now best known which is found on the shoar of *Borussia* by the Mediterranean Sea, in shape of a Mass or Clod without any form or Figure, hard and solid like a Stone, sometimes pure and sincere, sometimes mixt with Herbs, Woods, little insects, a certain black vitriol, and other filth. Hence some Lumps are transparent and clear, some dark: the color is also various; the smel pleasing in its kind. Being rubbed with a cloath it draws to it dry Chaf and Straws, by its spirit going forth. Being put to the flame of a Candle it takes fire, flames and sends out much footy Vapor.

*Succinum*  
or yellow  
Ambar.

Touching its Nature and Generation there are sundry opinions, whiles some hold it to be a vegetable, others a Mineral, others partly vegetable and partly Mineral; all which here to relate, (with the Reasons which are brought to confirm each opinion,) and to examine the same, would be too tedious. We shal propound therefore only that opinion which is most likely to be true: viz. That *Succinum* or yellow Ambar is a kind of Bitumen. For it hath all the proprieties thereof, and it is got out of Mines in the Earth, in *Germany*, *France*, *Italy*, and it hath been found on the outside Coagulated and absolute Ambar; and within pure *Naphtha* or *Petroleum*. Also that *Melanteria*, *Chalcitis*, and other Minerals did grow to Ambar. Finally, By Chymical Art an Oyl is drawn out of it, agreeing with *Petroleum*. And this Bitumen, according as it is White, Yellow, or Red, Black, Pure or Impure, so the like *Succinum* or Ambar is bred thereof. Now it doth not consist only of Bitumen, but also an Aluminous, Nitrous and Vitriolated spirit do concur; and therefore in many places where there is *Petroleum* no *Succinum* is bred, because these spirits are wanting. Now, At first *Succinum* or Ambar is liquid, but afterwards when it is shed into the Waters, without any Exhalation of parts and evaporation, it is Coagulated and grows hard by means of a Nitrous, Aluminous, and Vitriolated spirit, the Saltness of the Sea also, Peradventure, Concurring. And that these are the immediate principles of Ambar or *Succinum*, Chymical resolution it self doth shew. For a Vitriolated, Aluminous, Salt spirit comes out with the flegm: and moreover good store of Salt sticks to the Neck of the Retort. In its Rectification, if the work be diligently plied, a white spirit ascends, like the *Naphtha Babylonica*, which takes flame, so that it is not safe to hold lighted Candles near the Vessels wherein *Succinum* or yellow Ambar is distilled. A twofold Oyl may be drawn forth, Yellow and Red answering to *Petroleum*. The black Feces or Dregs, if it be suffered to stil till it is dry, do grow together into a Bitumen very like that of *Iudea*.

It Dries and Warms; it helps the distillations of the Head, the Falling-sickness, Apoplexy, Palsie, Mother-fits; is good for spitting of Blood and the Consumption, also for the *Gonorrhœa*, to Facilitate Child-Birth, and to provoke Urine: the Smoak thereof is an Enemy to Venemous Beasts, and Detects such as have the Falling-sickness.

The Vir-  
tues of yellow  
ambar

Of kin to *Succinum* is *Gagates* or Jet, so that some take it to be the same. It is also a kind of Bitumen, or a Bituminous stone, for the most part black; yet sometime of a pale or yellow colour. 'Tis soon set on Fire, smels like Bitumen. It

Jet

dete&ts such as have the Falling-sickness, by the Smoak thereof; and hath a softening and discussing faculty.

*Asphaltus.* There is yet another kind of Bitumen, but more concrete, which is called by the general Name *Asphaltus*. It is an hard kind of *Asphaltus* or Bitumen, and hath no filth mixt with it. It is of a solid substance, and shines like purple when it is broken. It is weighty and of a strong smel. Of this kind, that of *Sodom* is the best. That which is more impure doth not shine so, nor hath so strong a smel. It Dries and Heats, Discusses, Mollifies, and sodders Ulcers: it takes away fits of the Mother in a Suffumigation. See *Dioscorides* in his 1 Book, Chap. 83. &c. and the Commentaries of *Matthiolus* and others.

Finally, To the Family of Bitumens are to be referred certain Bituminous Earths and Stones. For it matters not much whether you cal them Earths or stones. Their first and chief Original is from Bitumen, with which as there is more or less of an Earthy and Stony matter conjoyned, so it receives this or that Name. And hence it is that in the Nature of Bitumens we meet with great difficulty, whiles Writers regarding the places where they are bred, or the outward Figure, but little considering the internal Nature, either they separate things of the same kind, or confound and Joyn together things of different kinds.

*Terra Ampelitis.* For this Bitumen of which such kinds of Earths and Stones do consist, is not sincere and pure Bitumen, but mixt with Earthy Juyces, Mud, Potters Clay, Veins of Metal and Stones. Of this kind is *Terra Ampelitis* so called, which is black like Sea-Coals, and resembling Bitumen; it dissolves in Oyl, resists worms, and Dries and softens as *Asphaltus* doth. Some account this *Ampelitis* Earth and Pit-Coals to be all one, but others make a difference. If they are not just one and the same, at least they are much of kin; whence come the sundry Names of the Germans which they give these kind of Bodies, as *Schwartze, Kreide, Koblerde, Steinkehlen, Bergkolen, Dorff, and Durpte*. For these kinds whether of Stones or Earths, have all one Root and Mother, viz. Black Bitumen: the Particular difference proceeds from the Various manner of Concretion and Admixture of other things.

For that which the Germans cal *Dorff*, and *Durpte*, Peat and Turfe, are Bituminous Earths which they Cut and Dry for Fewel. It is digged in *West-Frise-Land, Gelderland, Flanders, Brabant, Zeland*. It is also found in *Collao* a Province of *Peru*, which *Monardus* describes in these words. In *Collao* a Province of *Peru* there is a place quite bare, without Tree or Grass, because the Earth is Bituminous, out of which the Indians draw a liquor, good to cure very many Diseases. The manner of their drawing of the said liquor is thus. They cut the Earth into Turfs, which they lay in order upon poles or thick Reeds in a Sunny place, having vessels under them to receive the Liquor. For by the Heat of the Sun this Bitumen Melts, or the Juyce included in the Earth dissolves and sweats through. Afterward the Turfs remain Dry, and Robd of their Oylly Liquor, and so become fit for Fuel. But the Fire made of them is hurtful, by Reason of the thick blackness of the Smoak, and the stinking smel it makes. Yet for want of other Fuel they use the foresaid turfs. The Liquor which falls from them is good for many Diseases, especially such as proceed from cold. For it Mitigates pains, and discusses cold swellings. Wounds are cured therewith, and other Diseases for which *Caranna* and *Tacamahaca* are good. Its color is dark Red inclining to black, and its smel is strong. In *Saxony, Misnia, Low-Germany, Scotland*, and other places, Bituminous and Fat Turfs are found: the Germans cal them *Motten*.

*Sea-cole or Pit-Cole.* Lithanthrax, *Carbo Mineralis*, or *Fossilis*, or *Carbo Lapidus*, Stone-Coal, Mineral-Coal, Pit-Coal or Sea-Coal, is harder and of a stoney Nature, consisting of Bitumen and a stone making Earthy Juyce, Black, good to make Fires, especially for Smiths Forges. 'Tis found in *Germany, Bobemia, Scotland*, in many places.

And some hath in it more Bitumen, and some more of the Stone making Juyce: and therefore some of it will easily burne, but some wil not burn, unless it be nixed with other Coals and blown with bellows.

But he that would know more concerning Bitumens, let him read the Commentaries upon *Dioscorides*, especially that rare third part of *Andreas Libavius*, wherein largely and learnedly he explains the History and Nature of all sorts of Bitumen.



In the next Place comes Sulphur, or Brimstone, which the Greeks call *Tbeion*; Brim-stone it is a Mineral Juyce, consisting of one part which is inflamable and sends forth a grievous smel, and of another part which is Earthy, thick, and fixed, having a vitriolated Juyce mingled therewith. It is reputed the Agent and Father in the Generation of Metals, and Coagulates the Mercury, if there be conjoyned a Metalline Spirit, and a Seminary Principle. Of which if it be destitute it destroys Metals, and consumes such things as are volatile. Now it is twofold, Native or Quick, *Apuron*, which hath not felt the Fire. For it is engendred pure solid and in clods, so that there needs no Fire to separate its Impurities. The Ancients describe it to be transparent. And now adays there is hardly any such found; but it is of an Ashy color, and when it is broken, Yellowish within. Factitious or Artificial Brimstone is boyled out of the Sulphurous mine which is digged out of the Ground. Now there is some difference in the Artificial, especially in regard of Purity and colour depending thereupon, and some is yellowish, other some paler, and some enclining to an Ash-color.

Of Sulphur and Quick-silver is made *Cinabrium Factitium*, Artificial Sinoper. Of the Smoak of inflamed Sulphur received in a Glass Bell is made a sharpe Liquor, like Spirit of Vitriol. And flower of Brimstone is the purer part thereof, being sublimated with Salt and Calcined Vitriol.

Now Brimstone is of a digesting, discussing and drawing faculty, it is good for such as breath short and have an *Empyema*, taken in an Egg. Externally applied with Butter and Hogs-Greece, it Cures the Itch; and with Turpentine it heals the Tetter. The Virtues of Brim-stone

Neighbor to Brimstone is Arsenick, Orpment, and Sandarach, which seem to agree in Nature and Faculties, and only to differ, because the one is more the other less digested in the Bowels of the Earth; or that one hath more or less Quick-silver and Salt mingled with the Sulphur. Some take Arsenick for the kind, and call Orpment Saffron-colour'd Arsenick; Sandarach, red Arsenick; Risagal, white Arsenick. But that which they call white Arsenick, is now adays known by the Name of Arsenick absolutely: *viz.* Orpment so often sublimed with Salt til it become white, and Transparent like Chrystal: the strongest of all Eating and Fretting Putrifying Poysons. Now Orpment is a Sulphureous Mineral Juyce, having joyned therewith a little Quick-Silver, and the Spirit of Salt. All the kinds are caustick and corrosive, and Enemies of the inward parts, which they fret, and consume the radical moisture. Yea, it is not safe to apply Arsenick externally by Reason of its extream Venemous and Corrosive Nature. But if it be Calcined with Nitre, its volatile mercury and inflamable Sulphur are taken away, and a certain buttery Fatness remains, which is used externally for Fistula's and Ulcers hard to cure. Arsenicks Orpment and Sandarach.

Hither also we must refer Antimony, *Stimmi* or *Stibium*, which although it seems to come nearer the Nature of Metals, yet is it a Mineral Body, resembling Lead, but brittle, consisting of Sulphur, crude Arsenick and much Quick-silver of an Earthy Nature, but all of them volatile. And therefore it yields a stinking and hurtful Fume, which for the most part is Mercurial, but in some part Sulphureous and Arsenecal. Being crude applied externally it imitates the Virtues of Lead, and is binding, hinders the growing of flesh, takes away the filth of the Eyes, and cures Ulcers. It makes great work for the Chymists, who make thereof sundry purging and sweating Medicaments; of which they have written whole Books, wherewith you may consult. Antimony

Finally. Betwixt Antimony and Lead is *Bismuthum*, which is therefore called Ash-colour'd Lead; being a Mineral Body whitish and Livid, Hard, Brittle, consisting of Earthy and crude Mercury, Sulphur and Arsenick, and all of them impure and Volatile. Bismuthum

And that we may conclude this subject, those various kinds of Earths and Minerals which we have mustered hitherto, (and if there be any other to be reckoned,) they have their original from the Roots of Minerals. For in these also there happen sundry corruptions. For although Gold and other Metals now perfectly digested do not putrifie, and seem incorruptible; yet in their first Original they may be corrupted. So *Terra Sigiliata*, of which we spake before, is thought to be nothing else but the first matter of Gold, Silver, or some other Metal (for there are sundry kinds thereof)

thereof) corrupted, *viz.* When the principles of Metals do not remain united, but the Sulphur and Mercury are Separated and Sublimated, and either transferred into some other place, or dispersed into the Air. So Antimony seems to be nothing else but crude or raw Gold, corrupted before it was ripe; and *Bismuthum*, immature Silver corrupted.

### Chap. 4. Of Stones and Jewels.

**T**He hardest of Minerals are Stones. And since that under this kind are comprehended both common Stones and Precious Stones or Jewels, we must first speak something in General of the Generation of Stones. It is commonly held, that by the concurrence and mixture of Elements, the first and Second qualities Co-operating, Stones and precious Stones are produced. And though it is not to be denied, but that the Elements do concur unto their Constitution: yet the Elements alone do not suffice, and are only the remote cause of Stones and Jewels. Be the Elements mixed how they can, yet the Primary agent being absent, no precious Stone is made of them.

The Generation of

They who would produce a nearer Cause, have made exhalations the matter of Stones: but that also is too remote, nor wil it suffice alone, unless it be more specially determined. *Avicenna* therefore and *Albertus Magnus*, that they might come more near to the business, have held the matter of Stones to be Clay and Juice, *viz.* A clammy roaping Clay, to the mixture whereof more Earth hath concurred than Water: and a Juice that been hath sucked in, and raked off from the Earth, or that hath a Tincture of some Metal. This opinion others follow, and hold that Stones are made of Clay or Earth glewed together with a clammy moisture, such as are dark; and with a Transparent Liquor such as are clear and Transparent.

Yet in truth, not only Water and Earth, but all the Elements are in Stones, especially precious ones. Yea, and the Chymists think the Elements are not sufficient, but that as Metals so Stones and Jewels they say are made of those three principles, Mercury, Sulphur and Salt. Of which opinion I shall speak elsewhere.

This only we shall hint in this place; that the matter of Metals, Stones and Jewels, is very near of kin, which not only the place where they grow but many other things do witness. For examples sake, let us take Pome Garnets, out of which and Iron Tinctures are drawn so like, that it is not easie to discern one of them from another; and a more base sort which are found in *Silesia* and *Misnia* do resemble Iron also in color. Also many Stones, if they are burnt, do send forth Sulphureous fumes, just as Minerals and Metals do; and of Metals Glasses are made which do very much resemble some precious Stones. And therefore Jewels and Metals seem not unfitly to be reduced to common principles: and it seems possible to reduce Jewels to some certain Metals.

The efficient Cause.

Authors do stick yet more in Explaining the Efficient Cause of Stones: and the most have recourse herein to Heat and Cold, and favour nothing beyond the Elementary qualities. And among Stones, those which they count to be made of Clay, they think are coagulated by being baked together by Heat and dryness: and such as they conceive to consist of a watry matter, they hold to be Coagulated and hardened by vehement cold, as Crystal. But many such dark Stones are generated in the midst of Waters and springs, whose Coagulation cannot be made by the baking of heat and dryness. And they are truly too simple, who think that Crystals, Adamants and such like Stones, are frozen together by the Cold; since they are generated in the hottest Countries on the Surface of the Earth, both Adamants and other transparent Jewels; nor will they melt with Fire.

The true Cause of Concretion and Coagulation.

The Chymists hold Salt to be the Cause of Concretion and Coagulation: against which opinion of theirs although some fiercely dispute, yet is it not absolutely to be rejected; seeing many evident Documents do prove the same; and certain it is, that many things are Coagulated and grow together in moist subjects, where neither dryness, Heat, nor cold have place. Yet, seeing there are two sorts of Concretion, which happen without adding or taking away any part of the matter: they are

A double Concretion

are in no wise to be confounded, and we must speak distinctly of the distinct manners of Coagulation.

The former manner of Concretion is seen in Salts, as in common Salt, Vitriol, Nitre, Alum, Urin, and in the Salts made out of Plants and Animals may be seen; and it is proper to Salts, which naturally tend to such a Coagulation, and indeed under a certain Figure; as the said diversity is to be seen in Nitre, Vitriol, Alum and other things.

*The Concretion of Salts:*

But because Salts have not hardness of themselves, but are easily broken and dissolved in moisture; but Jewels and Stones do not only grow together, but they are solid and hard, and do not melt in moisture: this kind of Concretion or growing together is different from the former. The cause of which concretion some do also refer to Salt, and the hardness to the admixture of Earth therewith: But others again (& that probably enough) do hold that this Stoney hard concretion or growing together of Bodies doth proceed from a Stone making spirit or Juyce, which Stone making spirit and Juyce is every where found in the Earth and in the water, but not without Salt.

*The cause of solidity and hardness:*

And thus the immediate cause of Stones and Jewels is agreed to be a Stone making Juyce, that is to say, a matter of its own Nature tending to such an hardness and solidity. Now that several Stones and Jewels are generated, proceeds from the especial form of each. For every precious Stone hath its proper and specifick form whereby it is differenced from all other, which it obtains from, (as I may say) its Seminal principle of Generation. Which doth not proceed from the Mixture of the Elements, but, as *Scaliger* rightly Names it, it is a fifth essence, put into this sort of Natural things by almighty God, at the first Creation of the world. Which seminal principle and *Architectonick* Spirit, although it doth not appear in a Body peculiarly distinct, as in most plants, nor can its Essence be sufficiently explained, yet must it not be therefore denied. For as the Willow, though it produce no Seed as other Plants do, yet it hath a Seminal principle dispersed through the whole tree, and so is propagated by a bough cut off and stuck in the ground: so the Seminal principle of Jewels and Stones lies concealed in the Stone making matter; and in this darkness of our Minds its essence is unknown to us, as all other forms are; and their difference is not known save by the diversity of their faculties, operations and Qualities. For upon this diversity of Forms, fit matter being Joyned thereto, depends the diversity of colours and external shapes.

*The Immediate Cause of Stones and precious Stones*

Hence the Crystal and *Adamant* of *Hungaria* and *Silesia* have an Hexagonal or Six-corner'd shape; the Occidental Smaragds are four Square; the Bohemian Granate and the Stone *Geodes* have a Globous Figure; and other precious Stones have other shapes.

Now I conceive the Colours of precious Stones may chiefly be drawn from the Sulphur of Metals. For, Carbuncles, Rubies and Granats, do participate in their Tincture with Gold and Iron: The Turkois hath the Tincture of Copper. And there may by Spirit of Salt, Urine, and other liquors, Tinctures be drawn out of Metals, which do perfectly resemble the Colours of certain precious Stones. And from the same causes, *viz.* The forms and Mineral principles, other qualities also of Stones and Jewels, as hardness and weight. &c. As also their Virtues and properties do flow.

*Whence the Colour of precious Stones is:*

As to their Native place, Stones are found every where; precious Stones, as in many other Countries, so in *Misnia*, *Silesia*, *Bohemia*, and other places of *Germany*. But the more noble precious Stones are chiefly found in the *Indies*. The cause whereof is diversly by divers assigned; and the most refer the same to the posture of the Sun and Stars over the Zenith. Yet since in *Africa*, *America*, and other Regions which are under the same climate, there is no such store nor such excellent precious Stones found: the cause is rather to be attributed to the Nature and disposition of the Soil, and the Seminal principle implanted therein at the Creation.

*The Natural place of precious Stones:*

Now Stones are some vulgar, others precious, according to the Purity or Impurity of the matter whereof they consist, and the nobility of the Form. For vulgar Stones consist of a gross and impure matter, and have a more Ignoble Form: and therefore their effects are less excellent. But precious Stones consist of a more pure and Subtile matter, and have a more noble form. For the Chalk-stone, and other

*The difference of Stones:*

common

common Stones have also their sulphur, which is sufficiently discovered when they are burnt; but much thicker and impurer then the Granite or Amethyft.

*Ground unicorn* Now Stones are some Spungy, others Solid. Amongst those kinds of Stones that is justly in the first place to be explained which is vulgarly taken for Unicorns Horne; and some call it ground Ivory, others ground Horn. For in *Thuringia*, as also in *Bohemia* and other places, such Horns are found; yea, and not only horns but other bones also; which are said to be good to Sodder wounds, and to heal Ulcers. But especially, experience hath taught that these Stones have no small use in the Falling-sickness, Malignant Feavers, the Pestilence, gripings of the Belly in Infants, and the Cure of other Diseases; and therefore they are commonly given out for Unicorns Horns. Howbeit they may easily be discerned from the true Unicorns Horn. For the true Unicorns Horn is hard and solid, that it can hardly be rasped, much less can it be beaten to powder: nor doth it much cleave to the Tongue; But this Stone is not hard, but as it were calcined, it is easily broken and rub'd to powder, and being put to the Tongue it sticks fast, like *Terra Sigillata* or Bole-Armeniack.

Touching the Generation thereof, Men are of several opinions. Some conceive they are the bones of an Unicorn overwhelmed in the Earth by a flood, or some other occasion, which remain after the flesh and softer parts have been consumed by Time. But this opinion is not agreeable to reason. For how should there be so great a number of Unicorns, in *Thuringia*, the *Hercinian Forest*, near *Elbingroda*, also about *Heidelberge*, *Hildesheme*, in *Misnia*, *Silesia*, *Moravia*, and in many other places? And why are these horns found in those places rather then elsewhere, where it is more likely that there are Unicorns? Moreover stones are found, which represent the Bones not of this Creature only, but of others also.

*Its immediate matter:* More probable therefore it is, that these are Mineral Stones. But what is their immediate matter is not easie to tell. Some hold that it is Bitumen or corrupted Amber; others, as *Anselmus Boetius*, *Lib. 2. Cap. 242.* that it is *Marga*, or a kind of Marle; others that it is some putrified and rotten Stone. This is certain, that it is a mineral matter, not unlike some *Terra Sigillata*, or a Mineral Juice mingled with some such Earth, and shaped into the Form of an Horn, Tooth, or other bone.

Nor let that same external form stumble any man. For though no man can easily tel the Cause of its Conformation, though many have labored to do it; yet certain it is, that many wonderful things are shaped in the Earth. Not to speak of other things at this time, 'tis sufficiently known, how many sundry shapes are seen in Stones digged up at *Islebia* and elsewhere. For there are seen in those Stones sundry shapes of Animals and Plants; of a Frog, a Salamander, a Serpent, a Viper, an Eel, a Carp, a Gilt-head, a Gudgeon; Yea, and the Pictures of Princes and renowned Men. And what should be the cause of these Pictures 'tis hard for any man to tel.

As to the Virtues of these Stones, 'tis certain they are very good against the Falling-sickness, and Malignant Diseases, and therefore they are many times used no less succesfully then the Horn which is counted to be the Unicorns.

*Spungy stones:* Now vulgar Stones are either Porous or Solid. The Porous or Spungy Stones; are the *Tophus* or crumbling gritty Stone, the *Pumice*, the *Ossifragus*, the *Osteocolla*, *Stalactites*, and most of those Stones which are bred in living Creatures.

*Solid stones:* The solid Stones are many, the Sand-stone, the Chalk-stone, the Flint, the Fire-stone, the Whet-stone, the Touch-stone, the Smiris wherewith they cut Glafs. Sundry kinds of Marble, Alabaster, Serpent-stone, Porphyry-Stone, Free-stone, *Ceraunias* or Thunder-stone, the *Belemnites*, so called; and very many more.

Also there are other Stones of a middle Nature betwixt those common gross Stones and the Noble precious Stones: I shall only speak a little of one or two of them.

The Load-stone in the first place, is a stone sufficiently known; and its effects are wholly wonderful, the cause whereof many learned men have hitherto labored to render. Now the effects of the Load-stone are either of the Stone alone, or of Iron toucht with the Stone; or of both the Stone and Iron. The simple effects of the Stone are, to draw Iron to it, and to turn towards the Poles of the world. That it drew Iron was a thing not unknown to most of the Ancients: but its faculty of turning to the Poles of the world, as it is at this day very well known, so was it not known to the Ancients; nor hath any man been able as yet to make it appear, that it was known to *Aristotle, Dioscorides, Theophrastus, Lucretius, Pliny,* or any of the Ancients: but this Virtue was first discovered some few Ages since; although it is uncertain who was the Author or Inventor.

But what is the Cause of this motion, and whether it should be sought in Heaven or in Earth, is very obscure. But that we may search it out as much as is possible, we must presuppose this in the first place, that the Load-stone in many places doth not turn exactly to the Poles of the world but towards them, declining a little from them, in some places more, in others less. Which declination from the Poles of the world is altogether of great use and moment. For whereas the Ancients at Sea knew only in the day time by the Sun in what Meridian of the world they sailed; and in the night they knew by the Stars the Elevation of the Pole, and in what Latitude of the World they were: now by the help of the Load-stone they can find in what Longitude they are: and seeing it is confessed by all the Ancient Geographers, that nothing is more difficult in all Geography then to find out the Longitude of places, for which cause they do so much vary in assigning the Longitude of the most Famous Cities: by help of the Load-stone alone the Longitude of every place may most easily and exactly be found out. The Ancients indeed reckon'd their degrees of Longitude from the fortunate Isles, and there they made the beginning and end of the Globe of the Earth. But the late Cosmographers observing that the Pole of the Load-stone and the Pole of the world did consist in one Meridian, in the tenth degree beyond the fortunate Isles West-ward, about the *Azores* or *Flandrick* Islands; they make the beginning of Longitude there, not only to please themselves, but moved thereto by this Natural reason, Namely because in that Meridian the Poles of the Load-stone and the Poles of the world do agree together. Now from that Beginning and Meridian, towards the East, the Declination encreases more and more, and it is greater or lesser, according as the place is nearer to, or further from this first Meridian. In *Germany*, especially about *Norinberge*, the Declination is ten degrees; here at *Wittenberge* about nine. The *Hollanders* who have sailed into *Norwey* and the neighbouring places towards the East, have found the declination of the Load-stone from the Meridian to be sixteen degrees; and at *Nova Zembla* seventeen degrees in the more Easterly parts, provided they made their observations with exact Instruments. And it is probably asserted, that if the *Hollanders* should finish their Navigation towards the East, the more Easterly they went and the nearer to *China*, they should find the declination of the Load-stone from the Meridian so much the more abated, and they should at last come to that place towards the East, in which the Poles of the Load-stone and the world would be in one Meridian, and that there would be no deflection of the Pole of the Load-stone in the hundred and eighty degree of Longitude, opposite to the beginning of Longitude in the West.

Yet there is a certain learned Man who holds that the *Hollanders* are deceived in this point. For when they lookt upon their compasses they did not consider that the Compasses were so made, that the Iron toucht by the Load-stone was not placed just under the Flower-de-luce painted upon the card, but was distant therefrom certain degrees. And therefore whiles the *Hollanders* lookt upon the Flower-de-luce, and saw that it pointed directly towards the North, they conceited that there was no Magnetical declination in that place; whereas the Iron toucht with the Load-stone was some degrees distant from the Flower-de-luce or the true North-point. And therefore he placed the first Meridian, with the Ancients, in the fortunate or *Canary* Islands, because in that place there was no declination of the Load-stone at all. In which point experience must be judg. Yet it seems to me improbable, that the *Hollanders* who knew very well how to make their compasses, should be so heedless in such a Case.

But be it how it will be, this is certain and confirmed by manifold experience, that the Pole of the Load-stone is distant from the Poles of the world twenty three degrees or thereabouts.

And hence some do probably collect, that the declination of the Poles of the Load-stone from the Poles of the world; and the declination of the Poles of the world from the Poles of the Zodiack, is one and the same; and since the utmost declination of the Planets is twenty three degrees and some minutes, that doubtless therefore the declination of the Poles of the Load-stone from the Poles of the world is the same.

*The Cause  
of the  
Loadstones  
turning to  
the Pole.*

But doubtful it is whether the Cause of this motion of the Load-stone towards the Pole is in the Heaven or in the Earth, and where in the Heaven, or in the Earth. Some are indeed of opinion that there are certain Mountains of Load-stone under the Pole, to which the Load-stone moves by similitude of Nature. But they cannot well tel what or how great those Mountains are; nor are mines of Load-stone wanting in other parts of the world, but they are found in many Regions, especially in *Egypt*.

Others say the Load-stone turnes to the Pole-Star, others that it turnes to some Stars about the Pole-Star. But the Load-Stone doth not look directly to the Pole; save in such places where the Meridian goes through the Pole of the World and the Pole of the Load-stone both at once: in al other places it declines.

Moreover, that which is said of the conversion of the Load-stone to the North pole, is now adaies called in question by learned Men. And some do make two opposite points in the Load-stone, whereof one turnes to the North, the other to the South, if the Stone hang moveable and free. Which though others do not wholly deny; yet they say that point is stronger which turns to the South then that which turns to the North, and so they hold that the Load-Stone turns rather to the South then to the North. And though there were nothing in the Load-Stone which did Naturally turn to the North; yet its turning to the South is sufficient to shew the North-Pole. For since the South-Pole is just opposite to the North, if one part of the Load-Stone or of the card touched with the Load-stone turne to the South, the other end must of necessity point to the North. Of which this is a remarkable token, that those who make compasses and Sun-Dials with magnetick Needles, do rub the Load-stone upon that end which stands to the South, and not upon the Crossend which Looks to the North; and therefore the Magnetick Needle turns primarily to the South, and the opposite part points to and shews the North.

Hence therefore some have come to be of opinion, that the Load-stone is turned towards the South; because all the Planets have their Efficacy and Operation in the South. Since they move from the East, through the South, towards the West. Yet in very deed, although it go so in our Regions: yet there are opposite places, wherein the Ecliptick declines from the *Æquator* towards the North, and the Planets perform their courses, from the East, through the North, towards the West. Moreover the Planets do not abide in the same place, but one in one place, another in another; moreover they do not stick fast, but pass over the whole Heaven every day. If therefore the Load-stone should look towards the Planets, it could not look towards one place, since there are divers Planets; nor would it stand still, but should be alwaies moved, following the motion of the Planets.

The opinion of others is more probable who hold, that as other things tend to their own proper place: so the Load-stone unless it be hindred doth also desire alwaies the same Scituation which it had in its Native place. Wherein nevertheless we must consult with experience, and enquire how the Load stone is Scituate in the Mines.

But that Opinion is most probable, that the Load-stone is moved towards its own Pole in the Earth, which is distant about twenty three degrees from that point which answers to the Pole of the World: and that either the South only, or if the Load-stone have two Poles, and one part thereof turns to the North, another to the South (concerning which we must again consult with experience) yet that it chiefly tends to the South: and that it hath some affinity with its own place, or with the things that are there; and that doubtless the point to which the Load-stone

stone moves must be held to be rather in Earth than in Heaven. For that same point is fixed; but the Pole of the Zodiack, or any other Star thereabouts to which the Load-stone should be moved, doth it self move and finishes its round in the space of twenty four hours; whereas the Load-stone doth perpetually turn to one point. Nor can it be perceived that the Load-stone, or the smallest Iron Wires toucht with the Load-stone do ever move upwards towards Heaven. Contrariwise, good Authors relate that the Load-stone tends towards the Earth, which may be proved, they say, by these experiments. If you place a Needle in *Æquilibrio* so so that both ends are equally distant from the Earth, and then touch one end with a Load-stone; they say that end will bow towards the Earth more then the other. Also if you weigh pieces of Iron Wire, and after they are toucht with a Load-stone put them in the Scales again, you shall find that they weigh more then they did before they were toucht, because they encline towards the Earth. And therefore, since two Poles of the Load-stone are to be constituted in the Earth, one distant about twenty three degrees from the point just under the North-Pole of the world, towards the place now called the straits of *Anian*, the other in the South part opposite, Scituate in the Meridian which passes through the *Azores* or *Flandrick* Islands, *Caput Viride* and *Caput Corvo*, or (as others will have it) which passes through the *Canary* Islands: in all places under this Meridian there is no declination of the Load-stone, but the Needle toucht by the Load-stone falls exactly with the Meridian; in all other places of the whole Earth the said Needle declines from the Meridian of the place, sometimes more, sometimes less, sometimes towards the East, otherwhile towards the West; whereof see the observations of the *Hollanders*, and the Mathematical Memorials of *Simon Stevinus*, in the 5 Book of his *Geography*. But what that is to which the Load-stone is moved, is hard for any man to tel: let that suffice us, which *Scaliger* writes in his 131. *Exercitation*, where there are also other things concerning the Load-stone, worthy to be read: *Nature* (saith he) being linkt in a league of Amity to it self, hath allied all things as well those above as these here below in a perpetual band of friendship, which makes all this world to be one thing admirably disposed; so that there are not only certain degrees as it were of approach and distance in things separated: but also the Commixtures of those substances, which are quite parted one from another.

Now concerning the Virtue of drawing Iron (for I do not here dispute, as *Scaliger* hath it in *Exercit.* 102. *Sect.* 6. whether the Load-stone draws Iron, or Iron the Load-stone; for which so ever it is, the Cause is one and the same) the Controversie is no less. *Epicurus* is said to have held, that from the Iron and Load-stone *Atomes* do flow, which agreeing in Figure do imbrace one another, and strike against the Bodies of the Load-stone and the Iron, from whence being reflected they draw the Iron. *Anaxagoras* held that the Load-stone had a Soul and therewith drew the Iron. From whom *Cardan* differs not much, who also avers that the Magnet or Load-stone doth live; whom *Scaliger* opposeth *Exercitat.* 102. *Sect.* 5. *Marsilius Ficinus* in *Lib.* 3. *de Vit. Cœlit. Compar. Cap.* 15. fetches the Cause hereof from the Constellation of the Bear, to which both the Load-stone and Iron are subject, and both do orderly follow the Bear; but the Load-stone holds the upper degree in the propriety of the Bear, and Iron the lower; and that so the Load-stone as being in the upper order draws the Iron, which he reckons to be in the lower.

But in good earnest, if we shall diligently weigh the matter, we shall hardly find any thing more probable then that same mutual consent of things Natural. For therein well-near all learned men that have pondered the Nature of the Load-stone do consent, that the Load-stone is a kind of Iron Mine, and that Iron may be made thereof.

And here is to be observed, that the whole body of that which we call the Load-stone, is not indeed the Load-stone, for the whole Stone doth not draw Iron; but that the substance of the Magnet is dispersed in its stone like Veins; even as other Metals are seldom bred alone and pure, but in their Matrixes or Wombs, and therefore the Magnetick-stone draws the Iron only with that part, where is the Vein of the Load-stone.

From whence this also follows, that the Cause of Attraction is rather in the Load-stone then in the Iron. For the Iron is already a fixed metal: but the Load-stone is not yet fixed, and therefore it can more freely send forth its strength and spirit.

*Andreas Libavius, Part. 3. Singul. Lib. 1. Chap. 12.* where he treats of the attractive Virtue of the Load-stone, endeavours to assign yet a more special Cause, and writes that the Nature of this principle in the Load-stone is Bituminous, which is reduced and directed to a singularity with the Iron, by similitude of that conspiracy and mixture, whereby the same principles have grown together in Iron: and that an Iron and Bituminous spirit is common to them both, but that it doth not flow so strongly nor so continually from the Iron as from the Load-stone, because of the different Coagulation or Consistency. Where we willingly grant that a certain Sulphur or Sulphurous spirit is common to the Load-stone and the Iron: which if *Libavius* please to call Bitumen (for he counts Bitumen to be a thing more general than Sulphur, and that Sulphur hath its original from Bitumen) I will not contend with him about the Name; but that Bituminous or Sulphureous things only have a mutual Appetite one to another, I see not how he can prove. Nor doth he tell us, whether they mutually desire one another, by Reason of their Sulphur, or of their whole essence. But whatever is the Cause of the affinity betwixt the Load-stone and the Iron, which cannot be denied; that general Rule there laid down by *Libavius* holds true: one Nature covets another of the same sort, and like will to like, as much as it can; especially there where the Virtue arises and sticks, and apprehends another like it self.

The Load-stone armed.

We must not in this place pass over the armed Load-stone, whose force is much stronger than that of the unarmed. For a Load-stone unarmed will draw only a Pack-needle or a bit of Iron hardly weighing a dram or two: but if it be armed, it draws sixteen ounces or more. The Art of arming them, is this. Seek out in a Lump of a Load-stone its Poles, which may be done with the help of a Needle in a Sun-Diall; the Poles being found, let the Load-stone be polished, and reduced into such a shape as it is capable of (howbeit the long squar is the most convenient shape) yet so that the Axis reaching from the one to the other Pole may lie in the midst betwixt two parallel lines, equally distant from each of them. The sides being formed, let also the upper and lower part be wrought and polished, as also the sides, to the ends of the Axletree. Then let two plates be framed of the best Steel, of which the one side which touches the Load-stone must be smooth and even, if the sides where the Poles are be plain; or of what shape soever they be, they must be so fitted to the sides of the Load-stone that no space may be left betwixt the Steel and the Load-stone, but the other side must be a little round, and on the lower side the plates must hang a little beneath the Load-stone; and the parts that hang under must be somewhat thicker and squarer than the rest like Pillars. The Plates being thus formed must be applied to the Poles on each side, and to keep them fast they must be bound with two round hoops of Silver or brass, which must go about the Load-stone above and beneath. Also let the upper side thereof be covered with a Plate of Silver or Brass, with a Ring whereby to hang up the Load-stone thus armed. When it is hung up apply unto the little Pillars of Steel which come beneath the Stone a Plate of Steel as big as it can draw and there let it hang.

Bezoar Stone.

In the next place we must not forget Bezoar Stone, whereof Many things are extant in the writings of Physicians; seeing it is both precious and rare, and especially commended against Poyson. Some think 'tis so called from a Persian word *Pazar*, or *Pazan*, which signifies a Goat. Others think 'tis derived from the Hebrew word *Bel* which signifies a Lord, and *Zaar* which is Poyson. But an Antidote is by the Arabians called *Bedsoar*, and therefore they call all Medicines good against Poyson, by the general term of Bezoartick Medicaments: whence Bezoar-stone seems to be so called because of its rare vertue against Poyson.

What Bezoar is.

Now Bezoar stone is not digged out of the Earth, but is bred in the belly of an Indian mountainous She-Goat, shaped somewhat like a Buck or Hart, and is therefore by some termed the Hart-Goat. The Stones are long and round, and sometimes like Chest-Nuts or Acorns. Their colour is sometimes blackish, sometimes yellowish, greenish, Ash coloured, dark Red, or blackish Green. On the outside it is smooth and slippery. It is not very hard but is easily broken. It grows together by Scales, Scale over Scale, as an Onion is made up, upon some small Foundation, which is commonly a little Straw or Stalk; to which a certain humor cleaves. And therefore this Stone is made up of many Plates as it were, being greater



ter in an old, lesser in a young Goat; and all the Plates both Internal and External are smooth and shining.

Now there are two kinds of Bezoar-stone, the one Oriental, which is brought out <sup>its kinds</sup> of *Persia*, *Egypt*, *China*, *Cathai*, and the bordering countries, which is more excellent than the other; the other is occidental, which is brought out of *America* and *Peru*. This Stone is very much commended against all Poysons; it is given <sup>its use,</sup> in malignant feavers, to expel Worms in Children, and against Melancholick Diseases.

Some take *Lachryma Cervi*, or the Harts Tear, to be Bezoar-stone. But though, <sup>Lachryma Cervi:</sup> as I said before, the word Bezoar is used by the Arabian Physicians to signifie Antidotes in general; and the *Lachryma Cervi* hath a rare Virtue against the Plague and Poysons; Yet Bezoar Stone and it are divers things. Now concerning the *Lachryma Cervi*, which he saies he keeps as a great rarity in his study, *Scaliger* thus writes in his *Exercitat.* 112. It is not bred in the Hart, before he be an hundred year old. After that age it grows at the Corner of his Eye, to the bones themselves, and becomes it self a protuberant bone, of such hardness as exceeds that of the Horn it self. That part which sticks bunching out is round, of a rare brightness, of a yellow colour, notwithstanding some shew of black Veins. It is so smooth that you can hardly feel it, and it slips from between your Fingers, as if it could move it self. It is an excellent remedy against Poyson. Its given to such as are taken with the Plague, with a little Wine. Whereby so great a sweat is caused, that you would think the Patients whole Body were well nigh Melted. Touching Bezoar Stone see a peculiar Treatise of *Casparus Bauhinus*.

Moreover, of this kind there is Coral, *Lithodendron*, or Stone-tree, being a Sea-shrub, which when it is taken out of the Water turns to Stone. <sup>Coral:</sup> The reason whereof is, because there is much Salt and Stone making juyce in the Plant: which the Chymical resolution thereof shews, for all the coral well near turns to Salt.

And this is the common opinion of all Authors well-near, touching the Generation of Corals, who hold that Coral is soft under this Water, and afterward grows hard in the Air. Yet *Beguinus* in *Tyrocin. Lib. 2. Cap. 10.* questions the truth hereof and saies it is a Fable, and relates from the report of credible witnesses and certain experiments, that Coral is as hard in the Sea and under the Waters, as after it is drawn out into the Air.

There are three sorts thereof: Red, Black, and White. The best is the Red and that which hath many clusters. It Binds, moderately Cools; Cures the flux and vomiting of Blood, the *Gonorrhœa*, and Whites in Women. It helps the Falling-sickness and is a strengthener. <sup>The sorts thereof:</sup> <sup>its Use:</sup>

To this family also belongs the Stone *Ætites* or Eagle-stone, so called because 'tis <sup>Eagle stone</sup> believed that the Eagle carries it to her Nest to help her bringing forth of her young ones. It contains another stone within it. 'Tis found in many places: the Oriental ones are best. But they are found also in *Saxony*, *Misna* and *Silesia*. 'Tis thought to further Child-birth and to prevent abortion. To prevent abortion they tie it to the Womans Arme: to further Child-birth, to her thigh.

There are also other Stones found in Living Creatures, as the Cock-stone, the Swallow-stone, the Toad-stone, Crabs-Eyes so called, Carpe-stones, Perch-stones.

Before, *Lib. 5. Chap. 2.* among the sorts of Alum mention was made of the stone *Amiantos*, which is commonly cal'd *Alumen Plumosum*, Fetherd Alum, and sold <sup>Amiantos thus:</sup> under that Name; but it belongs rather to this place. In daies of old it was made into Thred and Woven into Coverlids as if it had been Wooll, and thereof they made Funeral Coates for the Bodies of Kings, that the Ashes of their burnt Bodies might be thereby separated from the other Ashes. But the manner of weaving the same it at this day unknown.

Of this Family also is *Hematites*, the Blood-stone, especially good to stop <sup>The blood stone:</sup> bleeding.

Now come the Nobler Stones and Jewels. In the first place, the fragments of five precious Stones are known and used in the Apothecaries shops: and those Stones are the Sapphire, the Hyacinth, the Sardius, the Granate, and the Smaragd.

The

*the Sapph-  
ire.* The *Sapphire*, in the first place, is of a Sky-colour, like the Heavens on a cleer day. The whiter Sapphire is called the female. It resists Poyson and strengthens. Being worn it hinders Pestilential Carbuncles from breaking forth, and laid upon a Carbuncle it extinguishes the same, and hinders venemous exhalations from passing thence to the Heart: being worn by a lascivious Person it looseth its brightness and beauty. It hinders fleshly desires, also 'tis commended against Diseases of the Eyes, and is said to strengthen them.

*the Hyacinth.* The *Hyacinth* is of a yellowish redness, and glisters as it were Gold, and imitates the flames of Fire. It is commended to cure the Plague, being worn in a Ring or hung about the Neck.

*the Sardius  
or Carneolus.* The *Sardius*, so called because first found at *Sardis*; also *Carneolus*, Cornelian, because in colour it resembles bloody water wherein raw flesh hath been washt. The *Sardius* worn is said to recreate the Mind, to drive away Fearfulness and sad Dreams; to which intent it goes into the Electuary *de Gemmis*. Being drunk with harsh red Wine it stops the Courtes, and Blood flowing from any part of the Body.

*the Garnet.* The *Garnet* is red, but with some yellowishness resembling Fire, and it hath the colour of Vermilion. 'Tis said to strengthen the Heart, and resist Sadness and Melancholly.

*the Smaragd.* The *Smaragd* is a most neat Jewel, the most excellent of all green precious Stones, and by its pleasant Greeness it refreshes and recreates the Eyes. It is given against Poyson, and the bitings of venemous Beasts, and pestilential Feavers. Being tied to a Womans Hip 'tis said to further Child-birth; and being laid on her Belly to prevent Abortion. It is contrary to all Venereal matters, and if it touch the Skin of the Man that is in his carnal Embracements, 'tis said to break asunder. Worn in a Ring or hung about the Neck it preserves from the Falling-sickness.

*the Adamant  
or Diamond.* There are also many other precious Stones and Jewels. The *Adamant* or (as we say) *Diamond*, is so called, because it is unconquerable by Iron or by Fire. For it is the hardest of all Jewels, transparent like Water. Rare virtues are by many attributed to the *Diamond*; and it is said to be an Amulet against Poyson and Witch-craft, frightful Dreams, and the Night-Mare; and to resist pestilential Causes.

*the Carbuncle.* The *Carbuncle* hath its name from a burning Coal: It is commonly beleeved to give light in the dark, but there is no Eye-witness thereof. And therefore learned Men conceive, that if there be any such Jewel as a Carbuncle, it is a great and a noble one.

*the Ruby.* The *Ruby*, whose brightness and flaming redness shines above other stones. It resists Poyson and putrefaction, preserves from the Plague; it drives away sadness and fearful Dreams, and exhilarates the mind.

*the Granate.* *Granates* or *Garnets* are as it were imperfect and rude Rubies, of which we have spoken before.

*the Amethyst.* The *Amethyst* is so called, because it is thought to prevent Drunkenness, it is of a violet color, mixt as it were with Purple.

*the Opal.* The *Opal* is an exceeding beautiful Stone, which alone hath in it all the colours of other precious Stones. For there is in the *Opal*, as *Pliny* in his 37. B. ch. 6. writes, the thin fire of the Carbuncle, the bright purple of the Amethyst, the Greeness of the Smaragd, all shining together with an incredible lustre. And therefore it cannot be counterfeited, as other precious Stones may. And as it hath the colours of all other Stones, so it is thought to have all their Virtues. But it is most commended for preserving the Eye-sight, being worn.

*the Topaz  
or Chrysolite.* The *Topaz*, which is now called the *Chrysolite* (though some difference them by the brightness of the colour) receiveth its name from its colour: for it is a Jewel transparent and of a Golden color. It is commended to strengthen the Heart and to drive away Melancholly: but is especially used against the Falling-sickness, and applied to Wounds to stop the Blood.

*the Beryl.* The *Beryl* in its color represents the Greeness of the Sea when it is calm, or the colour of a watry Hyacinth. It is chiefly commended for Wounds in the Eyes, being reduced to most fine Powder.

*the Crystal.* The *Crystal* indeed was named by the Ancients from Ice, and therefore some have held that *Crystal* is made of Ice frozen together upon exceeding cold Mountains. But this is false. For *Crystal* is generated also in *Cyprus*, and other Mountains, where Heat is never wanting. Again it will not melt with Fire, as those things use to do which are frozen: but the Fire reduces it into Earth and Salt. And doubtless it is coagulated by a Salt spirit or stone-making juyce. Being made into fine Powder, and given with Honey in Wine or Broth, it is said to encrease Milk by a propriety which it hath. Held under the Tongue it

it quenches thirst. A dram taken with Oyl of sweet Almonds is a present help for such as have taken Mercury Sublimate. Also it cures the bloody Flux, and the Whites in Women.

The *Jasper* is of many colours, and therefore they make divers kinds thereof. *The Jasper* That which is reddish is much commended against a Flux of Blood from the Nose, Womb and Hemorrhoides; Yea, and it is also commended for Wounds: and credible persons report, that a Flux of Blood and the Womb Flux, which could by no means be stopped, hath been staid by a Jasper Stone bound to the Womans Thigh; as also Nose-bleeding that no other Remedies would cure, hath been stopped by hanging the Jasper Stone about the patients Neck. Also 'tis commended to cure the Falling sickness, if it be worne upon the Mouth of the Stomach.

Some few years since there hath been brought out of new Spain a Stone called *Lapis Nephriticus*, the Kidney-stone; which is justly counted as a kind of Jasper. *The Nephritic Stone.* Its Surface is alwaies fat, and as it were smeared with Oyl. There are sundry kinds thereof in respect of colour. For the most part it is of a whitish Green. It is commended against pains in the Kidneys, from whence it had its Name; and being tied to the Arm it has a wonderful Virtue, yet confirmed by experience, to break the Stone and drive it out by Urine: of which later Physicians that have written of the stone, do every where speak.

The *Turcoise* is a Stone, not transparent, yet of a very pleasing colour, being a mixture of green and blew. It is believed to strengthen the Heart and Spirits. *The turcoise.* But especially they attribute thereunto admirable Virtues to preserve a Man from falling. For if a Man be any waies in danger of a fal, and wear this stone, it preserves him harmless; and they say the Stone it self will break or lose its Colour and grow Pale, when the party is in danger of a fal. The same it wil do, they say, when the wearer is not well.

*Lapis Lazuli* so called by the Arabian Physitians, and by the Greeks *Cuanos* *Lapis Lazuli.* *Litbos*, is also a Stone that is not transparent, of a deep blew color adorned with Golden specks. This Stone hath a rare Virtue to purge Melancholy Humors, and therefore it helps Diseases springing from that Humor: of which see the writings of Physitians. Of *Lapis Lazuli* is made that most excellent blew colour, cal'd *Ultramarinus*, which is dearer then Gold. Also Gold is got out of the said Stone. And even this Stone alone doth teach us, that there is one common principle of Metals and Stones, as was said before; and that the matter of Metals doth suffer many mutations, and that thence various Minerals may be generated, each of which hath a peculiar affinity to that Metal to the generation whereof the matter was disposed: which I leave to the diligent consideration of others. *Metals & Stones have the same common principles.*

*Lapis Armenus* is in colour and Virtues of kin to the former. But this is not so hard as the *Lapis Lazuli*, nor is it adorned with specks of Gold, but with many green, blew and blackish specks. *Lapis Armenus.*

Finally, let us conclude this our Doctrine of precious Stones with *Pearls*; which are not indeed generated in the Earth, as other Jewels are, yet are as precious and Noble as they. *Pearls.*

Now they are bred in certain Shel-fish, of that Humor whereof the Shel of the said Fish is made. The most excellent are found in the Persian Sea, and in the Regions of *China* and the *East Indies*: the occidental Pearls because they have not the Silver glance of the other are of less value. Now Pearls have a rare faculty to strengthen a Man, and to restore his Spirits; and therefore they resist Poyson, Putrefaction and Pestilential Feavers, they clear the mind, they are a Remedy for swooning, and Melancholick Diseases. They are good against a flux of Blood and looseness of the Belly, they do strengthen the Brain and Nerves. Mixt with Eye-salves they scour away the Clouds and Filth of the Eyes, and consume the dropping moisture thereof.

But so much may suffice to have spoken in brief of Stones and Jewels. You may see more in those Authors who have wrote peculiarly of this subject; as *Franciscus Rueus*, *Georgius Agricola*, *John Kentmannus*, *Andreas Baccius*, and especially *Boetius*, who has published an excellent History of Stones.

## Chap. 5. Of Metals.

The Aristoteleans opinion concerning the matter of Metals.

Now concerning the generation of Metals the opinion of Authors is various. And as to the matter of Metals, the Aristoteleans do hold that as all other things digged out of the Earth are made of a Smoaky exhalation, so all metals do spring from a vaporous Exhalation, and that moisture is prevalent in them, because they may be Melted and Hammered. And they teach that Metals are generated, when a Subterranean Vapor included, especially in Stones, in regard of a dry Exhalation which drew it upward, is gathered into one, and Coagulated like Dew into very small drops, which cannot be done without cold: yet with this difference; that in the Generation of Dew and Hoar-frost the foresaid driness which carried the Vapor upwards is separated: but in the generation of Metals that same separation is not made, but the dry Exhalation is contained and Coagulated with the Vapor.

Howbeit, this opinion is not to be received unless it be otherwise explained. For it supposes a matter too remote, and speaks of the generation of Metals, as if it spake of Meteors. And those who hold thus concerning the Generation of Metals, seem to be of his mind, who intending to speak of the Generation of Animals, should make, not Blood and Seed, but an Exhalation Dry or Moist, the principle of Living-Creatures.

The opinion of the Chymists.

The Chymists therefore do better, who having more diligently sought into the Generation and Resolution of Metals, hold their principles to be Sulphur and Mercury; to which later writers have, not without Cause, added Salt, or a Metalline, Copperasated, or Vitriolated Earth: and that in all these a Formative and Seminal Faculty was at the Creation implanted by God the Creator; which as *Scaliger* saies *Exercit. 307. Sect. 20.* is a certain fifth essence far different from the four Elements, and which as the principal agent makes Metals of matter thereto disposed. And therefore wherever this Seminal Principle is wanting, no Metal can be made of any Exhalation, Dry or Moist, by the power of any efficient whatsoever.

And that the Matter thus stands, is apparent from the Metal mines, the meltings, Probations, and resolutions of Metals, and the very Proprieties of the Metals themselves. For in all Mines these principles are found, and out of all the Oare where-in all Metals are Generated, Sulphur is boiled. Also 'tis very well known to Chymists, that Metals may be changed into running Quick-Silver, and that of Quick-Silver Metals may be made. Yea any man may judg by his Nose and Eyes, that there is Sulphur in metals; because in the Calcinations and melting down of Copper and Iron, a greenish and reddish flame is seen, and there is a smel of Brim-stone. And most Diseases wherewith diggers and refiners of Metals are troubled, have their original from Sulphur and Mercury. The Resolution or Dissolving of Metals shews the same, which is not into Dry and moist Exhalations only, but into things of kin to Metals, retaining their own Nature and properties, in sundry alterations and external Mutations. For Lead being turned into Ceruss, although it seem to have quite put off its Nature, yet may it be melted into Lead again. Yea and *Stibium* doth turn again to Antimony without much ado. The specifical proprieties of Metals do argue the same, which witness, that they have not their original only from the mixture of Elements. For that which is true of the Load-stone, as *Scaliger* writes, that it cannot by any faculty of the Elements draw Iron: the same may be said of many proprieties and operations of Metals.

And the Mercurial matter is the chiefest in the Constitution of Elements; which being sundry waies mixed with fixt or volatile Sulphur, and a copperasated Salt or Earth, makes sundry sorts of Metals. And the Chymists do commonly call Mercury the Mother and Feminine Principle, and Sulphur the Father and Masculine principle. Now with Sulphur is mingled Vitriol or Metallick Salt; and in Sulphur there is Vitriol, and in al Vitriol, Sulphur: whence it happens, that out of both there is a Spirit drawn much alike.

But

But that others do think otherwise in this point, the chief cause is; inasmuch as these principles are not alwaies found in mines after the same likeness and form as they imagined. Moreover, because metals are not found every where and in all places in which Quick-Silver and Sulphur are found. And Finally, because they cannot sufficiently discern these principles in Metals. For they think it necessary, that in every Mine of Metal these principles should be found with the Metals, but especially that Metals ought alwaies to be found in the Veins of Mercury and Sulphur: and if Sulphur were in Metals they conceive it must needs flame.

But unless they were blinded with the darkness of Chymical Ignorance they might easily see those principles in Metallick Veins. For they do not alwaies appear under one and the same visible form and shape; though sometimes they are found in the mines, in the very same shape: but sometimes they wander in the shapes of Exhalations and Spirits, sometimes they are Coagulated into the form of a Juyce, an Earth, or some other form. Yea, and the Metals themselves are found sometimes Fixed, other whiles Volatil. For Nature Generates Mercury after a Spiritual manner; to which if a Copperasated Sulphur be added, and a formative principle, it is Coagulated into a Metal. But if Sulphur and the formative Principle be wanting, it grows together into a peculiar matter and is found alone. For one of these doth not suffice to make a Metal, but all of them are requisite. And therefore in such Mines, in which one is present and the rest are wanting, Metals are not generated. But there alone Metals are bred, where a Sulphureous Vitriolated fixative Spirit is exactly mixed with Quick-Silver in a matter fit to become a Metal. Those Bodies do not make Metals, but the Spirit must of necessity be mingled most intimately. But in this formation, before they grow quite firm and Dry, and come to Maturity, they are often found in the likeness of a Mineral Juyce, and unripe Metal: and at last they are Coagulated and compacted into a perfect Metal.

And they that are stumbled at the inflameable Nature of Sulphur, must know, that there is no necessity that Metals must take flame because they have Sulphur in them. Simple Water Wets, but it doth not so in compounds; Air ascends upwards, but not in mixed Bodies. Again, they are ignorant that an inflamable and Volatile thing may so be fixed, that it shall take flame no more. For it is the property of all Sulphur to be inflamable, but not at all times: and the more it is fixed the less it conceives flame; and the more it is fixed, the less subject Metal is to burn. Hence it comes to pass, that Iron and Copper are burned, and send forth a notable flame: but Gold by reason of the fixedness of its Sulphur withstands the violence of Fire.

From hence also, it is easie to judg of the Efficient cause and active principle in the Generation of Metals. For they who conceive that Metals are Coagulated only by cold do discover their own simplicity of wit, or their unskillfulness in the point of Metals: seeing Metals have already an internal Cause of their Coagulation, and are dissolved by heat; cold only gives occasion of their Coagulation. But if that internal Cause of Coagulation be wanting, no external cold is sufficient to Coagulate the same. Which is to be seen in Quick-Silver, which no cold can congeal, and yet it is Coagulated with the Spirit of Lead. Yea, in the very Fire it self, by Cementations and other Coddions, Coagulation and fixation is made.

We ought therefore, touching the Nature and original of Metals, rather to credit the Diggers, Refiners, and Triars of Metals, and the Chymist, then idle disputers, Ignorant of the Nature of Metals, Who, out of an hatred to Chymistry, do endeavour (by I know not what Reason) to perswade us otherwise. And therefore the most learned also of the Peripateticks, who have searcht more deeply into the Nature of Metals, do in this point follow the opinion of the Chymists.

Now the Common Affections of Metals are, to be melted with heat; to grow hard again by cold; to be hammered and beaten out, to drink in Quick Silver; to be dissolved by *Aqua Fortis*.

They flow and melt by Reason of Quick-Silver: and therefore those who have most part Quick-Silver are more easily Molten; but those more hardly, in which Sulphureous dryness and Salt are most prevalent. And if there be good store of

Mercury in Metals they become so soft, as to be melted by the very least heat; Contrariwise, such as are often burnt in the Fire, their Mercurial moisture being taken away, they become at last hardly Meltable; as also if they be steeped in Aluminous, Copperated, and fixatory Waters.

Also malleableness depends upon the Mercurial Humidity. And those Metals may be best hammered and spread abroad by beating which have a Mercurial moisture most exactly mixed with a Sulphur proportionable. Contrariwise, those in which there is most of a Vitriolated Sulphur, of Salt and Metalline Earth, they are least Malleable.

Now Metals do drink in Quick-Silver, because they have one Root, and their substances are of kin; as we see Oyls easily mix'd with Oily things, and Water with things Watry.

Difference  
of Metals.

Metals are by others otherwise divided: but they are by the Chymists usually divided into Perfect and Imperfect. And they count that perfect which is compleat both in Substance and Accidents, and excellently fitted for use. Such an one (Namely) as hath a subtile Mercurial Substance, a most ponderous Nature; that endures the Fire and all the trials thereof, without even the very least detriment; it is easily joyned with Mercury, and most easily and largely dilated. All which marks, since they are most to be found in Gold, it is by the consent of all Nations reputed the most excellent and perfect Metal. Whereof nevertheless you may read what *Mirandulanus* saies, in his *Book de Auro*.

whether  
Metals  
differ spe-  
cifically or  
not.

Now a Question is here raised, whether Metals differ specifically, or not. Very many Chymists hold, that they do not specifically differ, but only in degrees of perfection, and that they consist all of the same matter; have the same efficient Cause; are generated in the same place: that in Lead there is alwaies some Gold found; in some Brasse there is Gold; and divers of them are commonly bred together; they are mutually changed one into another, as Iron into Copper; out of all Vitriol is made, and all are resolved into Mercury. Hence doubtless were these sayings of the Chymists: *Lead is Leprous Gold: the Inner parts of Silver are Gold.*

Yet, If I may speak mine own opinion, I conceive that Metals are specifically different. For though it may rightly be said that all have one and the same matter, not only generical and remote, but also immediate (in which respect they differ from other Natural things, and for which cause it is that they are turned one into another, and divers generated at once in the same place) yet have they not the same Ultimate matter; but therein they differ. Yet neither are they differentiated only by accidents, but by a substantial specifick form, and there is one form of Gold, another of Iron, and another of Lead, which disposes and Labours that common matter according to its own Nature, which appears by the effects and operations. Hence it is, that though all of them are resolved into vitriol and Mercury; yet that Vitriol which is made out of Copper differs not a little from that made out of Iron.

Nor is that of any moment which some Chymists say; that Nature alwaies intends that which is most perfect. For this is true in every kind. In the kind of Men, Nature intends to make the perfectest man; in the kind of a Vine, the most perfect Vine; in the kind of Gold, the most perfect Gold. Yet doth it not therefore follow that because Gold is the perfectest Metal therefore Nature alwaies intends to make Gold. For that is just as if a Man should say, that Nature in the kind of Animals alwaies intended a Man, who is the most perfect of all Live-Creatures. And if Nature alwaies intended Gold, why is there no more to be found? Now they hold that there are two perfect Metals, Gold and Silver: and four imperfect ones.

Gold what  
it is?

Gold is the most perfect of all Metals, consisting of the most pure Mercury, most perfectly digested and ripened, by Virtue of a most excellent and fixed ruddy Sulphur, wherewith it is most exactly mixed and united. Hence it comes to have a yellow colour; it is most weighty of all Metals, it indures the Fire, it may be beaten out exceedingly thin, and it is most easily of all Metals united to Mercury. The Chymists do call it *Sol*, the Sun.

Silver,  
what?

Silver is a perfect Metal, yet more inferior then Gold, consisting of a Mercury almost

almost fixed, and of a white Sulphur, almost fixed also. For it is neither so heavy nor so fixed as Gold. And therefore although it endures the Fire after a sort, and abides in the Ashy Cement, yet doth it not endure in the Royal Cement, Antimony, Sulphur. Next to Gold it is beaten to the greatest thinness of any Metal. The Chymists call it *Luna*, the Moon.

Imperfect Metals are those which have principles not so mature and well digested, nor so fixed and pure: whence it happens, they can neither endure the thunder of Lead, nor the Cement, nor Sulphur, but flee away in smook and sparkles; or are changed into dross, Glass, Stones.

Now they are hard or soft. The hard are those which by Reason of their Earthy Sulphur and hardned Mercury are first red hot before they melt; the soft are those which by Reason of a moister Mercury and less digested are first melted before they are Red Hot. The hard have more Sulphur then the soft; but it is Earthy and contains more vitriolated Juyce. And therefore they are easily turned into Vitriol. Hence it comes to pass, that they suffer detriment by Fire, and will not endure the tryal of more perfect Metals, but Fly into the Air.

Now the hard Metals are two, Brass or Copper, and Iron. Brass is an imperfect Metal, Hard, consisting of a little Mercury and very much impure Red Sulphur, not perfectly ripened, for the most part but yet not perfectly fixed; being of a reddish colour. And hence, by reason of its Sulphur, it is thought to have affinity with Gold, and to contain in it the principles and Seeds of Gold; and it is believed that by digestion it may attain to some maturity and perfection. Also it hath affinity to Silver; seeing in the Marchalite and the *Lapis Fissilis* they are oftentimes found both together; and Silver and Copper being dissolved are both of a blew colour. The Chymists call it *Venus*.

Iron is an imperfect Metal, consisting of a little Mercury and much fixed Sulphur, being of a whitish black and Blew colour. Hence it comes to pass, that it is exceeding slow in melting and bears long the force of Fire; and is readily calcined. Also it is hardly Joyned with Mercury, because there is little Mercury in it. Also it hath little Vitriol, and therefore it is of a whitish livid colour. The Chymists call it *Mars*.

The soft Metals are, white Lead which is called Tinn; and Black-Lead which is called simply Lead.

Tinn or white Lead, is an imperfect Metal, soft and white, consisting of much Mercury, less pure and fixed then in the perfect Metals, but purer and more fixed then in Black-Lead, and of a white impure and unripe Sulphur. Being mixed with Gold and Lead it leaves them malleable; but being mingled with the other Metals it makes them break under the Hammer. The Chymists call it *Jupiter*.

Black-Lead is an imperfect Metal, Soft, of a livid colour, generated of much impure and undigested Mercury, and of a little Sulphur impure likewise and stinking. Hence, being used in the trial of perfected Metals it consumes the imperfect, and carries them away with it self in Smoak, or turns them into dross. It is of all Metals the most easily melted. The Chymists call it *Saturn*.

Finally, Of kin to Metals is Quick-silver, a Mineral Liquor, of a wonderful Nature, for it flows like Water, and yet it wets not. It is the weightiest of all Minerals, and wil suffer nothing to sink into it but Gold. Now it consists of a clammy Metallick Water, and a Sulphureous Earth, exactly mingled; and it mingles with Metals, first with Gold, then with Tinn, then with Lead, then with Silver; hardly with Copper and Iron. The Chymists call it Mercury; because as Mercury associates himself with all the Planets, so doth Quick-silver with all Metals; and because its Nature is moveable and shifting, which hath hitherto sufficiently exercised many Chymists, and is not yet sufficiently understood. And therefore hardly can we say any thing thereof in this brief discourse.

And here to conclude our Discourse of Metals, we must not pass over that controverſie concerning the transmutation of Metals. Out of which briefly to unwind our selves, seeing, as *Aristotle* rightly judges, it is a certain weaknets of mind to seek

seek for Reasons and let go Sense; I conceive the shallow Reasons of some Persons unskilful in Chymistry are no waies to be preferred before experience. Now it is a most known thing, that in *Hungaria*, at a Town called *Smolnitz*, in the Mountain *Carpathus*, there is a Fountain, whereinto Iron being cast is turned into very good Copper. The like is done at this day in *Goslaria*. Nor is this performed by Natural Waters only, but the same may be done by Art also. For if Iron be cast into vitriolated Water there sticks a red powder thereto, which being melted in the Fire becomes Copper. So Quick-Silver is turned into Lead, with no great pains. Also it hath been often found true by experience, in this Age of ours, that other Metals may be turned into Gold: and it is Notoriously known, what that same *Alexander Sidon*, a Scotchman performed at *Colenius Basil*, and others places. Concerning which matter see the *Historis* of the Metallick Transmutation described by *Ewaldus de Hoghelande*; and the writings published by *Andreas Libavius*, for defence of Transmutatory Alchymy.

Since therefore by Experience it is sufficiently manifest; we need not dispute long of this Matter. One thing we shal briefly hint. That the Transmutation of Metals is not Simply and Barely Artificial, save as it applies things Natural to perform some certain action. Nor doth the Art proceed upon any but meerly Natural principles; and such things as Nature hath generated she doth only mix after a certain Fashion.

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T H E

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THE  
SIXTH BOOK.

*Of the Soul in General, and of things Vegetable.*

Chap. 1. *Of the Soul in General.*

Since Method requires that we should now treat of Living and Animal Things; we must first speak of the Soul. That there is such a thing as a Soul, is manifest by the operations thereof. For we see that Living things perform many operations which they cannot do when they are dead. It follows therefore that the Body it self cannot be the cause of those operations; but that there is somewhat in the Body which performs the same. Now since every operation is a kind of transient accident, never firmly subsisting in it self; there must needs be in the Body some cause, which is the stable and constant producer of actions; which being present, life and every action is performed, and when it departs, the life ceaseth: and this cause of such like actions is termed *Anima*, the Soul.

As to what concerns the Essence of the Soul, I omit the sundry Opinions of the Ancients, which are reckoned up, and largely refuted by *Aristotle*, *Lib. 1. de Anima*. *Marsilius Ficinus*, *Lib. 6. 7. 8. Theologiae Platonicae*. And I shall retain the Definition of *Aristotle* in *2. de Anima*, *c. 1. text. 6.* which is this, *A Soul is the first act and perfection of a Natural Body, which hath an aptitude to Life; or briefly, of a Natural Body, whose parts are Organs.* For the Soul is neither an accident, (seeing an accident cannot be one part of a compounded substance, such as a living Body is, nor the first principle of all actions, or make a true difference betwixt two substances;) nor a Body, for two Bodies cannot be in one place: But it is the act, or substantial form, by which a living Body is a living Body indeed; that is to say, by which it hath an inbred power and faculty to perform all the actions of Life. More may be seen touching the word *Entelecheia* used in this Definition, in *Book 1. ch. 9.* concerning Motion, where I have at large explained the genuine signification of this Word.

Now a Soul is not the perfection and form of any Body, not of an Artificial, but a Natural Body; nor yet of every Natural Body: For every Natural Body is not animated; but that Body only, which hath an aptitude to exercise the actions of Life, and is so disposed that the Soul may thereby, as by Instruments, exercise its actions. For here we must hold out of *Aristotle*, in *2 Metaphys. com. 31.* That the action of an Agent does not proceed from the subject without a form, nor from the form without a subject: for otherwise the subject and its form would be actually two things. Now if so be action cannot be performed by a subject without a form, nor by a form without a subject, much less can it be performed by Instruments without a Working cause. From whence it follows, that Action is performed by a certain compound of Matter, Form, and Instruments; so that the whole Compound may be called the Principle which acts; but the Form, the Principle where-with the act is performed, because the Compound acts by vertue of the Form; Finally, the Instruments, whereby; seeing the operation is performed through their subserviency.

Moteover, There is also another Definition of the Soul in *Aristotle*, in *2. de Anima*, *cap. 2. text. 18.* which is this: *Our Soul is the Principle whereby we live, move, use our Senses, and understand.*

And seeing there are many kinds of Living Creatures; we shall best come to the knowledge of their Differences, by observation of the effects and operations of the Soul; since every

*whether there be a Soul or no?*

*The Definition of the Soul. The Soul is neither an accident, nor a body.*

*Another definition of the Soul.*

cause discovers it self by its effects, and the form by its operations. Now the proper Energy of the Soul is Life, which as the second act, is evermore attended upon, and companion to the Soul as the first act. We may therefore from the distinct manners of Life constitute the distinct sorts of souls and animated things. Now a man lives, and so do other Creatures, and so do Plants, but each of these after a peculiar fashion. The life of Plants consists in Nutrition only, and the action proper to each one, but Plants have no Senses: the life of Brutes, besides Nutrition and action, contains also sense; and each sort of Brutes hath its proper action: Finally, Man besides all these, does also understand, and make use of Reason.

Three distinct sorts of Souls.

There are therefore three distinct sorts of Souls: all which are in Matter, and do constitute a living Body: Yet one of them is more loose from the matter, but another more plunged therein; and one can receive the spiritual and immaterial species of things, wherein consists the force of knowledg, but some cannot. Plants are nourished, and understand nothing; Brute Animals can understand some things; they receive immaterial species, howbeit with some conditions of the matter: For what things they perceive are here present, and at this time; seeing Sense is busied about particulars. But the rational Soul receives immaterial species or representations of things, even without all conditions of matter.

Whether the Faculties of the Soul differ therefrom, and how?

And seeing the soul is the cause of various actions, and hath the power to perform sundry operations in living Creatures, we must consider how the powers or faculties of the Soul are related to the Soul it self. And here some hold, that the faculties of the Soul are the very Essence thereof, which according to the sundry actions whereof it is the cause, hath sundry names: others contrarywise do conceive that the faculties and powers of the soul, as all others, are qualities of the second sort, and that they are really and essentially different from the soul. And this latter Opinion is the better of the two. For the Powers and Faculties of the Soul are indeed only properties and inseparable accidents thereof, and essentially distinct therefrom. For the Soul is a substance, but these are accidents or aptitudes and propensions to operate; which flow from the essence of the Soul, as their first cause, only by emanation, and so depend thereon, and are received without any medium, in the same animated Body, wherein the Soul is. For every power is ranked amongst the second sort of Qualities: and seeing the Powers of the Soul themselves are distinct one from another, they must also differ essentially from the Soul: For if they were the same with it, they would be the same one with another. Howbeit, it is to be observed, that the faculties are not mediate Agents, or middle causes betwixt the Soul and its operations, but only conditions and aptitudes to operate: For operations proceed from the Act, and not from the power; nor is it necessary that betwixt every agent and its operation there should intercede some middle agent. For so, neither could that middle agent be the cause of action, without another middle agent: and so there should a progress *ad infinitum*, without end.

These divers Souls are with their faculties so disposed, that the upper faculty does alwaies pre-suppose the lower: but the inferior may be without the superior. The Vegetative is without the sensitive in Plants: the Vegetative and Sensitive are without the Rational in Brutes: in Man all three concur. But how the Faculties are disposed in reference to the Soul in divers sorts of Living Creatures, intricate and hard Questions are agitated amongst Philosophers.

Whether in one living thing there is more than one Soul.

For in the first place Enquiry is made, Whether in every living thing there is only one Soul, or more. For some teach, That in every living Creature there is only one Soul, and that it is furnished with all the faculties of an inferior Soul; and that there are not in Man three souls, an Intelligent, a Sensitive, and a Vegetative; but one that is endued with the powers of all three, and takes its denomination from the nobler faculty: and that so the faculties which are in living Creatures of the same sort, do proceed from one sort of Soul; but those which are in living Creatures of a several sort, do arise also from a several sort of Soul; although both here and there they have the same names, and are attended by the same operations. Others do hold contrarily, That there are distinct Souls, not only in living things of several sorts; but that more also may be found in the same living Creature; and that in Man there is not only a nutritive and sensitive Faculty, but a nutritive and sensitive Soul, and also a rational; and that where-ever the Faculty is, there is also the Soul, to which it primarily belongs.

And although both Opinions have learned and famous Defenders; yet the first which is the commonest and most received, seems to me the more probable. For since there is one specifick Essence, and consequently one only Form of every thing; therefore the Soul of every living thing, which is the Form, and principally constitutes the Essence thereof, can be but one. Moreover, it is not possible, that the principles of things, opposite one to another,

ther, and several sorts of Souls can meet together, without uniting or confounding the Essences of things; or yet be subordinate one to another; seeing they are such opposites as Logicians call *Disparata*, and do exclude one another out of the same subject. Moreover, it is a needless thing to multiply souls; since one soul, furnished with divers faculties may produce all the degrees of life; and a soul of an higher degree, and more noble, does include the faculties of the more ignoble and inferior; just as the number Four includes the number Three: nor is it necessary, though there are in the understanding subordinate conceptions, by reason of subordinate differences, that there should therefore be subordinate Forms, without the Understanding. For the multiplicity of universal subordinate conceptions does not multiply the Essence and Form of a thing.

Now the Principal Cause that others have erred in this point, hath been this; That they thought the vegetative power alone to be a peculiar Soul, and to constitute the sort of a Plant; and the sensitive Faculty also to be a peculiar Soul which constituted the sort of Animal: Whereas nevertheless there are many sorts both of Plants and Animals; and the Plants have different sorts amongst them, as also the Animals, and there is one specific form of a Rose, another of a Violet, another of a Willow; though the vegetative Faculty be found in all of them: one of a Lyon, another of a Dog, another of a Wolf, although the sensitive Faculty be common to all. All Plants have indeed a nutritive and generative Faculty, but not that only, but withal somewhat proper, whereby a Violet differs from a Rose and a Willow. So a Wolf is nourished, does generate, and exercises its senses, but it does not these things alone, but it hath also somewhat proper to it self, whereby it differs from a Lyon and a Dog; and from the same soul in a Dog does flow the Faculty of nourishing, of sense, and of doing that which is proper to a Dog, whereby it differs from other Animals. Nor are there in a Dog many and divers Essences, as the Patrons of the other Opinion do erroneously suppose. For neither are the Vegetative and Sensitive, or the Vegetative, Sensitive, and Rational, certain peculiar general Forms, or three Essences; but only general conceptions, arising, and constituted out of the comparison and conveniency of Living things, which do no where exist separately save in the mind; just as Being, Substance, Body: and therefore they do not multiply the Essence of things.

After this Question follows another: Whether the Soul be totally in the whol Body, and totally in every part? or whether it be all in the whol Body, and part of it in one part, and part in another. But first that ambiguity which lurks in this Question, must be distinguished: For the term *Whol*, may here be considered in a three-fold notion; in respect of a Substance, Quantity, and Quality. The first is constituted of the parts of the Soul in the same living Creature; the second of the Subject, according to the extension whereof the Soul is extended, so as to have quantity; the third of the faculties, wherewith it is furnished. The School-men call the first, the Essential whol; the second, the Quantitative whol; the third, the Potestative whol.

As to the first, Inasmuch as the soul of every thing is simple, and not compounded of Essential parts, where ever it is, there it is totally, and so as that it is totally in the whol Body. For we must not allow of their Opinion, who hold, That the substance of the Soul is only in one part of the Body, which is the principal part; and that the rest of the Body is governed by powers shed out of the Soul: For thus the whol Body should not be animated, but only that part wherein the substance of the Soul is: For those Faculties whereby (according to their Opinion) the rest of the Members are governed, since they are accidents, cannot supply the room of a substantial Form. Moreover, since the Faculties are accidents, flowing from the Essence of the Soul, only by way of emanation, they cannot have a subject different from their Form, nor be produced in any subject, save that wherein the Soul is; and therefore where they are, there we may know the essence of the Soul to be. And therefore we conclude that the Essence of the Soul is in all parts of the animated Body, and that no part is destitute thereof.

Yet is not the Soul in its Body, in all animate things, after one and the same manner. For in Plants and some Animals, there is no principal Member, but instead of a principal Member, a certain humor is diffused through the whol Body, by means of which, chiefly, the soul is joynd to the Body: whence it is, that altho the parts being pluckt from the Body do live for a season. But the case is otherwise in perfect Animals, in which we must hold that there is some principal Member, wherein the soul, as in a Root wherein it is naturally inbred as it were, may reside, and pour it self out to the other Members. And therefore that principal Member being hurt, the Animal soon dies; but not if any other be hurt; and the Members pluckt from the Body, do presently die.

Secondly, If we enquire how the Soul is in the Body, in respect of Extension and Quantity, the Answer is briefly this: That every form which informs the matter and is united thereto, and makes up one compound therewith, is extended according to the extension of the Matter. Concerning which thing it is nevertheless to be observed, that only Matter is of it self furnished with Quantity, and divisible; but that the Soul of it self is neither subject to Quantity, nor to Division. In the mean while, because it informs the whol Body, it is rightly said to be coextended therewith, and that where ever the body is that lives, there also the Soul is. Hence the Body is properly said to be divided, and to be made greater or lesser; and the Body of a Plant, from a smal Twig, grows to a tall Tree, a Calf to an Ox; and a Body in a Consumption grows less, and so doth a Tree whose boughs are cut off. But it is not so with the Soul; nor is that Soul which is in a smal branch, less in it self, than the Soul which is in a tall Tree; nor is the Soul of a Calf less than the Soul of an Ox, but remaining the same, it spreads it self abroad into the additional nutriment; nor is a Plant or Animal the less by communicating it self in generation; nor when the branches of a Tree are cut off, is the Soul of the Tree the lesser; nor hath an Animal that is consumed a lesser Soul than that which is corpulent. For the Soul is joyned to the dimensions, partly as colors, partly after another manner. For it informs the measured quantitative Body, and its plenitude and fillingness is as great as the Body it self and the dimension thereof. And though we suppose the Body to encrease never so much, the Soul without any addition wil fill it all; and if it be diminished never so much, it wil fill no more than that little Body. Of it self therefore the Soul hath no Quantity: but in respect of dimensions whereto it is joyned, it hath such a property, that it fills no more than the Body, be it great or little. And though notwithstanding by accident its plenitude is restrained and contained: yet is it not cut in sunder or diminished. In which particular it affords a certain resemblance of the most good and great God, who as *J. Caesar Scaliger* speaks, Reigns every where without place, is all without all, and the whol without parts.

Finally, Since divers and sundry powers do flow from the Soul; the Question is whether the Soul have all these powers together, in all the parts of the Body. We answer: That in all the parts of the Body, there are all the faculties according to their Original; and that the Soul brings all its faculties into all parts of the Body: yet peculiar faculties are only received in peculiar parts as in their subjects. For the Soul indeed is in all the parts, which is the Original of all the faculties: yet such is the nature of proper accidents, that it exists from a principle or certain cause; yet they insist only in a certain Subject. Hence *Scaliger Exercit. 103. s. 37.* You shal see some doubt, whether Memory be in all parts of the Body. Nay I tel thee, the Understanding is in the Feet. For we have one Soul every where attended with its faculties, as being essential thereunto. But where there are Instruments, there the faculty exercises its act. For if there were an Eye in the Finger, the Finger would see by that Eye, without calling any power or faculty from the Brain. For the Soul which is the same in all parts of the Body, is indeed every where furnished with the same faculties; and hath in all members the power to do whatsoever is proper to it; yet it performs certain actions by certain instruments; it sees by the Eye, hears by the Ears, smells by the Nostrils.

which is  
the Princi-  
pal part of  
the Body.

But because we are fallen upon mention of the principal part, and the foregoing Question can scarce be rightly resolved, without explication of the Controversie concerning the principal member in man and other sanguine Creatures, we must not omit to handle the same. For it is one and the same Question, which is the Seat of the Soul, and which is the principal member. For the principality is to be assigned to that member wherein the soul doth chiefly reside. Now that there is one principal member Philosophers and Physicians agree, though they contend sharply which it is: and reason perswades the same. For since the soul is not the form of an homogeneal body, but of a body heterogeneal and organical, which hath many and different parts: there must of necessity be some order established amongst them, and we must beleve that one of them is more worthy than another: and since as hath been said, the Hand, Foot, and other members being cut off, die presently, the rest retaining life, we must needs think that the Soul hath more affinity to one than another. But what that principal member is, the Platonists, to whom *Galen* and many Physicians joyn, are at variance with the Aristotelians or Peripateticks.

*Plato* and *Galen* hold three chief Parts, the Liver, Heart and Brain, and they assign the principality to the Brain, because therein is the principle of Sense and motion, and the rational soul hath there its residence. Contrariwise, the Peripateticks hold the Heart to be the principal member.

But

But several men seem to have several respects in their assigning the principal part. *Galen* hath respect to the nobility of the actions; but the Aristotelians respect the Radication (that I may so speak) of the Soul it self. The Physicians count the animal faculties, so called, most noble; the Peripateticks make most account of the Action of the Heart, because thereby all the rest are cherished and governed. And therefore though we may grant Physicians, that there are three chief members of the Body: Yet if question be made touching the principality, and the radication of the soul, since there is only one soul in every Animal, not many, and one Animal hath only one soul and specifick form; we must hold there is one principal member, wherein it resides, as in its Castle: although it perform not all its actions therein, but act definitely and distinctly in the organs proper and ordained to every distinct action.

Now if you shal ask me which is this member, I do with the Peripateticks assign the prin-<sup>The Heart</sup> cipality to the Heart, and hold that the soul doth stick therein as in its root, from whence <sup>is the</sup> it is diffused into all the rest of the members. Yea and the holy Scriptures ascribe not only <sup>Principal</sup> the radication of the Soul to the Heart, but certain other actions also which most men at-<sup>part.</sup> tribute unto the Brain. And indeed this is a very ancient opinion; *Plato* (saith *Scaliger* in his 1. Book *de Plantis*) learned these things of the wise men of *Egypt*, the Egyptians learn'd them of the *Chaldeans*, out of whose decrees all exact literature hath flowed. For the *Chaldeans* placed the Principles of all our motions in the Heart, as in their principle.

Now that the Heart is the Part wherein the Soul adheres as in its root, and therefore the principal part, is many waies apparent. For that is the principal member, not wherein as in the immediate Instrument, the most noble action is exercised; but that whereon the actions of all parts whether ignoble or noble, do depend, and whereby they are governed. For the prime Agent is more noble than the secondary and Instrumental Agent. Hence that Argument of *Galen* is invalid, who thus concludes; that is the Principle, from whence the Nerves, Veins, and Arteries arise. For that member seems to be the fountain and seat of the faculty, from which the Instruments arise. But these three kind of Vessels have their original from three members; the Veins from the Liver, the Arteries from the Heart, the Nerves from the Brain. And therefore there are three chief members, and the most excellent is the Brain. For we must distinguish betwixt the prime and chief principle of any operation, and the instrumental or secondary principle. For that which is the immediate Principle of an action, is not alwaies the first and most excellent. The immediate principle of sense and motion is the Brain: but yet the soul is not rooted therein.

Nor is that Argument of greater moment, that when the Brain is hurt, the operations of the sensitive Soul are hurt; to which therefore for the same cause medicaments are applied. For the first Agent cannot act without Instruments. And therefore when they are hurt, the action is taken away. And therefore, though the Heart which is the immediate Agent be wel, if the Brain which is the immediate Agent be hurt, the action is abolished: after the same manner, the Hand being hurt, although the Brain be wel, a man cannot handle or hold a thing; because the immediate Instrument of handling is hurt.

That therefore must be held to be the principal member, which governs all the actions of the whol Body; which breeds the common and most familiar Instrument of the whol Soul, viz. the spirits, but that is the Heart: which besides other tokens, is manifest from swooning fits, in which sense and Motion, and all the actions in the body are taken away, through want of spirits which should flow from the heart.

Moreover, that is the principal Member, according to the unity or plurality whereof there comes to be one or more Animals. For because an Animal by means of one soul is one; by means of two, two; that member by the doubling whereof the Animal becomes double, must needs be held the seat of the Soul. Now that the Heart is such a member *Aristotle* tells us, *Lib. 4. de Gener. Animal. cap. 4.* and that truly. For experience doth teach us, that by multiplication not of the Brain but Heart, an Animal hath been made double. I will produce some Instances collected by *Schenkius, observat. Med. P. 1. Obs. 10.* In a certain Town called *Emaus*, in the reign of the Emperor *Theodosius*, a Boy was born, who to the Navel was perfect, but above he was divided into two, had two breasts, two Heads with their parts and Sences. For somtimes one part would eat, and the other would abstain, one would sleep, the other wake, somtimes they would play together, laugh and weep, and beat one another. Now they lived neer upon two years. Afterwards it fel out that when one of them died, the other that remained alive died by reason of the putrefaction communicated from the other. Again, in the year 1531. there was one born, and grew to the stature  
of

of a perfect man, who had only two Heads and two Shoulders, so that one Head stood behind the other, and they were wonderfully like in favor, their Eyes and Beards were alike. They had the same appetite to meat, were hungry at the same time, had the same voyce, and both Heads had the same desire to the Wife which he had, and to evacuations. From which Stories it is apparent, that in the first who had a double Heart, all the Animal actions were doubled, but in the other, though there were two Heads, yet the actions were single, and that therefore the Principality belongs to the Heart. For if Sense, Motion, and other animal actions depend primarily on the Brain, and not on the Heart, why were those actions double only in the former, in whom besides the Brain there were two hearts; and not in the latter, in whom there were only two Heads?

### Chap. 2. Of the vegetative Soul.

**H**AVING spoken thus much of the Soul in general, it remains now that we treat of the sorts of Souls. And because the vegetative Soul is common to all living Creatures, we will begin with the consideration thereof. Now the vegetative Soul is the act or perfection of an organick body, whereby it lives, is nourished, encreases, and begets it like. There are *The definition of the vegetative soul* belonging to this Soul three faculties: the nourishing, growing, and ingendring faculty. *The three faculties thereof.* The nourishing faculty tends to preserve the Individual or particular living thing; the growing faculty tends to encrease the Quantity thereof; the Generative preserves the kind or sort. For the nutritive or nourishing faculty is that which turns the food into the substance of the living Body. For since the parts of a living Body are consumed by the native heat, (lest if there should be a continued resolution, the Creature should perish) the nourishing faculty was bestowed thereupon, to repair that which is consumed. Now this Interchange of resolution and nutrition, lasts as long as the life: *for a living Creature is nourished as long it lives.* Aristot. 1. de Gen. et Corrup. cap. 5. t. 41.

Now to Nutrition three things are necessary, as Aristotle teaches 2. de Anim. cap. 4. t. 49. *The thing nourished, that wherewith it is nourished, and that which doth nourish: now that which nourishes is primarily the Soul, that which is nourished is the Body which contains it; that wherewith it is nourished, is the food.* Now Zabarella hath thus expressed the whol nature of nutrition, in Lib. de Accret & nutrit. cap. ult. Nutrition is the aggeneration of matter to the parts in a living Body, caused by the vegetative soul through help of natural heat, out of the food which is taken in; that the matter which is steamed away may be restored, and that the living Creature may be preserved, to the end of the term appointed by nature. Scaliger thus briefly defines it: Nutrition is a natural union of the changed food.

*Four faculties subservient to the nutritive.* The Principal faculties have other faculties subservient to them, which yet do not arise from the Principal. For one faculty doth not possess another: but they all depend upon, and proceed immediately from the Soul. The nutritive faculty hath four faculties subservient thereunto; the Attractive, Retentive, Concoctive, and Expulsive: others add the Separative, which severs things hurtful. The Attractive, is that which draws the food; the Retentive is that which retains it, till it be duly elaborated; the Concoctive, is that which alters it and makes it fit for the living Body: the Expulsive, is that which drives out superfluous matter, which is unfit for nourishment.

*The Augmentative faculty* Now in the first age, not only nutrition is made, but also augmentation, and the parts which are added to the living Creature are greater than those that are consumed by the natural heat. Now Augmentation or Growth, according to the definition of Zabarella de accret. & nutrit. cap. 25. is the motion of a living Body, whereby the whol Body and all the parts are at once extended according to all dimensions, so as to gain a greater quantity; caused by the Vegetative Soul through assistance of the natural heat from the food taken in, and converted into parts of the substance of the Body, greater than what hath been consumed; that the living Creature may attain to that greatness which it ought to have, that it may perform all the operations of Life. For Accretion or Growth differs not from Nutrition in the subject thereof, matter out of which it is made, and the Efficient Cause. For the same subject is the living Body; the Matter out of which, the Food; the Efficient, the Soul: but they differ in their form and End.

For Nutrition is the ag-generation of aliment, and belongs rather to Generation than Motion: but the form of Growth is a motion of extension, to a greater Quantity of the whol Body

body and all its parts. The End also is different: For in Nutrition there is only the re-  
stitution of what is consumed; in growth there is an acquisition of more than is consumed.  
Hence Aristotle, 1. de Generat. & cor. cap. 5. text. 14. *Nutrition is the same thing with  
Accretion or Growth; but they differ respectively: For inasmuch as that which is joyned  
to the Body, is potentially so much flesh, it is able to encrease the body: but inasmuch as it is  
potentially bare flesh, so far it is able to nourish.*

Now because there are many Augmentations improperly so called, it is worth our labor  
to observe out of Aristotle, Lib. 1. de Generat. & corrupt. cap. 5. t. 33. three conditions The Con-  
ditions of  
Augmen-  
tation. of Accretion or Growth properly so called, or three things necessary to Accretion. 1. Not  
only the whol Body must become greater, but also every part thereof. 2. It ought to become  
greater, by means of some matter coming from without. 3. That which is augmented  
must continue the same thing in number which it was before. In the first condition is ex-  
plained the proper nature of Accretion. For though some doubt (since many mutations  
concur in Accretion, and not only the addition of Aliment, but also extension is necessary)  
in what mutation the nature thereof should consist: yet their Opinion is the truer, which  
joyn both these mutations together, and hold that Accretion or Growth consists both in the  
conversion of the matter of the Aliment into the substance of the living Creature, and also  
in the extension of the said Creature. For Growth is caused by somewhat coming to  
the body, and the thing grown hath changed its place, 1. de Gener. & Cor. cap. 5.  
text. 25.

Now, after what manner a greater quantity is acquired in a living Creature, Authors are  
also at variance; Some conceive it is done by driving, and that one part drives another, and  
another another, after the same manner as we see it is in the Nails and Hairs: But this is  
not agreeable to truth. They think more rightly, who believe that it is done by extension,  
viz. When the Aliment is extended through all the parts of the body, and through all the  
different postures of the said parts; which comes to pass when all the Pores are filled, which  
being full, the parts are extended: and all the parts being extended and augmented, the  
whol body is also encreased; after the same manner as we see a sponge grow great, after the  
water hath insinuated it self into all the parts thereof. Now according to the extension of  
the Body, the soul is also extended: and if any man will call it being so extended, greater,  
let him remember, that a Form of it self is neither great nor little. Hence Scaliger, Exercit.  
101. Sect. 15. *The Form when it extends it self into the newly applied matter, it advan-  
ces it self, but is not encreased: For it does not generate a new Form. And verily he  
that shall call a Form greater or lesser, will abuse the patience of wise men.*

Now living Creatures are not alwaies augmented, but only to a certain term of their age;  
the cause whereof is not in the soul: For neither it, nor its Faculties, which are proper to  
its Essence, are corrupted or weakened, but only the body. Nor is the cause in the natu-  
ral heat; for that is as strong in a yong man, as in a boy. But the impediment is in the bo-  
dy; viz. the bones, which are the chief part that is augmented, and according to the en-  
crease whereof the whol body is encreased, are more moist and soft in youth, and more apt  
to be extended; but in succeeding Ages they are so dried and hardened by the natural heat,  
that they become unapt to be extended. Although in some elderly persons the flesh and fat  
are many times augmented, yet that is no true growth, because the whol body is not aug-  
mented, but only the softer parts.

Finally, The generative Faculty is that which by the prolifick seed begets its like: And The gene-  
rative fa-  
culty.  
The defi-  
nition of  
generation. the Generation of a living Creature, as Aristotle defines it, de Vita et Morte, cap. 10. *Is the  
first participation of the Vegetative Soul with heat.* For living Creatures are said to beget  
their like, when they give out somewhat of their own matter, and their own form; which is  
then done when they yield their seed. *For in the seed there is both the matter and form of  
a Dog forth coming: Nor does the seed of a Dog differ from a Dog, otherwise than as ap-  
titude from Act; and there is nothing added to the seed, but an expression of those Organs  
which were before confused, saies Scaliger in Exercit. 268. and Exercit. 6. Sect. 5. and 7.  
The form is in the Dogs seed, in the aptitude whereof it is said to be; because the seed is a-  
ble and apt to give that form which it contains in it self; or because it wants the express  
Instruments, which afterward the Soul frames to it self, both by altering the whol, and dis-  
posing the parts, and is its self the builder of its own house.* And in the same Exercit.  
Sect. 10. *Therefore a Tree generates when it produces its seed. But a Tree is not then  
generated, when it sprouts up out of the seed; but then the generated Tree, which was before  
imperfect, becomes perfect. So a Dog does not ingender when the whelp is brought forth,  
but when he ingenders seed: Because in the very act of copulation many have died, before  
the*

the seed received any disposition or qualification in the Womb. Which we see more evidently in Plants: For the Almond Tree being dead, a planted Almond taken therefrom grows up to a Tree. Now the Soul engenders a Soul by promotion of it self; after the same manner truly, as in growing it insinuates it self into the new matter of the nourishment.

Now Living Creatures obtained this Faculty of propagating their kind, from their first Creation by God, when he blessed all living Creatures, saying, *Encrease and multiply*; and again, *Let the Earth bring forth Grass, the Herb yielding seed, and the fruit Tree yielding fruit, whose seed is in it self, upon the Earth*: and again, *Let the Waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the Earth in the open Firmament of Heaven*: and again, *Let the Earth bring forth the Living Creature after his kind, Cattle, and creeping things, and the Beasts of the Earth after their kind*.

Howbeit the manner of the Propagation of living things is various. In Plants indeed if a branch of Willow be pluckt from the Tree, the Soul is divided by division of the matter, and abides in the branch; and therefore from the said branch stuck into the Earth, a Tree of the same sort will grow up. The same is done in other Plants by their Roots, in others by their seeds, and in others after other manners propagation is caused; as may be seen in the Writers of Husbandry. In all which nevertheless it is necessary, that the matter taken away may afford a fitting Mansion for the soul; which every part in all Plants cannot afford. For examples sake, A Willow is propagated by a bough stuck in the Earth; but a Pear-tree cannot be propagated after the same manner.

But in Animals or living creatures, although the manner of Propagation may also seem to be various, while some produce Eggs, others living creatures: yet herein they seem all to agree, in that Animals do not generate by any part of their body pluckt off as Plants, but by seed, or somewhat which answers to seed.

For the seed which Epicurus (as Plutarch relates, *de placit. Philos. Lib. 5. cap. 3.*) called *an Abstract of the Soul and Body*, being cut off from the rest of the body, according to the division of the subject, the Soul is also divided, and some portion thereof is with the seed separated from the Animal; which being of the same species with the Soul from whence it is taken, is now become numerically different, in regard of the subject. Out of the seed, by reason of this soul, a new Animal arises, while the soul lying hid in the seed, rouses it self, and displays its Faculties, and by operating manifests it self; and making use of the innate heat and spirits, it begins to shape all things necessary to the constitution of an Animal or living creature, and distinguishes, disposes, orders forms, and fashions the subject matter; that so it may have a perfect and fitting house, like to that from whence it came, and that it may have Instruments in a readiness, whereby it may put forth all its Faculties, and exercise all its natural Actions; which house it afterward possesses, after the same manner as it insinuates it self into the new matter of Aliment, when the Creature grows.

Howbeit, there is betwixt Plants and Animals, especially the more perfect sort, this difference; That Plants which breed seed, breed it so qualified, that it alone suffices to the production of a like Plant: but in the more perfect Animals which have Sex, the seed of neither Parent is sufficient to beget their like; but as Plato hath it, Each Sex contributes its shot to the matter of Generations; and the seed of neither Sex taken alone, but of both joyned together, and united in the Womb of the Female, is prolifick and fruitful seed.

### Chap. 3. Of the Parts of Plants.

**S**ince therefore there are three manners of Life, and Plants live, are nourished, grow, and generate; Brutes have besides, the use of sense and local motion; and a Man besides all these, hath the use of Reason: having spoke of the Vegetative Soul, before we shall speak of the Sensitive and Rational Soul, we must first treat of Plants. Now a Plant (which the Greeks call *Phyton*) is a Body animated and vegetative, or endowed with a nutritive and generative faculty. Where I must in the first place acquaint you with this, of which mention was made before, viz. How that many are of opinion, that all sorts of Plants have no other Faculty but the Vegetative, which is common to the whole kind, but that only the same kind is restrained by certain bounds to the proper faculty of its own sort. But this is a false Opinion: For if the case were so, there should be indeed no specifical difference

The definition of a plant.



ference in Plants and Animals; nor should a Rose differ from an Oak, nor a Moule from a Lyon, except in some Accidents. But thus we are to hold; That the Vegetative Soul alone does not constitute any sort of Plants; nor does the sensitive Soul constitute any sort of bruits, but only an Animal or Living creature, which is the kind comprehending Man and Beast: but the sorts of Plants and Animals do differ by their specifick forms; as namely a Rose from an Oak, a Fir-tree from a Violet, a Dog from a Wolf, and a Wolf from a Lion and a Man. And from the difference of forms proceeds this diversity of Actions, so that among Living Creatures some are more ingenious than others. And in vain it is that some anxiously dispute, Whether some Animals besides Man, are not Rational? For those actions we see in some Animals which are more ingenious than others, do not proceed from a Rational Soul, which is proper only to Man; but from the Soul that is proper to that sort of Animal. For as a Rose hath one soul, a Poplar another, and therefore the Rose and the Poplar have different operations: even so, as there is one soul of a Sheep, another of a Sow, another of a Dog, another of a Fox, another of a Lyon, another of an Elephant; so also all these sorts of Living Creatures do differ both in the structures of their bodies, and in their specifical actions. And although in some sorts of Animals actions appear sufficiently wonderful; yet the soul of Man hath only gained a proper name, and is termed Rational: the rest are for the most part destitute of proper appellations. But that we may speak now of Plants; every Plant consists of a proper soul, and of a body convenient to its sort.

whether  
some bruits  
are ratio-  
nal?

We have already spoken of the Soul, it remains that we should speak of the Body. But first there is a Question that presents it self: Whether the two Sexes are in Plants? To it Scaliger answers, in 1. de Plantis: There are in Plants (quoth he) the principles of Male and Female confounded, and that by an excellent design of Nature. For since Generation is made by an agent in a Patient; Nature hath put into her work, to which she had denied Motion and granted Generation, proportionable generative faculties joyned together, which may be also hence collected: Because in some Plants it is seen, that of one seed the male, of another the Female does spring up. Which is apparent in Hemp; Out of the same trunk proceeds seed, which partly grows to be Male, and partly Female.

whether  
there are  
two Sexes  
in Plants?

Now some parts of Plants are necessary to the constitution of the whol Body; others are superfluous. There are some hard Excrements, as Mushrooms, and Puck-fists; some soft, as tears; and of these, some remain liquid; others grow hard, as Gums.

The Ex-  
crements  
of Plants.

Among the parts necessary to the constitution of the body, besides that same juyce diffused through the substance of the whol body, wherewith Plants are nourished, and which answers to the blood in Animals, the most simple are, Fibres, Nerves, and Flesh. Fibres, which the Greeks call *Iner* (which Scaliger, de Plantis, would rather call threds or hairs; because the lobes and little roots of the Liver are called *Fibrae*) are those long, continued, stretched out parts, running through the whol Plant, answering to Veins, Arteries, Nerves, and Fibres in Animals; the greater and more succulent whereof are called Veins and Ribs, but the thinner and drier are called Nerves: And they are made both for the nourishments distribution into all parts of the Plant, and also for their firmness and consistency. The flesh is the remaining substance of the Plant, answering to musculous flesh in Animals. Now the flesh is of three kinds; some is moist, such as is in Cherries, Prunes, and such like fruit; some is a little more solid, such as is the pulp of a Pear and an Apple; some is of a more compact and woody substance as it were.

Their sim-  
ple parts.  
Fibres and  
Nerves.

Flesh.

Of these are made others, which themselves also are numbred amongst the simple and similar parts; viz. The Wood, the Marrow, and the Bark. The Wood in Plants called *Lignum*, is a body hard, that wil cleave, and consists of thin fibres: the middle part in the Wood is called the Marrow, Pith, or Heart: The Coat wove together of Fibres, going about the wood is termed *Cortex*, the bark; which when 'tis very thin, 'tis by a special name called *Cutis*, the Skin or Rind, especially in Fruits, whose flesh is alwaies covered with skin: that which is thicker is called by the general term *Bark*. Howbeit the Bark it self is not simple; but in most Plants there is an outer, and an inner: The inner is called *Liber*.

Wood.

Marrow.

Bark.

As to the compound parts of Plants, some are constant, others mutable. The constant are, the Root, the Stock, the Bough, the Branch: The mutable are, the Leaves in most, the Flowers, the Fruits. The Root is the lowest part of a Plant, whose Office is, not only to fasten the Plant and support it in the Earth, but also to draw its nourishment; and therefore it's compared to the Mouth in living creatures; yea, and by some the concoction of the Aliment drawn out of the Earth is ascribed to the Roots.

the Com-  
pound  
parts.  
Root.

*the stock,*  
*stalk, trunk*  
*Branches,*  
*Boughs,*  
*twigs.*  
*Suckers.* The Stock, Stalk, or Trunk of a Plant, is that part which rises immediately from the Root. Which is indeed soft in Herbs, and is termed the stalk; but in Trees and woody shrubs 'tis hard, and termed *Caudex* the stock. The stalk and stock parts into branches, and the part where the branch issues is properly called a knot; the branches are divided into boughs and twigs; besides these there are suckers, or small twigs that grow up out of the Root.

*Leaves,*  
*Flowers,*  
*Fruit.* Out of the boughs and twigs spring the Leaves, Flowers, and Fruits; and in some Plants tendrils, fingers, or clasps, by help whereof they rear and sustain themselves against some wall, pale, tree, &c. Parts of the Leaves are the little stalks they grow by, yet some Plants have them not, as the Indian Fig-tree.

*Flowers.* The Flowers to Plants are as the child in the womb, which come to perfection in the seed and fruit, or they are rather the first covering of the fruit. Now the Flowers consist of a most thin exhalation and a subtil spirit, which breaks forth when any Plant does grow wanton and big with desire of generation. For there is no emission of seed without such a spirit, nor any propagation of the soul, in Plants nor in Animals. Now the Flower includes within it self, and defends the fruit when it first breaks forth, till it becomes more firm and able to bear the injuries of the Air. For then the spirit ceasing and failing, which breaks out with the fruit, and in the act of Generation, the flower falls off. Howbeit all Plants do not blossom, nor do all that blossom bear fruit. Now the flowers are compounded of divers parts: For they consist of very thin Leaves, severally colored, shaped, and ranked in several Plants. Then is the Cup wherein the little Leaves are planted as in their basis, and wherein they are shut as in a case. There are also threads or hairs, such as the yellow in Lillies and Roses; finally, there are the small stalks by which the flowers hang.

*the Cup.*

*Fruit.*

Finally, there is the Fruit, by which word we sometimes understand the seed; sometimes beside the seed, the flesh with the seed is after a special manner termed Fruit. For the seed is either contained in Cods, as that of beans and pease; or in Cases; or in the pulp of the fruit, as in prunes, pears, cherries. Now the Greeks term that same flesh or substance which compasses the seed, *Pericarpium*. And of these parts do Plants consist, and some have all these parts, others not. And some have only one of them, others more. The whole substance of a Puckist is well-near all Root. Contrarywise some have no Root, as Mistle which is sustained and nourished by the Root of another Plant. Also Toad-stools have commonly no Root. A Rush hath no branches; Dodder no Leaves; the Fig-tree no flower; the Orice flower no fruit; Maiden-hair neither flower nor fruit.

Besides these parts, some Plants also have others, which grow out of an excrementious humor. Such is the moss of old Trees, the little sponges on Dogs-bryar, and other excrescences on other Trees.

#### Chap. 4. Of the Differences of Plants.

*the divi-*  
*sion of*  
*Plants.*

**N**OW Plants are divided into four kinds: *Dendron*, a Tree; *Tbamnos* a Shrub; *Phruganon* a Bush, (which *Gaza* calls *Suffrutex*, though *Scaliger* like not that word, *Exercit.* 139.) and *Botane* an Herb. Now how these kinds differ, is not so manifest. They are commonly distinguished by their Trunk, and their continuance: but *Scaliger* likes not this kind of Division, *Exercit.* 389. For also Harts-tongue lasts all the year without any Trunk. And Lettice and Coleworts have a kind of trunk, which are Herbs. He therefore both in the place alleadged, and in his 1. de *Plantis*, thus distinguishes them: An Herb sends from the Root Leaves, besides those two common to all, which presently issue out of the pulp of the seed changed; and in process of time a stalk, though some never have any. But in a Tree and bushy shrub these Leaves do not first come forth, but in the first place a stalk, and that one, or many; if one, either it is a great one, and that is a Tree; or a little one, and that is a shrub; or if many, then it is a bush: and it is the property of a Tree not to die and come up again; but shrubs and bushes do some continue as trees, and others die and come up again, as Herbs. Thus then a tree and a shrub agree, That each hath a single trunk. But they differ in greatness, and sometimes in yearly dying. A bush differs from a tree in smallness, and therein it agrees with a shrub; but it differs from both in the multiplicity of its stems or trunks. There is no need it should last all the year, no more than that a shrub should. An Herb agrees with a shrub in the single-ness

ness of its stem, as the Colewort; sometimes with a bush, in the multitude of its stems, as Fennel; sometimes with neither, by having no stalk.

But Scaliger seems not to have perfectly explained the whole Business; and especially there is a doubt concerning the Shrub, which he will have to be single stemmed, because he held that the shrub had but a single stem: whereas others attribute a manifold stem to the shrub, and they say that is a shrub which amongst wooden Plants is of smallest height and thickness, such as Rue, Sage, Hyssop, Marsh-mallows.

In searching out the Universal Nature of Plants, we must diligently enquire into their differences: which are indeed very many, so that it is hard to omit nothing, and in the mean while, not to produce things unprofitable and superfluous. Now these differences are taken from their Original, Native place, internal form, external figure and matter. Now since the internal forms lie hid, nor are known to the sense, they must be known from the virtues and qualities which proceed from them.

And first from the manner of propagation, which is manifold. For, first of all, some Plants spring of their own accord, in such places as are far from the resort of men, and are not capable of tillage. For the Earth hath in it the hidden seeds of Plants, from the beginning of the world, inserted therein by the Divine Benediction, and she sends them forth out of her bosom; or she receives seeds brought from elsewhere by Winds and Rains, and other means, and cherishes them in her lap; which manner notwithstanding does appertain to that which follows. For in the second place, some Plants spring from others. For first some Plants are propagated by seed; some by roots, bulbs, boughs and branches, and some are propagated by one of these, others by more: some spring from seed alone, as Smallage, Marjoram, Henbane; others hardly or never of seed, as the Fig-tree; others late, as the Peony; others of a Root alone, as the Hop, and Acorus; others of seed and branches, as the Rosemary. And the way of propagation by branches is again threefold; For either the branch or bough plucked off, is simply stuck in the Earth, and so the Willow and Rosemary are propagated; or the branch is inserted into another trunk, which is called Grafting; or when the Suckers which arise from the Root are pulled away. Or when a branch near the Root hath its lower half covered with Earth, the upper part remaining free. For then that branch sends out Roots into the Earth: which being done, a year or two after that branch is cut off from the Tree, and becomes a peculiar Plant: or of one Plant many are made. So the Dressers of Vineyards are wont to wean their Vines.

Moreover, Some Plants grow in moist places; others in dry. Those which grow in moist places, grow either in the water itself, or near the water, as on the banks, or upon Walls and Rocks, and other places, which are moistened by the appulse, or sprinkling, or vapor of the waters, as Liver-wort and Maiden-hair. Those which grow in the waters, grow either on the top, as Duck-weed, or from Roots. Also some never mount above the water, as the kinds of *Alga*, Sea-weed, or Ore-wood; others spring above the water, as *Aquapium*. Again, some grow in Brooks, others in Fountains, others in Ponds, Pools, and Lakes; some grow in the Sea, others in other places where water hath been, but now is not, as *Xanthium*, or Ditch-bur. Again, Land Plants do grow some on Mountains, Hills, Rocks, Walls, House-sides, upon hedges, in fields, meadows, Vineyards, Woods: others in plain places, earthy, gravelly, sandy, or clayish.

To the Native place also belongs this consideration, that some Plants are instead of ground to others which grow upon them, as to Moss and Mistle which grows upon the Oak, the Holm, the Pear-tree, the Hazel, the Linden, the Birch, the Apple-tree, the Plum-tree, the Fir, the Pine, the Elder, and Chestnut-tree.

Most indeed of the Ancients were of Opinion, That the Thrush having eaten Mistle-berries, the pulp being digested, the seed was cast out with the dung, and falling upon such Trees as the Thrush used to sit upon, from that a new Plant of Mistle sprung upon the said trees. But this conceit is not agreeable to Reason: For it is not probable, that the seed can so cleave the barks and pierce into the hard wood of a tree. And why should it not grow upon many more trees on which those birds nestle, as well as on the foresaid? Nor hath there ever any seed been found in the maws of Thrushes that have fed upon Mistle-berries. Most likely therefore it is, That Mistle is like the horns which spring out of the bones of Animals, and that the principles of Mistle, in a juice Natural thereunto, being cherished by the internal heat, and assisted by the heat external, do grow together into this Plant.

Moreover, some Plants grow most speedily and attain their perfection, others very

slowly; so that this difference is manifest in the Alder, Willow, Peach, Pitch-tree, and Oak.

Again, some last all the year, as Trees and Capillary Herbs; some continue not. And of these some die and grow no more, as Wheat, Barley; others grow again, as Gentian. And of these some last all the year, as Agrimony; and some perish within the compass of a year in several manners. For some last one month, others three months; some two years, others three, and others four. Again, some are perpetually green, as the Fir, the Box; in others their Leaves fall off, and grow again.

Moreover, some are fruitful, others barren; some bear flowers only, others both flowers and fruit; and some only once in their life, others often; and that either yearly, or every other year: and some flower in their first year; others in the second, third, and some not till their fourth year.

Also in their figure and other qualities partly arising from their forms, there is a great diversity. For some are straight, others crooked, round, cornered, Turbant-fashioned, hollow, solid, prickly, without any knot. They differ in substance, which is spongy, compact, soft, hard, thick, thin, fat, clammy. Some are temperate, others hot, cold, moist, dry; some are smooth, others rough, thorny, hairy, downy. The taste of some is sweet, of others bitter, biting, salt, harsh, sour; others are void of taste. Also some Plants have taste in all their parts, others in some only. Some have no smell, others have a strong smell, others a sweet; some a vehement smell, others a weak; some smell totally, others only in some part.

There is no less variety in their colors. For though all Plants are green; yet some are more, others less green; some are of a light, others of a deep green; in some there is a whitish greenness, in others a yellowish, in some a reddish; some are spotted, and others have no spots.

Moreover, there is a great difference of Plants in respect of the parts whereof they consist. For the juice wherewith they are nourished, and which answers to the blood in Living creatures, represents water in some, milk in others, as in Spurge; in some it hath a Saffron dye, as in great Celandine; in others it represents Oyl: and therefore it differs much in color and taste. Also some juice is wholesome, another purging, another venomous.

Again, The Fibres in some Plants are straight, in others oblique, small, thick, soft, hard. The flesh is in some thick, compact; in others spongy, tasteless; also it is of different smell and color in different Plants. The Bark is fleshy, nervous, clammy, in color, taste, smell, much different: And the same differences we find in the Wood. The Matrix or Marrow, is in some solid, in others spongy.

Also there is a great difference of the Roots of Plants. You have a Root great, small, long, short, continued, cut off; round like a Globe; single and manifold; fibrous; collected, spreading; deep, shallow; thick, thin; soft, hard; stiff, limber; crisped, even; straight, bending; compact, spongy; fleshy, barkish, woody; round, turbant fashioned; single, double; hairy, smooth; rough, glib; mossie, juicy, dry; consisting of scales, uniform; crumbly, soluble, boylable, esculent; heavy, light; white, yellowish, red, black; sweet smelling, stinking; bitter, sweet. A great Root bears a great Plant; a little Root, a little Plant; a great Root bears a small Plant, as in a Turnep; a little Root a great Plant, as in a Pine-tree: as *Jul. Cesar Scaliger* hath collected, and digested these differences, in *1. de Plantis*.

The stems do arise some before the Leaves, others with the Leaves, in some they are perpetual, in others annual; in some straight, crooked, trailing on the ground, growing upright, thick, thin, solid, hollow, knotty, without knots, woody, herby, round, four square, three cornered, nervous, streaked, smooth, rough.

The variety of Leaves is thus digested by *Jul. Caf. Scaliger*, in *1. de Plantis*. In respect of shape: there are round Leaves, as in Penny-wort, or Two-penny grats; almost round, as in Bindweed, small Celandine, Asarabacca; oblong in Hyssop; plain in the greatest part of Plants; round and long in Stone-crop; with a continued edge in the Birthworts; with a crested edge in the Lawrel; a Saw-fashioned edge in the Elm; blunt teeth in Scordium; large toothed in the two Cichories; full of bendings in the third kind of Cichory, which they call Monks-head; forked in the *Caucalis* or bastard Parsley; fingered in Ellebore and Wolfs-bane, lobed in Fern, hair-like in Fennel. In respect of their Surface, they are rough, biting, sharp pointed, in Borrage, Nettles, Artichoaks; they are prickly either by reason of their kind, and that continually, as the But-Thistle; or by age in a kind, as the  
Sow

Sow-Thistle. Some have for Leaves real Thorns, as the *Corruda* or wild Asparagus; some as it were Thorns or Prickles, as the Juniper. Many have thin leave, Purslane have thick. The Leaves of most Plants hang on by a smal stalk, which is streight or crooked, long or short. Some have no stalks, as the Lilly. Also from the places of the Plant; from the root, from the stem, from the branches; on the top; on the bottom. The Flower-de-luce hath sharp-pointed Leavs, most Plants have them blunt. In respect of Quantity: they are great, little, broad, narrow; single, manifold, In point of relation and scituation, some grow thick and close together, some grow thin and far asunder. In respect of colour; they are all in a manner green, but with a various greenness; some few are pale-green, as a sort of Orach; some red as another sort of Orach and Beets. Also some naturally die by sickness in the Autumn, as the Bramble, the Vine, the Apple-tree. In point of scituation; some stand bolt upright, others hang down, some are saddle-shap'd, crooked, crisped, rouled together, hollowed as the Lettuce; streaked, nerved, veined, with bending Gutters. And what hath been omitted in the former differences; as the soft, hard, leatherish, limber, brittle, shining, dull, woolly, hairy, smelling sweet, acid, bitter, salt, sweet, harsh, tasteless, continued, with holes bored through, or holes as it were, as in St. Johns-wort. Also the dispositions of trembling, of falling, of abiding, and turning according to the Sun. Also of order; some are set in a confused manner, others are orderly placed; some alternatively do cloath the branch at equal distances, some are set just one against another, whether they be two, three, or four, compassing the branch like a Crown. Some breed one Leaf upon another.

Flowers do some of them come out before the Leaves, as in the Peach; others after the Leaves; some come out the first year with the Plants, others the second or third year, and some later. Also in respect of the time of the year, there is great variety. For some flower in the Winter, as black Hellebore; some at the beginning, others at the end of the Spring, some in the Summer: and some flower once a year, others twice, others thrice. Also the scituation and place from whence Flowers grow, is not the same: for the most part, they grow out of the stock, the branch or twigs; yet sometimes from the Roots. And some flowers stick on the smal stalks, and those either long or short; Some come out of one Cup, others out of divers Cups; some come out like clusters of Grapes, others like ears of Corn, others in a round tuft, on some there are more flowers, on others fewer, and some of them have many, some few leaves. Some Flowers are fertile, others barren, and these do some of them compass the fruit, others are seated therein. Also there is a great difference in the falling off of the Flowers, some fall off more slowly, others go away in Down, some are contracted, others dried.

The same variety is in the colors, odors, taste, and shape, all which can scarce be perfectly set down.

Finally, The same variety is to be seen in the Seeds, and Fruits. For some Plants bear fruit, others not, as Harts-tongue. Of those which bear fruit, some bear much, others little; some once every year, some twice, others thrice; again some bear fruit only once in three years. Some bear fruit early, others late; the Mulberry Tree flowers late, its fruit comes suddenly to perfection; contrariwise the Peach-Tree soon flowers, but is long ere it bear fruit. Again some flower late, and bring forth late fruit. Some have fruit and no flower, as the Fig-Tree; some have flowers without fruit, as the Flower-de-luce; but for the most part the fruits come out of the flowers. Some have fruit of only one kind, others of divers kinds, as the Oak. Some produce fruit from their root and stem, some at their boughs, others on the boughs under the leaves, on the leaves, above the leaves; and the fruit sticks upright, or dangles, or sticks fast, or sits, or cleaves, with a stalk, without a stalk, single, double, one, divers, thick together, here and there, far asunder, rare.

The Seeds grow, some of them naked, others are shut up in some other substance. And some are contained in some humor, others in a shel or bone, others in an hollow bag, and sometimes in one fruit one seed, and sometimes many, either ranked in order, or without order. There is no less diversity in their figures; some are round, others oblong, some represent one thing, some another. In the bags or cods wherein the feeds are contained there is the like Variety. For some of the Cods may be eaten, but the grain not, as the Ceratia or Careb fruit. Of some the pulp only is esculent, as the Cassia: some cods are not at all esculent, as of Bean, Lupines, horned Poppy; some boyled are all eaten cod and fruit, as french Beans: of some only the Surface is eaten, the skin being left, as of Pease and the Pigeons-Vetch. Also from the figure there is much difference: also from the substance of the Grains, their magnitude, figure, number, marrow, bark, color, scituation, Scaliger in 1.

*de Plantis.* In fruits also, the Rind wherewith they are covered, is thin or thick, hard, boney, woody, smooth, rough; and al fruits are covered with flesh, skin, or shel. And with it they are either totally covered, or half covered, and that not after one manner. For an Acorn is covered in one manner, an Hazel Nut after another manner. Also there is great diversity of tast in fruits; yea and in one part there is one fruit, in another another. Also some fruits may be eaten, others not; and in some that which is to be eaten is within, as in Almonds; in others both the kernel may be eaten, and the pulp which doth compass the same.

Now to illustrate these differences of Plants with examples would be too tedious. This as it hath been done by others; so *Andreas Matthiolus* a most learned Herbalist, in his *Preface upon Dioscorides*, hath both collected all this variety, and shewed how Plants differ in their native place, their roots, stalks, flowers, feeds, and fruits.

### Chap. 5. Concerning the History of Plants.

FORasmuch as that which *Jul. Caf. Scaliger* writes in his *Exercit.* 104. sect. 6. *To collect out of Books such things as have been delivered by the ancients is very dangerous: the true knowledg of things is learnt of the things themselves;* is both true in other things and most true in the Doctrine of Plants: they that would gain the knowledg of Plants must of necessity know the Plants themselves. And although in this Age of ours, the Art of Printing hath afforded great helps to this Intent; seeing not only the History of Plants hath been described and published by many, but also the Plants have been delineated, and painted out with elegant pictures, by many learned men, especially *Tragus, Matthiolus, Fuchsius, Dalechampius, Pena, Lobelius, Dodonæus, Clusius, Taberno-montanus, Bauhinus* and others; by which it is much easier to know the Plants than by their descriptions alone: nevertheless Plants are best of all known by view of the Eye-sight.

And seeing in this place it is impossible, by way of compendium to reckon up al plants, much more impossible to describe the same; and that yet it is very profitable to the knowledg of Plants, to have the knowledg of certain general heads, to which al Plants may be reduced; I have thought good in this place to propound certain Tribes, and a method as it were of Herbarisme, with the names of the principal, and the virtues of such as are most in use. For though I know some have been extremely solicitous, laboring to reduce all to Dichotomies: yet how unhappily they have acquit themselves therein, the success doth shew. And therefore I have chose herein rather to imitate *Lobel* and others, who have distributed some Plants at least into certain Tribes. It wil be easie for any man to fetch the petty divisions and enumerations from the foresaid Authors, and there to see their Pictures and Descriptions. Only this I shal hint by the way, that many are indeed superstitious in reckoning up abundance of names and differences of Plants; but very short and bare in seeking out their virtues. It is better in my opinion, to know fewer Plants, and to understand their virtues withal, than to be able to reckon up the names of abundance, which many illiterate Gardeners are able to do; and to be quite ignorant of their faculties and Qualities.

#### Tribe I. Mushrumps and Toad-stoals.

Since Nature, yea rather God himself the Author of Nature, contrives and works nothing without order; and that order is also most clearly to be teen in Plants; therefore I think fit to begin with Mushrumps, and Puck-sifts, which are as it were the Rudiments of Plants. Puck-sifts grow within the Earth, without any stalk, leaf, fibre or thred. Mushrumps do some grow out of the Earth, others upon the stocks of Trees. Those which grow out of the Earth, are some of them soon ripe, in April: others come late, in Autumn; among which there is great difference, from their shape, color, and other Qualities; and some are fit to be eaten, others are venomous. The several kinds have in sundry nations their peculiar names. There is also a peculiar sort, round like a ball, sticking to the ground without any stalk, whitish in color, which being dry becomes poudery: it dries without any biting, and is therefore used to heal places where the Skin is galled off, and by Surgeons to stop Blood.

*Agarick.*

Among Mushrumps that grow on Trees, the most noble is *Agarick*, which is white, spungy, sweetish in tast, especially that which grows upon the Larch-Tree. It is very well known

known to Physicians, for purging cold and flegmatick humors. Touch-wood, well known for its use as tinder in striking fire, doth also grow on Trees. *St. Maries* Bals so called, or *Halcyonium*, is a kind of Toad-stool, also the Seaspunge. Touch-wood.

### Tribe II. Mosses and Mossie Plants.

Moreover amongst the Rudiments of Plants are also the Mosses and certain mossie herbs: amongst the which notwithstanding some perfect Herbs are reckoned. Now Moss is an hairy substance sticking to the stocks of old Trees, upon the ground, and on stones, also swimming upon the water. And there is, I. Earth-moss, which they call *Lycopodium*, Wolfs-claw, of three sorts, the greatest, middlemost, and smallest. II. Hitherto appertain certain creeping herbs, as hairy Moss, Golden Maiden-hair, and *Ros Solis*. III. The common Moss of Trees, and Broad-leav'd Moss or Lungwort, which heals the Ulcers of the Lungs. IV. *Lichen* Liver-wort, which grows to Stones, in dark and moist places. The Apothecaries call it *Hepatica*, others call it *Hepatica Petraea*, Stone Liver-wort, because it is good against inflammations of the Liver and Feavers proceeding from Choler. For it is cold and dry and a little astringent; whence it stops bleeding, and resists inflammations of the mouth. V. Sea-Moss, of which there are many sorts. VI. *Corallina* which is also a Sea-Moss, having a drying and astringent faculty, and kills Worms and drives them out the same day, to admiration. VII. *Fucus Marinus*, Seaweed: of which there are also some kinds; among which is the Sea-Oak so called. VIII. Hither may be referred the common Maiden-hair of the Shops, because of the likeness it hath in its stalks to capillary Mosses: appropriated chiefly to the Breast and Lungs, whose gross humors it extenuates: also it breaks the Stone. IX. Wall-Rue, or white Maiden-hair, growing in moist places, and on old Walls; like in faculty to the black and vulgar Maiden-hair aforesaid. X. In this Tribe may be reckoned Duck-weed, which is as it were a Moss, swimming on the top of standing waters: it cools and represses Inflammation. Corallina.  
Maiden-hair.  
Wall-Rue.  
Duckweed

### Tribe III. Grasses.

In the third Tribe we rank Grasses, among which the first is the vulgar meadow Grass, with long, white, knotted and sweet roots, the decoction whereof is good for the Kidneys and Bladder, and opens their obstructions, and the obstructions of the Liver: it kills Worms also.

There are sundry sorts of Grass; Wood-Grass, Cat-tail-Grass, Cypress-Grass, Knot-Grass, Dog-Grass, Painted-Grass, Sorgh-Grass, Millet-Grass, Canary-Grass, Stanch-blood-Grass, Manna-Grass, Esculent-Grass, shining-Grass, Oat-Grass, Fox-Grass, Wild-Chamomel-Grass, Corn-Grass, Bulbous-Grass, Reed-Grass, Grass of *Parnassus*, Water-Grass, River-Grass, Rush-Grass, Panick-Grass, Sea-Grass, Flowry-Grass, Woolly-Grass, Hares-Grass, Broom-Grass, Grass-nobone, Clove-Grass, or Gilloflower Grass, Mous-tail, Spider-Grass, Sword-Grass or Sedg.

### Tribe IV. Reedy Plants.

The fourth Tribe contains Reeds and reedy Plants. *Arundo*, a Reed, which the Greeks call *Calamos*, contains many sorts. For there is in the first place the vulgar smal reed, which is call'd *Phragmites*, good to thatch Houses and to fence Gardens; after that is the solid or ful Reed, which is not hollow, called *Nastos*, of which Darts are made. There is also the pipe Reed, the *Donax* or *Cyprian* Reed, the broad-leav'd Indian Reed or Cane. Also to the family of Reeds belongs the Water Cat-tail.

Among Reeds the most excellent are the *Calamus aromaticus* or spicy Reed, and the Sugar Cane. For though at this day Apothecaries use the root of the Tree *Acorus* in stead of *Calamus aromaticus*: yet that is not the *Calamus* of the Ancients, which was not a Root, but a reedy hollow Cane in *Syria* neer *Mount Lebanon*, and in *Arabia* and *India*; Which Reed though hitherto it hath been almost out of knowledg; yet it is now come to light again; and is every where to be had at the Apothecaries. It heats and dries, is gently astringent, a little biting, and by tenuity of its parts opens the passages of the Body, moves the Courses, and refreshes the spirits. Calamus  
Aromaticus.

Moreover, The Sugar Reed, or Sugar-Cane, is spongy and ful of pith, and within ful of a most sweet juyce, which either drops out of the Trunk being cut, or it is drawn out of the The Sugar  
Cane or  
pith Reed.

pith by boyling, which boyling is continued til the liquor congeal into Sugar, resembling Salt.

To this Tribe may be referred the several sorts of Flower de-luce, which differ chiefly in the colour of the flowers, and have their name from the Rain-bow which they represent in their patty-coloured flowers. There are two sorts especially now in use; the one is the vulgar which hath a blew flower, whose Root, especially the juyce pressed thereout, doth powerfully purge the water from such as have the Dropsie. To which belongs the smal thin-leav'd Flower-de-luce, also the Chamæiris or ground Flower-deluce. The other hath a white Flower & Root which smells like a Violet, and therefore the Germans call it *Viol-wortel* or Violet Root: it hath a spicy faculty, heats and extenuates, and is good for the Heart and Brain, but especially for Chest. There are also the *Dalmatian*, *Chalcedonian*, double flowered, and *Portugal* Flowers-de-luces &c. To this family belongs also the *Spatula fetida*, *Xiris* or stinking Gladon, having a stalk and leaves like the Flower-de-luce, but blacker and stinking, its flowers also are alike but lesser and of an obscure purple colour. Also the wild yellow Flower-de-luce. Nor is the Water-gladon with purple flowers to be shut out of this Tribe, though by others referred to the following Tribe. Some call it *Fungus floridus*, and *Gramen arundinaceum*; *Dodoneus* terms it *Platanaria*, and *Matthiolus* *Sparganium*.

The *Acorus verus*.

The *Acorus* also or *Acorum* belongs to this Tribe, which the Shops very erroneously do call *Calamus Aromaticus*. And this is the true *Acorus*, in stead whereof the Apothecaries do sometimes badly make use of the bastard yellow Flower-de-luce, whereas their faculties are far different: for the bastard Orice is void of smell, cools and binds: but the true *Acorus* is of a spicy smell and taste, heats and dries, moves Urine, is good for Gripings in the Guts, and for pains of the Sides, Chest, and Liver. Also the *Cyperus*, long and round, and the bastard *Cyperus*. Now the roots of *Cyperus* do heat and dry, and are a little astringent, and therefore good to bring moist Ulcers to a Scar: Also they have a cutting faculty, and therefore are good for such as have the Stone, cannot Piss freely, and want their monthly Courses. Also Galangal the greater and lesser sort, which heats, and helps all cold Diseases caused by flegm, discusses Wind, and helps the Cholick. But the smaller sort is more effectual than the other. Some also refer to this Tribe *Costus*, *Zedoary*, and *Ginger*.

*Cyperus*.

#### Tribe V. Rushes.

To the reedy Plants aforesaid, Rushes are neereft of kin, and therefore they make up the fifth Tribe. Now they are all void of Leaves, and instead of Leaves have long round stalks, void of knots, and ending with sharp points. There are sundry even, short knotted Rushes which grow in the waters and watry places. *Schenanthum* is the flower of a certain odoriferous Rush. *Spartum* seems to belong to this Tribe. Also some refer the sorts of *Equisetum* or Hors-tail to this family: which have indeed thin rushy Leaves growing about the Joynts, but knots withal. To the sorts of Hors-tail also pertains the female Knot-Grass which grows in moist places, and by Brooks and Rivers. Also *Asparagus* is reckoned amongst these; which word in general signifies the tender stalk of any Plant when it first springs up: but it signifies more peculiarly a Plant that sends forth such young stalks fit to be eaten. It is Garden or Wild; and of the Wild there are certain sorts.

*Asparagus*

#### Tribe VI. Bulbous and Taberous Plants.

Seeing among Bulbous Plants there are many which have affinity with certain reedy and rushy ones of the two former Tribes; therefore we marshal the Bulbous Plants in this sixth Tribe next to them; specially because there are some Bulbous Plants, one sort whereof is only bulbous; the rest agreeing with other Rushes even in the Root. Now a Bulbous (whence this Tribe is termed) is a certain kind of Root short and round, and consisting of many Skins or Scales one within another, as you see in an Onion. The first of these is the *Asphodelus bulbosus* Galeni, Galen his Daffodil with a bulbous root. And then there are other Daffodils, whose roots are not really bulbous, but long-round, somewhat like to Acorns, and of those also there are many sorts. I. There is one with a white flower, and that is greater or lesser, which in stead of Roots hath many thick fibres. II. There is also a white-flowered bulbous Plant called *Ornithogalum* Birds-milk, and Yellow Birds-milk, or *Ornithogalum of Narbon*. III. There are three or more sorts of a Bulbous Flower-de-luce. IV. Single



gle Gladen, bearing flowers on both sides. V. *Sisyrinchium*, the greater and lesser. VI. Sundry sorts of Hyacinths or Crows-toes, for there is an oriental one greater and lesser; there is the *Botroides* of two kinds; the hairy, the autumnal greater and lesser. VII. *Narcissus*, the Water Daffodil, of which there are many sorts; one purple in the middle; another yellow in the middle; and that is not of one kind, there being one all white and double, another Rush-leav'd, greater and less; a wild yellow one greater and lesser, and the Sea *Narcissus*. VIII. The Bulbous Stock Gilloflower, that with three leaves, and that with four, that with many leaves, and that of Autumn. IX. Sundry sorts of Tulips. X. the Wool-bearing Bulbous, and the *Flos Tigridis*. XI. Sundry sorts of Lillies, the White, the Purple, the Blood-red, of which there are some sorts. The *Hemorrhocallis* or wild Lilly which lasts but a day; the *Martagum*, the Crown Imperial. Now though there are sundry sorts of Lillies: yet the white Lilly is more used than any of the rest, which hath a rare virtue to soften hard swellings and ripen them, and to take away obstructions; of the flowers of this Lilly a neat Oyl is made, which asswages pain. XII. *Fritillaria*. XIII. *Colchicum*, Meadow Saffron, which most call *Ephemeron*; and which have wrongfully used in stead of *Hemodactilis*. Now there are two sorts of this *Colchicum*, *Ephemeron* or Meadow-Saffron; the first is of a strangling nature, & wil choak a man to death; the other strangles not and is properly called Meadow-Saffron: but the true *Hemodactilis* differs from them both. XIV. The Lilly which is not bulbous, call'd the Lilly convally, or the One-leav'd Lilly. XV. The true Saffron, whose flowers which are in use are hot and dry, doth recreate the Spirits and strengthen the Heart, breed cheerfulness, make all the Senses quick, cure the obstruction of the Liver and the Jaundice, move the Courses, provoke Urine, and incite to Generation; yet too much thereof is hurtful. There is a wild Saffron, a Spring Saffron of several sorts, and an Autumn Saffron. XVI. The Squil or Sea-Onion, which hath a rare cutting faculty, and is therefore commended against cold Diseases of the Brain and Nerve. XVII. *Panorarium*, a Sea-Onion so called, hath affinity with the Squil. XVIII. *Moly*, Ladies-Cushion, or Sea-Grass, the Narrow-leav'd, Broad-leav'd, and the Indian. XIX. The several sorts of Onions and Leeks, to which pertain the Rush-Leek, the Vineyard-Leek; Garden Garlick, and sundry sorts of wild Garlick, as the narrow-leav'd, broadleav'd or Bears-foot-Garlick, and that of the Alpes. XX. Many kinds of the Orchis, Gander-Goose or Dog-stone, which have sundry names from their shapes. XXI. Sundry sorts of *Palma Christi* & *Satyrium* or Ladies-Traces, *Stander-Grass*. Of which one kind is now in use, whose Roots are kept in the Shops, preserved in Sugar, and being of a temper hot and moist, are thought to be very good for Persons in a Consumption, and strongly to provoke to Generation. XXII. To this Tribe is referred and reckoned for an *Orchis* the *Bifolium* or Tway-blade, which most do call *Opbris*; which is also of two kinds.

The white Lilly.

Saffron.

The Squil.

Ladies Traces.

Tway-blade.

Tribe VII. *Corns and Pulses.*

To the seventh Tribe we may refer *Corns and Pulses*: amongst which *Wheat* is Captain, after which comes *Zea*, *Zeopyron*, *Secale*, or *Rogga Rye*, *Barley*, *Oats*, *Turkish Wheat*, viz. all such Grains of which Bread is made. But *Legumina Cerealea*, *Pulses*, *Galen* tells us are such as of which bread is not made: as *Rice*, *Miler*, *Panick*, *Beech-Corn*; though some count these *Corns* and reckon none for *Pulses* but such as are pulled up by hand. Amongst which nevertheless Authors reckon many things which are food only for Beasts, and not for men, whose seed is in dayly use; such as are *Beans*, *French Beans*, sundry sorts of *Pease* and *Hastifers*, *Vetches*, and *Tares*; of which many sorts, *Wild and Garden*; *Lentiles*, *Erets*, *Lupines*, *Sefamus*.

To which family may be reduced such Plants as have some affinity to these, or which are bastard and corrupted *Corns and Pulses*, some of which notwithstanding are used for Food, such as are the *Fox-tail*, *Wild and Garden-Flax*, *Hemp*, (which others refer to the *Trefoils* or *three-leav'd Plants*) *Garden and Wild*; *Fænugreek* *Garden and wild*; *Hedysarum*, *Securidaca*, and *Horf-shoo*; *Galega*, *Goats-Rue* or *Cocks-comb*, which is of great efficacy against the *Plague*; *Onobrychis*, *Earth-Acorns*, *Astragalus*, *Anthyllis leguminosa*, *Stella leguminosa* of *Lobelius*, *Birds-foot*, *Aphace*, several sorts of *Wild Vetches*, *Sea-Wheat*, *Bramos* *Wild Oats*, *Cow Wheat*, *Smucted Corn*, *Orobanche* and *Anblatum* of *Cordus*, *Tribulus terrestris* or *Caltrop*. Some refer to this place *Cassutha* or *Dodder*, which removes obstructions of the *Liver and Spleen*, helps the *Jaundice*, moves *Urine*, and is good against *Diseases* springing from *Choler* and *Melancholy* also the *Leguminous Capar* is referred to this-Tribe.

Galega

Tribe VIII. *Trefoyls, Cinque-foyls, and Herbs of that Family.*

In the first place, there are many kinds of Trefoyls, or three-leav'd Plants: Meadow-Trefoyl or Clover, shrubby Trefoyl, codded Trefoyl, American Trefoyl, Heart-fashion'd, spoon-fashion'd, horn-fashion'd, odoriferous Trefoyl, or Melilot. Also all the sorts of *Lotus* and *Melilotus*, *Cytisus* and bastard *Cytisus*, the *Medica*, the sorts of *Zapogus*, four Trefoyl or Wood-sorrel, which *Pliny* calls *Oxys*, Golden Trefoyl, or Golden Liver-wort, Marsh Trefoyl.

Also there are sundry sorts of Cinquefoyls or Five-leaved Herbs: The great, the less, the Ash-colored, the creeping, the marriish or berry-bearing Cinquefoyl. Whereunto be-  
*Tormentil.* longs Tormentil, the Root whereof resists putrefaction, is good against the plague, and moves sweat; it stops the bellies looseness, flux of blood, and the Courses. Also 'tis good for such as are fallen from on high, and who are suspected to have received some inward hurt. Moreover, there are other Plants also, which have commonly two Leaves opposite one to another, not unlike the sorts last reckoned, but at the end of the branches they resemble Trefoyls, and may be reckoned in this Family. Such are *Anonis* or *Ononis*, Rest-harrow, the bark of whose Root moves urine, and breaks the stone: Strawberry Leaves,  
*Liquoris.* wild and Garden Liquoris, whose Root makes the wind-pipe smooth, is good for the Chest and Liver, quenches thirst; cures the scabbiness of the bladder, and pain of the kidneys;  
*Broom,* Broom, petty Broom. Now the seeds of Broom have a faculty to loosen the belly, provoke urine, and break the stone both in the Reins and bladder. Hence a Conserve made of the flowers thereof is very good to remove obstructions of the Liver and Spleen. *Hypericum*,  
*St. Johns-wort* St. Johns-wort: of it an Oyl is made, most effectual to heal wounds. Also this Herb hath the faculty to provoke Urine and the Courses.

*Centory.* Centory the Lesser, which being beaten green, and laid on, cures wounds, and purges ulcers. It is exceeding bitter, and therefore 'tis called the Gall of the Earth, and cures Feavers, and hath its name thence in the German Tongue; it kills worms. *Flos Solis*, the flower of the Sun, like to *Cistus* and *Ledus*.

*Sena.* Sena, which is now known sufficiently not only to all Physicians, but even to the common people. For it hath a rare faculty to open, digest, cleanse, gently purge, and also wonderfully to comfort and strengthen all the members of the whole body; so that it is a purge for all Sexes, and for all long and melancholick Diseases most convenient.

*Rue* Rue hath no small affinity with some Herbs of this Tribe already mentioned, both the wild and garden Rue, which is hot and dry, of subtile parts, discusses wind, cuts thick and clammy humors; and consequently cures shortness of breath and a cough proceeding of a cold cause; it moves Urine and Courses, and takes away the Appetite to Generation: among the wild sorts is reckoned also *Hermala*.

*Fumitory* Not must we in this place omit Fumitory, which is hot, though accidentally by purging choler it cools, and therefore is by some said to be cooling, though falsely; it opens, and frees the Liver and Spleen from obstructions, purifies the blood, and provokes urine. And therefore it cures Feavers, and all Diseases springing from adust humors; and is most effectual and safe in curing the itch, and other diseases of the skin; since in the mean while it strengthens the Liver, stomach, and other bowels. Hither also must we refer *Tbaliëtrum* or *Tbaliëtrum*, Fluxwort, the greater and lesser. Finally, hitherto belongs Madder, to which *Chivers*, *Mollugo*, Ladies Bedstraw, sweet Wood-ruel, and other sorts thereof do retain; *Cruciata*, Cross-wary, Gentian.

Tribe IX. *Anemonies, Crowfoots, Cranes-bills.*

Next to the foregoing Tribe, we fitly rank Anemonies, Crowfoots, and Cranes-bills. There are many sorts of Anemonies, differing in Leaves, Roots, and Flowers. There is a tuberous sort; one with many Flowers; one that hath three Leaves. Hither some refer the Flower of Adonis, as also *Dentaria alabastrites*, or *Viola dentaria* & *pulsatilla*. To these also may be reckoned the greater and lesser hollow Root, which some wrongfully use for Round Birthwort Root.

Moreover, There are also many Crows-foots; some sorts of Garden Crow-foots; and divers wild ones. There is the simple tuberous Crowfoot, and that with the many flowers, the Grassie Crowfoot, the Illyrian, the Alpine, the greater and lesser Spear-crowfoot. In this Family may be reckoned Wolf-bane the greater and lesser yellow; also the little purple and blew one; also the *Napellus* and *Anthora*. Thirdly,

Thirdly, There are many sorts of Cranes-bills; the tuberous, Herb Robert, the musked or muscovy, the Cretick, Doves-foot, Cranes-bill, *Geranium supinum*, Frog-like, Mountainous, &c.

Tribe X. *Gilloflowers, Rose-Campions, Violets, and the kinds of Loose-strife, and certain allied Plants.*

Gilloflowers, which some call *Betonica* or *Vetonica*, and *Flores tunicis*, are of sundry <sup>Gilloflowers</sup> sorts, differing both in the color and figure of the Flowers, and other waies. There is the great and the little, the single and double, the white and purple; also the feathered, wild, and proud Gilloflower. Also many sorts of Armenian flowers; among which the most remarkable is the Carthusians Gilloflower, and the *Viscaria* or Catch-fly. But among all the Garden Clove-Gilloflowers are most in use, which with the sweetness of their smel do wonderfully refresh the spirits, and are exceeding friendly to the Brain, Liver, Stomach, and Heart. Hence their Syrup is cordial, good against poysons, and the bitings of venomous Beasts, and is commended by late Writers to encrease blood, and strengthen the Liver. <sup>Clove-gilloflowers.</sup>

Nor is there less variety of *Lychnides* or Rose-Campions; for first there is *Lychnis Coronaria*, to which belongs the Flower of Constantinople, and the *Lychnis* of Chalcedon. Moreover there is a wild one with a single, and another with a double flower; a sort whereof is *Ocimum* or bastard Basil, by some so called. Hither also belongs the Herb commonly called *Papaver spumeum*. Nor is bastard Nigella a stranger to this Tribe, nor Soapwort, Gentian, and *Cruciata*, or Dwarf-Gentian.

Thirdly, In this Tribe may be Ranked the purple Violets, with the sweet flower, both <sup>Violets</sup> simple and double. These Violets are cold and moist, and the flowers are good for internal Inflammations of the Breast, and smoothe the roughness of the Throat and Wind-pipe; allay the heat of the Liver, Reins, and Bladder; mitigate the acrimony of choler, and consequently take away the heat and thirst of Feavers, and strengthen. Also there is a wild Violet without color; also three color'd Violets, or Herb of the Trinity, which we call Hearts-ease and Pansies.

Then there is the *Leucoion*, or white Violet, with a single and a double flower. Also the yellow *Leucoium*, which the Arabians call *Keiri*; whose flowers and also the seed move the courses, bring forth the Secondine and child; the Oyl made of them is good to resolve cold humors, to assuage pains, and to strengthen the Nerves.

Among these are reckoned the *Viola matronalis*, or Matrons Violet, or *Lunaria Græca*; to which the *Viola Mariana* is of kin, or the *Viola Galathiana* or *Pneumonantbe*: as also *Flos ambarvalis*, commonly called *Polygonon*: to which appertain *Cervicaria major, media, minima*.

Next come the sorts of *Digitalis*, especially differing in the color of the flowers. Yea, among these may be numbred *Aquilegia*, chiefly distinguished by the variety of flowers: <sup>Aquilegia</sup> A dram whereof in powder is given to such as have the Jaundice, to make them sweat. 'Tis commonly used to drive out the Meazles and smal Pox.

To this Tribe may be reduced *Lysimachium* or *Lysimachia*, Loof-strife, whose sorts are, the yellow, the purple; and there are many kinds thereof, some of which have the flowers upon the top of the stalk like a fore-top, or as an ear of Corn; others have them in Cods, which are therefore termed Codded Loof-strifes. There is also a sort which may be called the Shrubby Loof-strife. Among the bastard *Lysimachia's* there is reckoned a blue one. Moreover, because of the affinity of the flowers, we add both some water and marish Herbs: as Water-violets, Frogs-bit, white Water-Lilly, yellow Water-Lilly, Water Crowfoot, Water Archer, the Marish Marigold.

Tribe XI. *Other Plants remarkable for their Flowers.*

To this Tribe many and sundry Plants may be referred, among which in respect of the greatness of the Flower, *Chrysanthemum Peruvianum*, or the Flower of the Sun of Peru, may justly be Captain. In the next place Elecampane, whose Root is of great use, being good <sup>Elecampane</sup> against poysons and biting of poysonous beasts, is helpful to such as cannot fetch breath <sup>pane</sup> without sitting upright, cuts gross humors in the breast, and cures the Cough, moves Urine <sup>pane</sup> and Courses, helps the stomach and digestion.

Next come the other sorts of *Chrysanthemum* or Golden flower, which are commonly called

called *Oxen-eyes*. To which the sorts of Chamomel are allied: also *Eranthemum*, or flower of *Adonis*, which some reckon among the Anemonies, as we said before.

*Chamomel* Chamomel is frequently used in Physick: it heats, is loosning, discussive, mollifies internal and external pains. Of kin to Chamomel, and as it were a wild Chamomel, is *Comula foetida*. Also the kinds of Marigolds are to be referred to this Tribe, as also the *African Flower*: also sundry sorts of Blew-bottles: *Tragopogon* Goats-head, and *Scorzonera*.

*Nigella* To this Tribe also *Nigella* or Gith is a retainer, whose seed heats, dries, cuts, and extenuates: being smelt to frequently it dries up the distillations of the Head: taken inwardly, it discusseth winds, cuts flegm, moves the Courses, helps shortness of breath. Pellitory also.

*Tansie* Hither also are to be referred the Daisies both Garden and wild: and the *Aster atticus*, or Star-wort. Nor are the sorts of Tansies unlike in flower, as the common sweet Tansie, the crisped, the Tansie without smel, the little white Tansie. Also *Matricaria* or Feaverfew belongs to this sort, which others reckon among the Corymbiferous Plants, that bear clusters of Berries. Now Tansie is an hot and dry Herb, and bitter: it kills worms, moves Urine. Feaverfew is hot in the third, dry in the second degree: it opens, clenfes, is good for the Womb, and brings away the dead child: it cures the Tiflick, Melancholy, and the stone. Peony brings up the Rear in this kind, having a goodly Flower. The Root whereof is especially good against the Falling-sickness, and strengthens the Brain and Nerves.

#### Tribe XII. Poppy, Henbane, Nightshade, and Herbs of kin to them.

*Poppy* First there is Garden Poppy of many sorts, differing chiefly in the flower and seed. All Poppies have a cooling sleepy faculty; but the black is the strongest. Of Poppy *Opium* is made, which is the juyce which drops out of the Heads of black Poppy in hot Countries, the said heads being cut; and it is afterwards condensed. That of *Thebes* is most commended. Now it is bitter, of a strong smel, causes sleep and stupifies. Touching the Quality thereof Physitians are at variance: while some make it cold in the fourth degree, because of its sleepy stupifying faculty; others say it is hot, in regard of its bitterness and acrimony. But now adates not only Chymists, but other learned Physitians hold, That sleep and stupification is caused, not so much by its coldness, as by a stupefying Sulphure, which is found also in hot things, as in Spirit of Wine: and from such a Narcotick Sulphur *Opium* hath all its force; but its bitterness it hath from a bitter salt. A token whereof is this, That being largely taken it causes a drouzy dulness, with an itching all the Body over: and the Turks use their *Maslach* to make them couragious in Battel, wherewith they become as it were drunk. After this comes Red Poppy, or Corn-Rose; also horned Poppy, of which there are some kinds, and *Hypecoon*.

Also Henbane is manifold, white, black, yellow; Henbane of *Peru*, which they call *Tobacco*. It also, though hot and dry in the second Degree, hath nevertheless a Narcotick Faculty; the smoak taken in a pipe draws Rheum out of the Brain; the juyce given to strong persons, purges by stool, the operation being followed by a deep sleep. Some give the water stilled out of the Leaves in Agues before the fit, to drive the same away. An Oyntment is made thereof good for Wounds.

*Winter-Cherries* There is Garden Nightshade, and Winter-cherry Nightshade, of which there is an outlandish sort. The Winter Cherries have a notable faculty to provoke Urine, and to bring gravel from the Kidneys and Bladder. There is also a deadly sleeping Nightshade. Hither also belongs the Mandrake. Also of this Family are the Apples of Love, Golden Apples, or mad Apples of *Aethiopia*; also the Thorn-apple; and *Strychnodendrum*, or Woody Nightshade.

#### Tribe XIII. Endives, Cichories, Lettices, and Plants of kin to them.

*Endive,* To this Tribe belongs Garden Endive, broad leaved and wild Cichory, Dandelyon, *Cichory,* Gum Cichory; all which are cold and dry, bitterish, whence they open and clenfe, and are a little astringent; whereby they strengthen the Bowels. Hence they are most profitably and most frequently used in opening the obstructions of the Liver, and other Bowels, and in clenfing away cholerick humors. Sundry sorts of Hawkweed are of this Tribe; also *Dandelion,* Groundsel, Ragwort, Sow-thistle, and sharp thistle; many sorts of Garden and wild Lettice. All Lettices moist and cool, help a cholerick stomach, and procure sleep.

#### Tribe XIV.

Tribe XIV. Orach, Beets, Colewort, Docks, Rocket, Mallows, Cresses, and Herbs of kin to these.

In the first place there are sundry sorts of Orach; The Garden, the Wild, the Sea Orach; *Bonus Henricus* & *tota bona*, English Mercury; which some nevertheless refer to the sorts of Docks: *Pes anserinus*, Goose-foot. Then there are Blites, a greater, a lesser, a spotted; to which appertain the sorts of *Amaranthus Purpureus*, or purple Flower-gentle.

Thirdly, there is Spinage and some kind of Beets; and among them the red Beet, whose Root is eaten as a Sallet with Vinegar and Oyl; also some kind of Garden Colewort, also the wild, one sort whereof they call *Perfoliata*, Thorough-wax.

Fourthly, To this Tribe Borrage and Bugloss may be referred; to which *Anchusa* or *Bugloss*; *Alkanet*, and *Echium Vipers-borrage*, are added. Now Borrage and Bugloss (especially their flowers) have a very great faculty to strengthen and cheer the heart, also they refresh and recreate the spirits; and therefore Conserves and Syrups are made of them, which in Melancholick Diseases, and such as proceed from adust humors, are very good.

Fifthly, Mercury, male and female, *Cynocrambe*, Dogs-Cabbage, and *Herba impatiens* the impatient Herb, or Touch me not; and Pellitory of the wal, which is cold and moist, cleanses, is good for inflammations and burnings. The Leaves applied in manner of a Cataplasm to the stone, with Oyl of sweet Almonds, are an help to such as have the stone, and provoke the stopped Urine.

Sixthly, The kinds of Docks, as the wild Dock, the Garden Dock, Monks Rhubarb, red Dock, Sorrel, tuberous Sorrel, smallest Sorrel. Now Sorrel cools and dries, hinders putrefaction, provokes Appetite, and is therefore good for continual Feavers and Pestilences.

Seventhly, Garden Mallows with the double Flower, which is called also the Tree-Mallow, and over-sea Rose; also crisped Mallows, wild Mallows, Marsh Mallows, *Abutilon* yellow Mallows; Vulgar *Alcea*, and *Alcea Vesicaria*; the Cotton-plant.

Eighthly, We refer to this Tribe such Herbs as have a biting taste: Amongst which the Captain is Water-Cresses, and a sort thereof called Cuckows Flower; Brooklime; Scurvy-grass; Garden Cresses; Winter Cresses; Indian Water-Cress; Garden Mustard, and wild; all the *Nasturtia* or biting Cresses are hot and dry, provoke Urine, expel the Gravel and stone, and are therefore good for the Kidneys and Bladder. But they are especially excellent against the Scurvy, and principally Scurvy-grass.

Also Garden Rocket, and wild Rocket: to which may be added smal Celandine; herb Dragon, wild Dragon or Neesewort: several kinds of *Tblaspi* or wild Mustard; among which is that of Candie; *Erysimum*, Bank-cresses; *Lepidium*, Dittander or Pepperwort. The Turnep, the Navew, *Rapistrum* or Charlock; Garden Rhadish, *Lampsana* or Dock-cresses, which others are wont to refer to the Hawk-weeds.

Finally, we add to this Tribe the Nettle, which is burning and stinging, or dead Nettle. The stinging Nettle hath some sorts: they are all hot and dry, being boyled they loosen the belly by absterision, drive out the Urine and Stone; the seed provokes to Generation; it digests crude humors in the Chest, and is therefore good for them that cannot breath unless they sit or stand upright: it is a present Remedy against the poyson of Hemlock, and the malignity of Henbane and Toadstools. There are also divers sorts of dead Nettle and Arch-Angel.

Tribe XV. Mint, Sage, Horehound, Bawm, and Herbs of kin to them.

In the first place, there are many kinds of Mint: and then there is bastard Mint, *Sisymbrium*, Mountain and field Calamint, Cats-mint, Sarazens Mint. Mint is hot and dry, hath a rare faculty to strengthen the stomach, and help digestion, stops vomiting, dispels wind, ceases gripings, stops flux of the belly, and the whites; it hinders Milk from curdling in the stomach, hinders conception. Calamint is also hot and dry, good for the Tiffick, stops gripings, heals the womb, kills worms, brings down the courses, and is especially good for the womb, and furthers conception.

In the second place there is Sage the greater and lesser sort, which heats and dries, opens, is especially good for the Head and nerves, and is good for the cough and spitting of blood, and against the bitings of venomous Beasts. Wild Sage; *Sclarea* & *Horminum*; Clary, of which also there are divers sorts.

Thirdly,

**Horehound** Thirdly there is Horehound white and black: now this is hot and dry, opens obstructions of the Liver and Spleen; purges the Chest, and is therefore good for Persons in Consumptions who have no Feaver, it brings away the Courses and the After-birth: 'tis good against Venoms and bitings of venemous Creatures.

**Bawm.** Fourthly Bawm, it is hot and dry in the second degree, a great and good friend to the Brain and Heart, recreates the Spirits and comforts the Memory; 'tis good against Poysons and helps the bitings of Dogs, Scorpions and Spiders, being outwardly applied; it moves also the Courses.

**Basil.** There are also other Herbs, like these in smel, which may be justly reckoned in this Tribe, as Basil, which some think is called *Ozimos* because of its sweet and savory smel. Being smel'd to] its good for Head and Heart; the Seed helps the Diseases of the Heart, Discusses sorrow and sadness proceeding from Melancholy, and begets Mirth and Cheerfulness.

**Pennyroyal** Penny-royal is hot and dry with a certain bitterness and astringion; it hath a rare faculty to open obstructions, and to cut thick humors, to move Urine, and especially the Courses, also cures the Stone, Dropfie, Gout and Palsie.

**Origanum.** True Wild Origanum or wild Marjoram is hot and dry in the third degree, hath a very great faculty to cut, attenuate and scour, and is good against Poyson. Therefore its decoction is profitably given to such as have the Asthma, Convulsion, Dropfie, and such as are bitten by a Serpent. To Origanum belongs Trag-Origanum, or Goats Origanum.

**Wild Time** Wild Time *Serpillum*, is an Herb very much of kin to Penny-royal, and sends forth a most sweet and fragrant smel. It provokes the Courses, plentifully brings down the Urine, asswages Headach coming from a cold Cause, allaias the Gripping of the Guts, and is good against the Lethargy.

**Stachados** Arabian *Stachados*, most effectual against all Diseases of the Head from a cold Cause.

**Hysop.** Also *Polium* and Hysope, which being hot and dry in the third degree, digests, opens and discusses. Therefore boyled with Honey and drunk, it helps much to digest and bring out flegm in the Chest, and frees the Lungs stuffed with vitious humors; and helps an old Cough.

**Mother of Time.** Mother of Time, Time, Savory, are plants of affinity; have in a manner the same faculties, being hot and dry; being mingled with our meats, they help the Concoction of the Stomack, free the Womb distended with Wind; are thought to help the Palsie and all sleepey Diseases.

**Lavender and Spike.** To these may be added Lavender and Spike, being hot and dry Herbs, spiritfull, oily and odoriferous, most effectual in cold Diseases of the Head. Hence their water applied to the Fore-head and the Temples is good for the Palsie of one side of the Body, and for the Falling-sicknels; and a Conserve of the flowers is effectual against the Apoplexy and cold Diseases of the Brain.

**Rosemary.** Next to these marches Herb Mastich or *Clinopodium* and Rosemary, which is hot and dry, with some astringion, heals all cold Diseases of the Head and Brain, dries the Brain, whets the Senses and Memory, is good for the Poze, strengthens the nervous parts, comforts the Womb, and helps the old fluxes thereof.

**Marjoram** Marjoram, which also heats and dries in the second degree, also helps the cold Diseases of the Brain; and snuffed up the Nose it causes sneezing and brings away flegm, provokes the Urine and Courses.

**Betony.** Betony is also hot and dry in the second degree, and cutting; 'tis good for the Falling-sickness, and cold diseases of the Head, purges the Breast and Lungs, opens the obstructions of the Liver and Spleen, cures the Jaundice, strengthens the Stomack, and helps Digestion; moves Urine, breaks the Stone, is good for the pain of the Kidnies and Bladder, moves the Courses, allaias Mother-fits, is good against the bitings of Serpents and Venemous Beasts, is good for Worms and the Sciatica.

**Dictamus.** *Dictamnus verum* or *Creticum*, Dictamus of Crete, being in faculty like Penny-royal, moves the Courses, expels the After-birth and dead Child, facilitates Child-birth, is good against the stingings of venemous Beasts.

**Scordium.** *Scordium* heats and dries, cleanses and purges the Bowels, moves Urine and the Courses, draws gross and purulent humors out of the Breast, and is therefore good for an old Cough. 'Tis usefull mixed with Antidotes against Poyson.

Tribe XVI. *Scabious and Plants of kin thereto.*

There are many kinds of Scabious, the greater, the lesser, the middlemost, the greatest, *Scabious*<sup>1</sup> the Spanish, and that of the *Alpes*: It is hot and dry in the second degree, attenuates and cuts thick and clammy humors; therefore it cleanses the Lungs, helps the Cough and shortness of Breath, is good for the Scab, effectual against the Plague, pestilent Fevers, and the bitings of venomous Beasts, and is good to move sweat in such Diseases.

Hereto belongs *Stabe*, Devils-bit, *Jacca nigra* or black Marfellon. Among these some do reckon the Blew-bottles mentioned before in the eleventh Tribe; also the Royal Comfrey, or Flower Royal, and the *Serratula* or Saw-wort, Centaury the great, *Sarafens* Confound, *Virga aurea*, or Golden Rod, Plants good to heal Wounds. This Tribe admits also other Herbs, as *Agrimony*, which hath an attenuating, opening faculty, and is especially good for the Liver; also the Herb of *Kunegund* or *Avicennas Eupatorium*.

Also the kinds of *Veronica* or Fluellen, which is good for obstructions of the Liver and Spleen, brings forth the Urine and Stone, heals the Scab and all Diseases of the Skin, wounds, and especially cancerous Ulcers. Also it helps those that have the Tiffick, and who cough up purulent matter. *Veronica*<sup>2</sup>

*Vervain*, Ground-Oak, and *Teucrium* or Tree-Germander, with Ground-pine or *Chamaepitys* and their sorts. Now *Chamadrys* or Germander, and *Chamaepitys* Ground-pine, *Chamadrys* have virtues much alike. *Chamadrys* opens obstructions of the Liver and Spleen, helps the Dropsie, moves the Courses, and is good against the biting of Serpents; also *Chamaepitys* opens obstructions, cleanses the Kidnies, moves Urine and the Courses, strengthens the Nerves, helps the Sciatica and other diseases of the Joynts; wherefore 'tis commonly called *Iva Arthretica*, and *Herba Apoplectica*.

Finally *Eye-bright*, which by a strong faculty comforts the Eyes, and helps dimness of *Eye-bright* sight.

Tribe XVII. *Woolly and Downy Plants.*

Among those Herbs whose Leaves are covered as it were with Down; the first is *Gnaphalium*, Cud-weed or Cotton-weed: And then the sorts of Mout-Ear, *Leontopodium Matthioli*, yellow Stachados: the third Scorpion-Grass, the sorts of Mullein, and Ethiopian Mullein: To which also other Herbs are referred, though not downy, as *Blattaria*, Mochmullin, the Primerose, which is good for diseases of the Joynts and Nerves, also for Rup-*The Prim-* tures and Dislocations of the Joynts, and the Stone in the Kidnies and Bladder; Bear-Ear. *rose*. Also Hounds-tongue, and *Anchusa* or Alkanet, are by some reckoned in this Tribe.

Tribe XVIII. *The House-Leeks.*

To this Tribe belong the kinds of Houseleek, as the great branching Houseleek, the smal Houseleek, that is cal'd *Illecebra*; *Telephium* and *Crassula*.

*Aloes*, of which is made a thickned Juyce wel known in Physick, it purges yellow choler, helps the Stomack and Brain, resists putrefaction, opens the Hemorrhoids, moves the Courses, cleanses Wounds and brings them to a Scar. *Aloes*


*Purslane*, which is cold and moist and binding, helps the Teeth when they are on edge, kills the Worms in Children, especially if they have a Feaver withal, is effectual against spitting of Blood, the Bloody Flux, and voiding of Blood. Some also refer to this Tribe the *Radix Rhodia* or Rose-wort, especially good for the pains of the Head. *Purslane*  
*Radix Rhodia*

Tribe XIX. *Bindweeds, and of Twining Plants.*

Of this Tribe are Briony, Wild Vine, white Vine, *Dulcamara* or Bitter-sweet, black Bindweed, Indian Bindweed, Blewbel Bindweed.

Scammony, the Juyce whereof, (called by the same name) is famously known, being an effectual purger of Choler and wheyish Humors; being prepared and boyled in a Quince, 'tis called *Diagridium*.

The *Smilax levis* greater and lesser, or the greater and lesser Bindweed; the *Smilax aspera*, the Hop, the *Jessamine*, *Periclymenon* or Woodbind, *Hedera clematis*, Creeping Ivy, *Daphnoides* or *Vinca Perwinca*; *Flammula* or Spearwort, and creeping Chickweed; Ground-Ivy, Twopenny-wort, wild Tansie or Silver-weed, *Soldanella*; *Mechoacan*, which was

 was unknown to the Ancients, and is now in great use; it purges Flegm and watry Humors, is good for the Falling-sickness, the Gout, the Tiffick, Colick, and Mother fits. Hithen also may be referred *Epithimum*, *Polygonum mas*, male Knot-Grass, *Anagallis* or Pimpernel; Rupture-wort or *Herniaria*, most excellent for Ruptures, whence it hath its name; or Rupture wort: which they say doth also move Urine and break the Stone. Some say 'tis especially good to comfort the Sight.

Tribe XX. The Cowcumber, Gourd, and Plants of kin to them.

In regard of their long crawling stalks wherewith they creep on the ground, we joyn to the former Tribe Cucumbers, Citruls, Muskmelons, Pompions, Gourds: of All which there are many sorts. Hereto appertains *Coloquintida* or wild Gourd, Balm-Apple, *Balsamina* which is a wound Herb: and the Oyl wherein the fruit hath been steeped after the seed is taken out, is good for Burnings, Burstness, Pains and Ulcers of the Dugs.

Tribe XXI. Thistles and Thistly Plants.

*Carduus Marie.* In this Tribe is Garden Bears-breech, *Carduus Marie* or Milky Thistle, which removes obstructions of the Liver and Spleen, and purges the waters of such as have the Dropsie. The seed is said to be good for Convulsion fits of Infants, and to help such as are bitten by a Serpent; and it is now frequently used for the Pleurisie. The Globe-headed Thistle or Roundheaded Thistle, the Downyheaded Thistle, the Goldenflowred Thistle, the Star Thistle, the Artichoak, the Chameleon, *Spina Solstitialis*, Venus basin, Shepherds Rod: *Carduus Benedictus*, the blessed Thistle, commonly call'd *Carduus*, which is hot and dry, cleanses and opens, resists Poyson, opens obstructions of the Bowels, cures inveterate Feavers, kills Worms, moves Urine, is good against the Stone. Wild or Wood-Thistle; Garden and Wild *Carthamus*: *Eryngus* and *Chrythmus*; *Eryngus* moves Urine, and the Courses, staies Gripings, helps those that are Hepatick and Nephriticck, incites to Generation. Also *Cirsium*, or soft Thistle.

*Eryngo Roots.*

Tribe XXII. Tufted Plants, that have Clusters of seeds on the top.

*Fenel.* In this Tribe Fenel is the Captain, whose Roots open obstructions, provoke the Courses, move Urine. The seed comforts the Stomack, dispels Wind, comforts the Sight, encreases Milk, drives out the Urine and Stones.

*Anis.* Anise is very much of kin to Fenel, it also expels Wind, provokes to Generation, helps shortness of Breath.

*Carway.* Caraway, Its seed is hot and dry in the third degree, discusses Wind, helps Digestion, moves Urine.

*Dill.* Dil, whose seed boyled encreases Milk, alliaies Gripings, helps the Hiccup though but smelt unto.

*Cumin.* Cumin, whose seed is also hot and dry in the third degree, it discusses Tumors and Winds, alliaies Gripings, outwardly applied; being drunk it is good for a cold Breast, being beaten and mixt with Vinegar it stops bleeding of the Nose by smelling thereto.

*Coriander.* Coriander, whose seed prepared, (that is to say, steeped in Vinegar and dried) taken after meat drieth up the moisture of the Stomack, consumes the Spittle, expels Worms, and moves Urine.

*Ammi* or Bishops-weed, Carrot, *Libanotis* Hogs-Fenel, Bears-breech, Hercules Wound-heal, *Asclepium*.

*Lovage.* Lovage, whose Roots drunk with Wine help the digestion of the Stomack, discuss Wind, move sweat, provoke the Courses and Urine, bring away the After-birth, are good for Mother-fits, heals the biting of Serpents.

*Angelica.* *Angelica*, which is good against Poysons and the bitings of venemous Beasts, dissolves clotted Blood, purges the Chest.

*Pimpernel* Mountain Siler, Pimpinell, hot and dry in the third degree, whose Roots move Urine, break the Stone, provoke the Courses, open the Liver, dispel Wind, ease the Colick pains, is good against Poysons.

*Masterwort.* *Imperatoria* or Master-wort, whose Root is hot and dry in the third degree, of thin parts, digests cold Humors, moves Sweat and Urine, dispels Wind, is good for Nephriticck and Hydropick Persons.



Herb Gerard, Fennel-Giant, Hogs-Fennel: Garden and Marsh Smallage, Mountain Smallage, Parsley, which moves Urine and the Courses, and drives out the Stone: *Hipposelinum*, Chervil, *Smyrnum*, *Caucalis*, Sweet Cicely, *Gingidium* or Tooth-pick, Hemlock, *Cicutaria* bastard Hemlock.

*Filipendula*, which is hot and dry, opens and cleanses with a certain astringency; the Decoction of the Roots drives out the Urine and Stone: some commend the powder thereof against the Falling-sickness.

Meadow-sweet, *Thapsia*, or stinking and deadly Carrots, Parsneps, Carrots, Valerian, whose Roots are good against the stings of venomous Beasts, and the Plague; they take away the Strangury, Cough, Winds; help faults of the Eyes, and comfort the Sight.

### Tribe XXIII. Berry-cluster bearing Plants.

I think fit to place in this Tribe such Plants as bear Clusters of Berries or seeds and are therefore called *Plantæ corymbiferae*; for *Corymbus* being a round bunch of Berries such as we see in Ivy, these kinds of Plants have thence their name: such an one is Mugwort which brings away the Courses and After-birth, also the Child, and drives out Urine and Stones.

Yarrow, which cleanses with astringency, glews together wounds, stops Blood flowing from any part, stays the Courses, and heals the Bloody Flux.

The sorts of Tanfies, whose flowers in Wine or mul'd Sack kills and drives out Worms, dissolves the Stone; and brings away Gravel.

*Matricaria* or Feverfew, as the name shews, is good for Women troubled with pains in their Wombs both inwardly and outwardly applied, discusseth Wind and wonderfully strengthens the Womb.

*Ambrosia*, *Botrys*, Southern-wood.

Wormwood is a common Plant, but of manifold use, very bitter, very good for a Stomack troubled with Cholera; for it scours it away, by Stool and Urine: It strengthens the Stomack, encreases appetite, comforts the Liver, and opens its obstructions, expels bad humors by Urine; and in this respect it is with great profit used against long Agues, especially Tertian, which at length bring the Patient to a Cachexy.

Chamomel, *Cotula Fatida*, stinking Chamomel, which have been reckoned up in Tribe II.

### Tribe XXIV. Ferns and ferny Plants.

All Plants whose Leaves are placed along the stalks like wings, may be called Ferns. There is first male and female Fern; to which Polypody is of kin, which cleanses away and digests thick and clammy humors: most say it purges, but experience shews it purges little or not at all; yet it is good to mingle with other Purgers, especially of Melancholy, Oak Fern.

Harts-Tongue, to which though others ascribe other virtues; yet experience tells that it is good for Diseases of the Spleen, whose obstructions it opens, asswages its hardness and swelling, and is good also for the like Diseases of the Liver. *Hemionitis*, or Milkwort.

*Scolopendrium*, Ceterach or Finger Fern, is of rare virtue to open and assuage the swelling of the Spleen, cure the Jaundice, break and expel the Stone; *Lonchitis*, great Spleenwort. To these also may be added *Lunaria* or Moon-wort, and *Ophioglossum* or Adders-Tongue.

### Tribe XXV. Milkie Plants.

Besides the forementioned there are other Herbs that have a milky juyce in them; as all the kinds of Spurges, *Characias*, with its sorts: *Cyparissias*, *Myrioidis*, *Paralium*, *Helioscopium*, the broad leav'd, narrow leav'd, Knobby, and the woody, all the sorts of *Esula*, and *Pytusa*, as *Lathyrus*, *Peplis*, *Peplion*, *Chamefyce* or Ground-Fig. The *Esulae* do purge vehemently Cholera and Flegm, move Vomir, burn the Throat, and exulcerate.

### Tribe XXVI. Nervous Plants.

In this Tribe we may place all the sorts of Plantane: Now Plantane cools and dries, is astringent and absterfive, and hath mixed faculties: it cures Tetter and Inflammations, is good against all fluxions, yea of Blood; resists Putrefaction and strengthens the parts, and is good against Poysons; Swines-Cresses, All-bone, Fellow-wort,

*Psyllium* *Psyllium* or Fleawort, whose seed is cold in the second degree, temperate as to moisture and driness, according to *Galen*. Its Mucilage mitigates burnings within and without the Body, is good for exulcerated Guts: yet the frequent use thereof hurts the stomach. Hitherto also some refer Hounds-tongue; Star-wort, or the Harts-horn of *Dodoneus*; Woad, Toadflax, and *Linosyris* or Golden Star-flowered Toadflax, Shepherds pouch, Knot-grass, *Vincetoxicum* or Indian Swallow-wort, which as the name shews, is good against poyson.

## Tribe XXVII.

The remaining Plants which could not conveniently be reckoned in the foregoing Tribes, we put all together into this last Tribe, and leave it to further consideration, how they may be better digested and disposed. And in the first place we rank white Hellebore; whose Root purges by Vomit, but very violently, kills the child in the womb, kills Mice mixed with honey and flour; also the powder drawn up into the Nose causeth sneezing. *Elleborina*, bastard Hellebore, our Ladies slipper.

*black Hellebore* After the white comes black Hellebore, which purgeth melancholy, and therefore cures madness, Hypochondriacal melancholy, those troubled with the spleen, Quartan Ague, Falling-sickness, and all Diseases proceeding from Melancholy.

*Ricinus* *Ricinus*, or *Palma Christi*; it heats and dries, its seeds purge choler and water by stool.

*Ladies Mantle* Ladies-Mantle and Sanicle, which have the faculty to heal wounds.

*Sanicle* *Garyophyllata* or Avens, whose Root smells like a Clove, whence it hath its name, it heats and dries, is good for the stomach and Liver, dissolves blood clotted within the body, and helps such as are bit by venomous Beasts.

*Asarabacca* *Asarum* or Asarabacca, whose Roots cause vomit, and purge out thick and flegmatick humors: they move Urine and the Courses, remove obstructions of the Liver and Spleen, and so are good for the Dropsie and Jaundice.

*Birthwort* *Aristolochia* or Birthwort long and round, so called because 'tis good for women in child-bed whose after-births it brings away: also it moves the Courses, and is good for the Tiffick and Spleen. *Arum* or Cuckow-pintle, whose Root cuts thick humors in the chest and elsewhere. Dragon, water Dragon.

*Bistorta* *Bistorta* or Snakeweed, whose Root cools and binds, and therefore stops the looseness of belly and flux of blood, is good for exulceration of the Guts, strengthens the inner parts, resists putrefaction and poyson, strengthens and fastens the Gums. Bindweed, Herb Paris, water Pepper, Ars-smart.

*Coltsfoot* *Colts-foot*, whose green Leaves do somewhat cool, and therefore they are good to apply to hot Ulcers. Being dried they are hot and dry, and moderately biting, and their smoak taken in a Tobacco pipe helps shortness of breath; also the Root is used to the same purpose, and against the cough, whence 'tis called *Tussilago*.

*Thorough-wax* *Perfoliata* or Through-wax, is bitter and astringent. The Decoction or powder thereof is given to such as are bursten and fall from on high; and represses the starting Navils of children.

*Great comfrey* *Symphytum* or Comfrey, of which there are certain sorts: The great, which cools, contracts, and binds, heals Ruptures and broken Bones, stops spitting of blood and other Excretions thereof, and is good for the Bloody flux, and most effectual to sodder wounds.

*Lungwort* Hereto belongs spotted Comfrey or Lungwort, good for ulcers, and other diseases of the Lungs. Also Bugle and Rock-comfrey; and finally, *Prunella* or Selt-heal, which is commended against the blackness of the Tongue in burning Feavers.

## Tribe XXVIII. Of Shrubs and Bushes.

Shrubs are The Bramble, greater and lesser; the *Cistus* or Holly-Rose, the red Corants, the Barbary Bush, Goats-thorn; *Acacia*, the Slo-bush, the Buck-thorn, white thorn, Holm, Broom, Tamarisk, bastard Dittany, bastard Sena, Rocker, Black-berry-bush, the Myrtle-bush, the Dwarf-Myrtle, *Agnus Castus*, Privet; the Pipe-bush, Curriers Sumach, Box, Hounds-tree, black Aller or Butchers-prick tree, Spindle-tree.

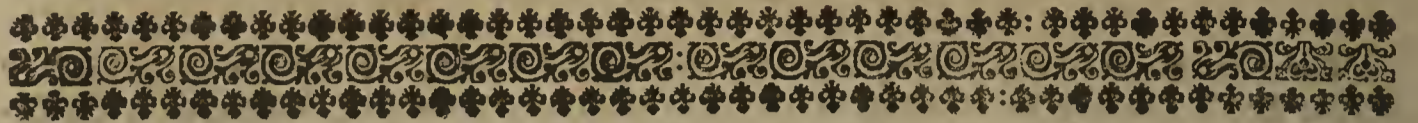
## Tribe XXIX. Trees.

There are many sorts of Trees, but not so many as of Herbs. There are many kinds of vulgar Apple-trees; also which more belong to this place, there is the Citron tree, the Lemon Tree, the Orange Tree, the Pomegranate Tree, the Quince Tree, the Peach Tree, the Apricock Tree, the Almond Tree, the Pear Tree, of which again there are many kinds; the Prune and Plum tree, the Cherry tree, the Mulberry tree, the Fig tree, the Medlar tree, the Cornel tree, the Service tree, the Jujubee tree, the Chestnut tree, the Walnut tree, the Hazel tree, the Pistachio Nut tree, the Bladder Nut tree, the Palm tree, the Olive tree, the Bay tree, the Rose tree, the Juniper tree, the Oak, the Holm, the Cork tree, the Beech tree, the Ash tree, the Alder tree, the Cedar tree, the wild Ash tree, the Poplar, the Elm, the Linden, the Birch, the Willow, the Elder, the Lote, the Savine, the Cypress tree, the Tree of Life, the Eugh tree, the Pine tree, the Pitch tree, the Fir tree, the Larch tree, the Turpentine tree, the Lentisch tree.

And thus you have a Catalogue of the chief Plants, which I have therefore set down, both that all men, but especially our idle Disputers (who alwaies stick in the same general matter, and yet think themselves rare Naturalists) may see by the example of Plants how great the amplitude of Nature is, and how that which we know is the least part of what we are ignorant of: also that such as are studious of the knowledg of Plants might have occasion to consider how there may be a Method in Herbarium, and how all Plants may be reduced to some certain Tribes: Which though I have not here finished and brought to perfection, yet I have laid the Foundation. And not to speak now of others; *Andreas Casalpinus* in his Sixteen Books of Plants, undertakes a laborious Method: For after in the first place he hath explained Trees and Shrubs; he propounds the variety of Herbs according to the difference of their Seeds. And in the first place he describes such as bear single seeds under every Flower, or have a single receptacle of seeds: Secondly, such as contain two seeds or receptacles of seeds, under the same flower: Thirdly, such as contain four, or more: And at last such as have no seed.

But though this distinction of Plants seems to be laborious and curious enough, and is therefore commended by some, yet I see not what Foundation it hath; seeing those Plants are joynd in one and the same Tribe, by reason of the agreement of their seeds, which neither agree in any signature, nor any other waies. As for example sake, in the fourth Book, what agreement is there betwixt Valerian and *Spica celtica*, Hemp, Hops, Beets, Wheat and other Corns? In the Fifth Book, how do Cowcubers and Gourds agree with Dwarf-Elder, Nightshade, Indian Pepper, Lilly Convalley? In the Sixt Book, what argement is betwixt Rose Campion, wild Turnep, Twopenny grass, and Purslane? And the same may be said of the rest.

But I leave it free for any Body to change and perfect this Method as he pleases. For I am not ignorant that several men have several aims in their Methods of Plants. Physitians rank them according to their faculties and use in Physick. Natural Philosophers have other considerations; some this, and some that.



# THE SEVENTH BOOK.

## *Of Animals, or Living Creatures.*

### Chap. 1. *Of the Sensitive Soul in General.*

**A**S the Vegetative Faculty is common to all Living things; so in all Living Creatures there is Sense, which is common both to Man and Beast. By the faculty of Sense Animals are distinguished from Non-animals, as Aristotle hath it *de Juvent. & senect. cap. 1.* and *de sens. et sensil. cap. 1.* Wherefore having treated of Souls in general, and of the Vegetative or growing Soul, and of Plants; we now come to the Sensitive Soul, and to treat of Living Creatures.

The sensitive soul is not the specific form of any beast:

Beasts are not rational:

The faculties of the sensitive soul:

The word sense taken two waies

And here in the first place, as we did before concerning Plants, so we must signifie, That the Sensitive Soul is not the form of any Animal, though void of reason; nor is a Horse a Horse by vertue of its principle of sense; for so a Pike-fish should be an Horse, nor would a Lyon differ from a Dog. Yet is it most manifest, that these Animals differ in their forms, and in their specific operations depending thereupon. But what those specific forms are, is not easie to tel, but they are known by their specific actions. And though many bruit Beasts perform wonderful actions by their specific forms; yet are they not such as that we should therefore hold them to be Rational, and to partake of understanding. For as Scaliger, *Exercitat. 317. s. 5.* rightly proves, No living Creature (except Man) performs actions properly Rational. And the holy Scripture attributes Reason to Man alone, as being created after the Image of God, *Ecclus 17. ver. 16, 17, 18. Psalm 32. ver. 9.*

But that we may treat of the Sensitive Soul in general; there are three faculties thereof; the knowing, desiring, and moving faculty. The knowing comprehends the external and internal senses so called: Appetite follows knowledg: finally to the thing known the living Creature moves. And seeing the knowing faculty goes before the rest, in the first place we must treat thereof, and for the same cause we must first speak of the external Senses. And here you must observe, that the word Sense is taken two waies; sometimes for the Soul it self, or its Faculty; sometimes for the operation which proceeds from the Sensitive Soul, and is called Sensation.

Now to the performance of Sense these four things must necessarily concur. *First*, The Sensitive Soul: *Secondly*, the Organ: *Thirdly*, the Object: And *Fourthly*, the Medium, which comes between the Organ and the Object. For in the *first place*, Although Sensation is attributed to the whol Animal, Soul and Body; yet the sensitive Soul is the Primary Efficient thereof, and the body is sensitive by means of the soul, which is the sensor or perceiver of things by the senses. For it is the *Entelecheia* or act by which a sensible Animate Body perceives things without it self. And therefore a dead body void of a sensitive soul hath no longer the use of sense. Now the secondary Efficient is the Instruments of Sense, which are also necessarily required to sensation. For although the soul be essentially present in the whol body; yet is it no where the Author of any sense, where it hath no Organ: and although the same Essence of the Soul which is in the Eye, be also in the Foot; yet because in the Foot there are no Instruments either of seeing or of hearing, in the Foot it neither sees nor hears.

Now

Now the Instruments of Sense (to use the words of Scaliger, Exercitat. 297. Sect. 3.) are two: The Spirits which have most affinity to the Faculty; and the Members which have most affinity to the sensible Object. For the Spirits are so subtile, that they may be almost reputed immaterial. They receive the imprinted species or representations of Objects. But the Instruments are the conveyers of the Spirits. And although the Organs of the Senses consist of many parts; yet one above the rest is the chief Instrument of Sensation: which Aristotle also tells us in these words, 2 de part. animal. cap. 1. *All sense is caused by means of the similar parts, because every sense is of some one certain kind of thing, and each sensitive part is accounted capable of some one sensitive kind of things.*

Now the Object is that which is perceived by the Sense, viz. The sensible qualities. For although the Objects of the Senses are said to be singular or several things, and corporeal substances; yet substances are not perceived by the sense, as they are substances, but as they are endued with sensible qualities, and contain in them the formal Nature of a sensible Object. For Peter (for examples sake) is seen as he is colored; is felt as he is hot, cold, &c.

Now a sensible Object is twofold; of it self, and by accident. That is sensible of it self, which primarily affects the sense, without the intervention of any other thing, as color is perceived by the sight primarily and of it self. But that is accidentally sensible, which is not perceived of it self, but by help of some other thing wherewith it is joyned and coupled. For example sake, when we say, I see a sweet thing, meaning Milk: the whiteness of the Milk is seen only of it self, which is the proper object of the Eye; but the sweetness because joyned with that whiteness, is said to be seen.

A thing sensible of it self, is again twofold; Proper and Common. The Proper is that which can be perceived by one sense, and no other; and concerning which no Error can be committed, as color by the sight, sound by the hearing, &c. But the Common is that which is not proper to one sense, but common to divers. And these are five: Magnitude, Figure, Number, Motion, Rest; as Aristotle reckons them 2. de Animal. cap. 6. text. 64. And to these general Heads may all those be referred, which others reckon up; as nearness and farness, which Scaliger in Exercit. 66. makes a sixt common sensible thing; Scituation, Continuity, Separation, Roughness, and Smoothness, and others which are wont to be reckoned.

Now which way the common sensibles do affect the senses, is controverted amongst Authors, while some say that peculiar species are by them imprinted upon the Senses, and others deny it. But their Opinion is nearer the truth, who hold, That the common Sensibles do present no peculiar species or representations to the senses; but only determine the species or representations of the proper sensibles, and add to them a peculiar manner. For because the Sensitive Qualities are not perceived separated from their subjects, but together with them, the proper enters the sense with the common by one simple species or representation, yet somewhat qualified: and color appears after one fashion in a square Body, after another fashion in a round. But if the common sensibles should send forth proper species, they should also do it without the proper ones. But that they do not do, which appears in transparent things, as the Air, whose figure we do not perceive by its color which is none at all, but by the containing body, rather by imagination than by sense.

Yet we do not say that the common sensible objects are perceived by accident, but by themselves secondarily. For there are three things which belong to a sensible by accident, which do not belong to a common sensible. First, a sensible by accident acts nothing upon the outward sense, whereby it is said to be accidentally discerned, but is only joyned with that which of it self affects the sense. Again, a sensible thing by accident may be perceived of it self, by some peculiar faculty in the Perceiver, whether it be some external or internal sense, or the understanding. Finally, it may easily be perceived by its proper power.

Now seeing all action is performed by mutual touch, and the sensible object is many times far distant from the Organ of sense; the Question is, how the object affects the sense. Herein all Philosophers agree, That some quality is sent out of the object unto the sense. Now qualities are twofold, some real or material, others spiritual or intentional; as was said before in Book 2. chap. 2. and the spiritual are nothing but Pictures and Images of the sensible objects, flowing from them, pure, thin, and free from the concretion of matter; and that there are such spiritual qualities experience it self doth teach us. For in the Summer time, we see the cloaths of such as lie under a Tree painted green with the color of the Tree; and a cloth held beside a Glass full of Claret, appears red; and other

examples

examples Scaliger brings, *Exercit. 80. Sect. 8.* and *Exercit. 298. Sect. 3.* And in general the same thing is taught by artificial Glasses, which receive the Images even of things remote. And the same is apparent also as to other senses. And that the Nature of sensible spiritual species or representations is quite different from that of material representations, Leo Hebraeus shews in his *Dialogue de Amore, Lib. 3.* by many reasons. The first is, because all other qualities diffuse themselves successively and by degrees through their subject, but light penetrates suddenly and in a moment through a transparent body. Secondly, a quality when it comes changes the natural disposition of the subject; but Light makes no alteration in the transparent body, save that it enlightens the same. Thirdly, other qualities do not extend themselves through an infinite space, but light does. Fourthly, that though the efficient cause of other qualities be removed, yet there remains some impression upon the subject; but the Illuminator being removed, there is no light remaining. Fifthly, other qualities are moved with their subject; but Light is not moved when the Air or Water is moved. Sixthly, many qualities of the same sort in one subject are joyned and mixed together; but many Lights are not jumbled nor confounded, but two Candles make two shadows, three make three shadows, &c.

Whether all the senses do receive only spiritual representations of things?

The first Question therefore in this place is, *Whether all the Senses receive spiritual representations of things.* Some indeed have been of opinion, that spiritual representations are not necessary in all the Senses, but only in the sight; and that all the other senses are wrought upon by material qualities issuing from their objects. But this opinion is false, and all the senses are wrought upon by their objects with spiritual species or representations. And seeing of all the senses feeling is most terrestrial and most drowned in matter, and its object seems to have most affinity with material qualities, if we shall prove that this sense is not wrought upon by real but spiritual qualities, the same will be proved of all the rest. But heat according to their opinion, acts upon the touch materially; and therefore produces another heat therein; which nevertheless is false. For all the senses are said to perceive the same numerical object whereby they are affected; which observation is true in spiritual qualities. For although an accident or real object does also differ from a spiritual, numerically, if it be considered in it self and according to its own Nature; yet as being the image thereof it resembles and represents the same, it may be termed the same numerically; and the sense perceiving the spiritual image of a thing, is said to perceive the thing it self; but not so, if it perceive a like real quality produced thereby. So he that hath seen the image of *Aeneas*, is said to have seen *Aeneas*: but he that hath seen *Ascanius* his Son, is never said to have seen *Aeneas*. The same appears from the difference betwixt a material and spiritual quality. For since the action of the first qualities is true motion, and is performed in time, and seldom produces in the Patient a quality answering in degrees to its own vertue, by reason of the resistency of contrary qualities; it would follow that sense should be performed in time and leisurely: also that the sense should seldom perceive the true degree of its object, but commonly a lesser. But seeing it is not thus in sense, we must hold that only spiritual species or representations, which have no contrary, are perceived by sense: which opinion also Aristotle professes to hold in *2. de Anima, chap. 12. text. 121.* Which also is exceeding manifest in most of the tangible qualities, which if they should act materially upon the touch, they should produce therein a real quality like themselves, and the organ of feeling should become hard by feeling an hard thing, soft by feeling a soft thing: whereas these qualities have no such activity; and no such thing is found, either in the Feeling, or any other sense.

Nevertheless you must here observe, that indeed all sensible species or representations of objects are qualities not material but spiritual, and Images or Pictures of the sensible objects flowing from them, as was said in the place before alleadged; and that nevertheless there are some differences of them, and that some are drowned in the matter and cannot get out, others diffuse themselves far from the Body from which they arise, being tied to no matter. The lowest of the Senses is feeling, whose object does no where raise it self out of the matter, but being hid in the matter offers it self to the sense. So that nothing is perceived by the touch, but what immediately touches the sensible body. And just so it is with tastes, which never affect the sense of tasting at a distance; but whatever affects the taste must immediately touch and affect the tongue. But the visible species or Images of things, imitating the most noble Nature of Light, are free from matter, and at far distances are carried to the sight and affect the same, no body coming between wherein they adhere. After the same manner Sound is diffused to a long distance, and penetrates not only the Air, but also Metals, especially those that are less solid. Betwixt these species or images, viz. The tangible,

tangible, taste, and visible representations, smells are as it were of a middle nature. For they for the most part, though they are not brought to the organ of smelling without a subject, as the visible species are brought to their organ; yet is there no necessity that the thing smelt should be wholly applied to the nostrils, but smelling things do send forth certain vapors, which are not themselves odors properly to speak (though some Physicians do so think) but the odours are in them; nor can the species or representations of smells be carried without them, into distant Places.

Now as touching the original of the sensible representations, we need not vex our selves, nor introduce any agent sense, to form sensible species out of the objects. Such is the nature of qualities properly sensible, and this power they have, That they can multiply themselves by sending forth their Images; and all forms can multiply themselves, some both really and spiritually, some spiritually only. And if any shall ask, What way they do it? We can answer him no more than if he should ask us how or why Fire heats.

Also a Medium is necessary to Sensation. For seeing the senses are only virtually affected by the object, a Medium must needs come betwixt: which also Aristotle affirms, 2 de Anima, cap. 11. text. 114. *We perceive all sensible objects through some Medium: And in 2. de Anim. cap. 9. t. 98. It is common to all, that a thing laid upon the Organ of Sense cannot be discerned.* And all these things must concur, if Sensation be made, and that rightly disposed to; whereof if one be absent, or be not rightly disposed, the Sensation either ceases or is vitiated.

Now wherein the Nature of Sensation consists, Authors vary; nor is the Controversie small, *Whether Sensation be merely a Passion*, and nothing but the reception of the representation of sensible things? Or whether besides the reception of the species there is any other action of the Soul concurring thereto? I spare to relate all the Opinions of others, which are at large by Authors related and confuted; only I shall set down that which seems to me most true, and this it is: The sensible species, or the object which sends forth the sensible species, is not the agent or active principle of Sensation: for Sensation is the work of the Soul, and that an immanent work, nor can be attributed to any external thing, especially an accident; but it offers and represents to the sense the thing sensible as the immediate object. Nor is Sensation only Reception; which besides other things, is hereby apparent, in that very often, when the sensible species is received in the organ, there is nevertheless no sensation, because the soul intent upon other things does not discern the sensible appearances: but Sensation is also a kind of Action. For Action which is more noble and worthy than Passion is not to be denied to the sensitive faculty, since it belongs to the vegetative faculty, and to Accidents.

Yet we are not to hold two Senses, one active, another passive, really distinct: but the same Soul is said to act and suffer in a different respect. For the Soul inasmuch as it judges and takes cognizance, is so far said to act; but inasmuch as the species is received in the organ, so far the Soul also it self, which is in the organ and informs the same, is said to suffer. Wherefore to receive the sensible species belongs to the Organ; to judge thereof when received belongs to the Soul: yet because the Soul gives the Organ power to receive the species, and is it self the cause of Reception, Passion is also ascribed thereunto. Sensation is therefore thus made: Spiritual Representations produced by a material object, are received in an animated Organ: being so received the Soul takes cognizance of them and judges of them, and so is said to be sensible: finally, the Action is received in the Organ, and communicated to the whole.

One thing remains yet to be explained, what credit is to be given to the senses, and whether they may err about their proper objects. The Epicureans did attribute so much to the Senses, that they thought we could never be deceived, and held that all which we learn is to be measured by the Rules of the Senses, as *Austin* saith in his Book *de Civitate Dei*, B. 8. cap. 7. Whence *Lucretius* in his Fifth Book, conceives that the Sun and Moon, are no bigger than they appear to us. Contrariwise, the Academicks will give no credit at all to the Senses. That we may know what to think in this point, we must observe these things following: The sense may err three manner of waies: First about the kind or common nature of its object, as taking color for sound, sound for smell. Secondly, in the sort and particular nature of the object, as to take white for black, bitter for sweet. Thirdly, in its application to the object; when it so apprehends some sensible thing, as if it had in it some quality which it hath not indeed; as when the taste judgeth meat to be bitter, which is not so indeed, but seems so, by reason of the bitterness of choler, wherewith the tongue is infected.

Hence therefore thus we conclude the matter: The Sense cannot err about its object, after the

The original of sensible species.

The Mediums of the senses.

Whether there is an active and a passive sense?

the manner of sensations

Whether the sense can err about its proper object?

the first manner : for the sight never mistakes Sound for Colour, nor the Ear Smell for Sound : but concerning the common sensibles it may be thus deceived : for it often takes that which is moved to stand still ; and that which is divided into many parts it often judges to be one continued thing. But in the second manner it is not impossible for the sense to be deceived ; and that which is blew seems many times far off to be black. Finally, in the Application both of the common and proper Objects it is deceived : 'To a white thing sending its appearance through a red Glass, is thought to be red also : for then the sight errs not in the colour, but in the application thereof to a wrong subject ; and so it is when the Sun is seen through a red Cloud ; for it attributes the redness which is in the Cloud unto the Sun. And therefore concerning its proper object, the sense can be deceived only these two latter waies ; about the common object all three waies. Howbeit these errors may be avoided, especially in the proper objects, if these conditions be observed. First, That the Organ be rightly constituted, and there be no fault therein. Secondly, That the medium be fitly disposed, and infected with no strange quality. Finally, That there be a fit distance betwixt the Object and the Organ.

### Chap. 2. Touching the Sight.

**B**UT that we may now come to the external Senses themselves, which in the outer part of the Body do perceive outward things which are present, we acknowledge them to be five in number. For experience shews, that there are no more Organs of Sense, nor can we find more in Man who is the most perfect of Living Creatures, nor in other Creatures any more : and so many do both suffice the use of Living Creatures, and are able to bring the Understanding to the knowledge of Substances. More may be seen touching the sufficiency of the Senses, proved from their End, Efficient, Subject matter, and Object, in *Scaliger's Exercit. 297.*

*Sight the most excellent Sense.* *Sett. 2. 3. 4.* Let us now begin with the Sight : For that is the most excellent and noble of all the Senses ; seeing it apprehends more things, more excellent and divers, quicker and at a greater distance than the other Senses ; *Scaliger Exercit. 298. Sett. 6.*

*Its definition.* Now Sight is an external Sense, perceiving and discerning the representations of things visible. And Vision or Seeing, is the apprehension of visible things by the Soul exercising its sensitive faculty in the Eye. The Organ of seeing is the Eye, receiving the visible species or shews of things like a Looking-Glass : Hence is that common saying that *the Eye is the Looking-Glass of nature*, and that a Looking-Glass is the Eye of Art, as *Coelius Rhodiginus* hath it in *Ant. Lect. Lib. 3. Cap. 28.* But the chief part of the Organ is the Chry-stalline humor, for the sake whereof the other parts of the Eye were by nature ordained.

*Its Object.* The Object of Sight, is that which is visible. Now what that is, we are to consider. Now although many things are said to be seen ; yet as to the proper object of sight, the controversy seems to be chiefly of Light and Color : For the best Philosophers do sometimes say, that Light is the first thing visible and that which is visible of it self : and sometimes again, they say the proper and adequate object of the sight is Color, and that all visible things are coloured. Howbeit these two Opinions are not contrary, but if they be rightly explained they include the true opinion concerning the Object of Sight : For indeed the adequate object of sight is colour, and whatsoever is seen under the notion of colour ; and therefore light it self inasmuch as it is said to be seen, is comprehended under colour, and is as it were a whiteness. Howbeit, you must observe, it is one thing to be visible, another to be actually seen. All colour is of its own nature actually visible, nor doth it receive its visibility from any external Cause ; and though it should never be seen, yet were it visible of its own nature, saies *Scaliger, Exercit. 325. Sett. 4.* and that colour which is in the dark, and deep within a thing, is actually colour, yet light is required that it may be actually seen.

*What Colour is.* Now *Aristotle* defines colour, in his *B. De sens. & sensibl. cap. 3.* *The extremity of that which is transparent in a terminated body, or the Extremity of a transparent thing terminated :* which definition that it may be rightly understood, it is to be observed, that colour belongs to all things by means of perspicuity, and that transparency terminated is the Subject of colours. For transparency being condensed, so that it can be no longer seen thorough, nor transmit the Images of other things, becomes coloured, and is said to be terminated : for it prescribes bounds and limits to the Sight, and is an hinderance that other things cannot be seen which lie betwixt it and the sight ; for although that same colour also which is in the middle and depth of a thing, is also colour : yet he seems rather to have defined that which



is actually seen, and is in the Surface. For Colour is not the Surface as some ill expound *Aristotle*, but in the Surface: and the extremity of a body as a body is one thing, and the extremity of a diaphanous or transparent body considered as such is another. Now the term or bound of a Diaphanous or transparent body is where it becomes dark.

Colour therefore hath its Original from the termination of that which is transparent: And that is two waies; first only by condensation of the transparent body, without the admixture of another body, after which manner the Stars come to be seen. Again Colour is made by the mixture of a dark body with a transparent. So Fire which is of it self transparent, if it be mixed with exhalations and fumes, appears of a red colour; and the same comes to pass in the Air and Water: for these three Elements are transparent, though in a various degree; for Fire is most of all transparent; after that the Air, Water seems to have some darkness in comparison; but the Earth is absolutely dark. And therefore by the mixture of the earthy parts with the other Elements sundry colours arise. But in the first place, that which is transparent becomes white; and therefore that which is transparent, light, and whiteness, are almost of the same nature: in like manner, Intransparency, Darkness, and Blackness are also of kin. And these are the first, simple and extrem colours, which do also proceed from the first simple Bodies, and all other colours consist of a mixture of these; all the sorts whereof to reckon up in this place would be too tedious; touching which *Scaliger* hath many excellent things in his 325. *Exercitation.*

Now apparent colours are made of the Species of real colours mingled with others. And therefore when the Sun's light is mingled with the colour of Clouds, various colors do result therefrom. Therefore we conclude that colour is visible, but that illuminated or shining colour is only actually seen. *Apparent Colours how made*

Whence also a Cause may be rendered why some things are not only seen themselves, but make others to be seen; and some things can be seen themselves, but cannot make other things to be seen: and others again can neither be seen themselves, nor make others to be seen. For some things have an inbred light proper to themselves; some only an adventitious or borrowed light. Such as have an inbred light can be seen without the help of other things. And such as have it plentiful and potent, as the Sun and Fire, do also make other things visible; but such as have little light in them, and so little as can only render them visible, and that but in the Night, do not at all help other things to be seen; such as are some rotten woods, Glow-Worms, and such like: but those things that have no innate light, can neither make other things visible, nor are they visible themselves, unless they be enlightened by some other thing.

Now because Light is necessary to Sight, it is worth our enquiry how it concurs thereto. Some hold, that it is only required to illuminate the object and medium, others that it is necessary also to inlighten the Organ. As to the object, it is altogether necessary that it be illuminated, that it may be actually seen; and that appears by experience. For although the whol Air which is about the Party seeing be illuminated, yet if that which is about the colour be not illuminated, the colour cannot be seen: for the colours of themselves if they be not illustrated by light, do remain sluggish as it were, so that they cannot produce an Image of themselves; and light is the act of colour, not to make it to be, but to make it visible, as *Scaliger* saies, *Exercit. 75. S. 7.* Also for the Medium light is requisite: yet is it not necessary that the whol be illuminated, but only that part which is about the thing visible: and so light seems not necessary to the medium as a medium; but only in respect of the visible object therein residing. For even when we are in the dark we see those things that are in an illuminated Medium; and in the deepest wels, where no light reacheth, we see the Stars even in the day time. *How light concurs to sight.*

As to the Organ, we avouch with *Aristotle, de sens. & sensibil. Cap. 3. that as without, so within, there is no seeing without light*: howbeit we hold that it is rather an inward and inbred than an external light, which the Eyes of many Creatures that shine in the night, do witness. But that an Eye which is in the thickest darkness can be illuminated and illustrated by a light so weak, as to be able to inlighten things close by it (as for example that which shines from rotten wood) is improbable: As also it seems impossible that a light and colour smal and weak, far distant from the Eye, can any waies inlighten the whole Air as far as to the Eye.

And because that Light is altogether necessary to sight, it is enquired, whether it also be seen. We answer: That Light while it is in a transparent medium is not seen, as that which, but as that *wherewith*; and that it is not seen of it self, but by accident; because it makes colours to be actually seen: and when we see colour, we judg that the Air is illuminated. *Whether Light it self be seen*

The Medium of sight.

Whether sight be caused by receiving in, or sending forth.

But the Medium of Sight is that which is *transparent*; and that which is seen is alwaies more darksom than the Medium. Hence we see water in the Air, and the same thing colored is seen in pure cleer water, and hid in that which is troubled. And therefore a thing colored may also be the Medium of Sight, provided it be not quite dark, but more transparent than the visible object. So we see smal creatures inclosed in Amber.

The Manner of Sight remains yet to be explained, concerning which there are no smal controversies amongst the Ancients. For though herein al consent, That to cause sight the object must of necessity be joyned to the organ; yet how that is done they are not al agreed. The Platonists (for as for *Plato* himself, some wil have him to be of one Opinion, and some of another; and *Scaliger* in *Exercitat.* 325. Sect. 5. cites places out of his *Timæus* and *Meno*, whereby he endeavors to prove, That *Plato* conceived sight to be cauled by species flowing from the Object to the Eye) very many skil'd in the Opticks, and al ancient Philosophers in a manner until *Aristotle*, held that the Optick spirits and raies went out of the Eye to the Object, and laid hold of the same.

But this Opinion is false and corrected by *Aristotle*, so that those Ancients are not so much to be blamed, as they are to be chastised who contrary to the judgment of that wise Man, do stil follow those toyes. For Sight as al other Senses, is an immanent action, and therefore it must be performed in the Eyes, and not without. And seeing every agent which acts upon another thing without it self does not receive in it self the end and fruit of its action (as the operation of heating is not received in the agent but the Patient) the fruit also of sight if it were caused by sending forth of raies, would be in the thing seen, and not in the Seer; which is absurd. For the end of sight in a Living Creature is the accommodation of its life: but in Man besides that, also the knowledg of Nature, comprehension of God, and Happiness. Finally, What can that be, which out of so smal an Eye-bal can be sent so suddenly to so many things as we behold, so distant? A corporeal substance, such as are the Optick spirits, cannot be shed forth in so great plenty. For there is nothing that can suffice to repair so many spirits; nor can it be moved in an instant from the Eye so far as to the Heavens: Nor can any quality of it self perform the same; but if it should do this, the soul must needs be in it. But the subject of the soul is a substance, not an accident. Yea, in general, whatever you hold goes forth and causes sight, it must do it by means of the soul. Whence it would follow, that the Air hath in it not only one soul, but the souls of many living Creatures. And those very arguments and many more which are brought by *Zabarella* Lib. 2. de Visu, cap. 4. 5. do make against that Opinion of *Galen* and others, who hold, That the sight goes out a certain distance, and is united with the image of the visible object, and that so sight is caused.

the true manner of sight.

Let us therefore hold with *Aristotle*, That sight is caused by the reception of visible images into the Eyes; and that as from every point of a lightsom body into every point of a transparent Medium Light is propagated: so from every part of a colored body, an Image thereof is sent into a transparent Medium, by a right line, and received into the Eye, and discerned by the sight. For even the images received do appear within the apple of the Eye; and an excellent visible object hurts the sight; and the Eye is made of so many parts, for this Receptions sake.

### Chap. 3. Of the Hearing.

the definition of hearing. what sound is.

How sound is generated.

After Sight we rank *Hearing*; for it (after Sight) is the most excellent Sense, and seems to contend therewith in point of nobility. Now the Hearing is an external sense, which by help of the Ear perceives audible things, viz. Sounds: for the object of Hearing is Sound. Now Sound is a quality arising from the Air or Water being smitten and broken by the vehement and sudden concussion of solid bodies.

To the generation of Sound three Bodies are necessary: two of which mutually strike one another, or at least one performing the office of two, in two parts. Now these bodies ought to be solid, that they may gather and condense the Air, and not having many pores. Hence Sponges, and locks or fardles of wool knockt together, do cause no sound; because being full of many pores, the smitten Air is received by them, and so it is not broken. Besides two solid bodies, a third thing is required, which may be intercepted betwixt those two solid bodies and broken. And this is that which also Fishes hear.

the Medium of hearing.

The Mediums which receive sound are the Air and the Water. They commonly hold, that a certain inbred air of the Ear is the chief organ of Hearing. Contrariwise other later Authors,

Authors, since the Organ of a sense ought to be a similar part animated, do reject this Air: and hold the principal instrument of Hearing to be a certain Nerve spread out in the Ear. And truly the former Opinion is not so allowable as this, unless it be explained as *Capivaccius* explains it; who teaches, that as the innate heat of the Eye is luminous or lightful; so the innate heat of the Ear is Aerial, so that it may be affected by sound, and is commonly called, complanted Air, that is, Air bred in the Ear from the first formation; but that it is not included in any peculiar Cavity, but ingrafted and implanted in the expanded Nerve.

Here we must not pass over the *Eccho*, which is a reciprocal and reflected sound from a smooth and hollow place. For as Light and visible Images lighting upon a smooth and polished body are reflected: so sounds, if they light on a smooth, even, and hollow body, whereon they are not broken, they are reflected. And as in general, that sound may be heard, it is not necessary that all the air from the place where the sound is first caused, should be continually broken, as far as to the Ears; but it is enough if the image thereof be propagated so far; even so an *Eccho* is not bred by a new breaking of the Air, for so this reciprocal sound would not be articulated: but only the image of the former sound rebounding back to us. Nor may a word be only once reflected, but divers times, viz. If the voyce beaten back do light upon other hollow places, one after another. So the seven *Cyzician Towers* did multiply words received by them with a manifold *Eccho*. And *Pliny* relates, how in the *Porch of Olympia*, which they therefore termed *Heptaphonon*, the same word was seven times repeated; *Nat. Hist. Lib. 36. cap. 15.* And *Lucretius* in his Fourth Book, thus writes:

*Poe known some Ecchoes, if you spake a word,  
Would six or seven times back the same afford.*

#### Chap. 4. Of the Smelling.

**T**HE Smelling follows after the Sight and Hearing in point of Excellency, which is an external sense perceiving smells, by help of the Nose or mamillary processes therein. For the object thereof is a scent or savor.

Now touching the Nature of the Smel, the vulgar Doctrine is, that it is a quality arising in mixt bodies, from a dry savory thing by the Heat mingled with moisture. For they say smel and tast are so of kin, that all things which have tast have also smel, and every thing that hath no tast, hath no smel neither. Hence mixt things only have smells, and not the Elements, which also have no tast: for neither have all mixt things smells, but those only which have tastes. For stones have no smel, which are also void of tast; but woods, and other things which have tastes, have also smells. But herein nevertheless smells and tastes differ, in that driness prevails in smells, moisture in tastes. Hence Nitre hath a stronger smel than Salt, and Salt is moister than Nitre; because in Nitre there is more driness, in Salt more moisture; and things that smel, if they are over moistened they loose their smel. For the same cause, if after a drought the Rain falls, at first a certain smel is perceived; because the dry is mingled with the moist: but the smel lasts only so long as until the driness overcomes the moisture; but if the rain continue so long, that the driness is vanquished by the Moisture, the smel also ceases.

They hold the efficient cause of smells as of all works in mixt bodies to be heat, which in due measure and manner mixes the moist with the dry. And hence they give the cause why most things that have smel, smel strongest when they are hot; why some things smel not at all unless they be heated; and why most things smel more in the day than in the night, in the Winter than in the Summer. For when in the mixt body moisture does very much abound, or driness is not rightly mixed with the moisture; there arises either no smel, or one which is imperfect. And that therefore there is need of heat, which may either consume the overmuch moisture, or mingle the same with the dry parts after a due manner.

But seeing what *Scaliger* saith of Tastes, *Exercit. 279. Sect. 4* That Tast no more arises from the first Qualities than Laughrer, is most true of smel: they labor in vain, who endeavor to draw smells from the first Qualities; since they are not in the power of the first Qualities, and we must have recourse to nearer principles. And the Chymists do far more probably deduce odors from Sulphur, and hold that Sulphur is the prime subject of

smels; of which we have spoke elsewhere in our Treatise of the Consent and Dissent of the Chymists with the Aristoteleans and the Galenists, chap. 11.

Differences  
of Odors.

The differences of Smels are little known; but because the Taft and Smel are of kin, and most smels have much affinity to tafts, the names of tafts are also given to smels. Now the Tafts do follow the Nourishment, which is examined thereby by Creatures that eat the same; and therefore these favors of themselves bring no pleasure or displeasure, but only by accident, as they are signs of good or bad nourishment. Hence the greatie smel of roast-meat is delightful to the hungry. These odours are exquisitely perceived by Bruits, and therein they excel Man-kind.

Yet there is also another kind of smels which does not follow the Aliment, but is of it self pleasant or unpleasant, as the smel of Spices and many other things. And with these smels, as also the beauty of colors, Men are either only or chiefly affected: and other Living Creatures how exquisitely soever they smel other scents, yet herein they are far out-gone by Man-kind; so that either they take no delight from sweet smels, or if they do, it is very imperfect and maimed, and agrees but to a few of them. Of which see Scaliger in Exercit. 303. S. 2.

From what hath been said is not hard to judg what is the true object of smelling, and after what manner smels are perceived by the sense of smelling. That Odours are the object of smelling was said before, nor does any man deny it: but how that is to be understood, is not so manifest. Heraclitus (as Aristotle saies) de sens. & sensibil. cap. 5. Many ancient Philosophers, Galen and very many Physicians are of Opinion, That the sense of smelling is not only affected by some spiritual image and representation, but that a certain corporeal, aerial, thin exhalation does flow out of smelling things, and is perceived by the sense. Contrariwise, the greatest part of Peripateticks are of opinion, that a naked image of the smel does spiritually flow from the odorous body, as an image from a thing visible, and is carried to the organ of smel, and thereby perceived.

Odors are  
not sub-  
stances.

The latter Opinion seems truer to us, provided it be rightly explained: yet that there is some truth in the former cannot be denied, though in some part it swerve from truth. For in the first place, this must of necessity be allowed, That odours are not substances, nor any thing corporeal: For the senses do not perceive substances, but only their accidents. Again, this also hath been shewn before; That no sense is affected by a real or material quality, but only by its representation, or a spiritual and intentional quality as they call it. And therefore we must also hold the same as to the sense of smelling, that the said sense perceives nothing corporeal, nor yet any real quality, but only the Image thereof.

The smel-  
ling per-  
ceives only  
an image.

Nor must we in the next place deny that somewhat does flow from and exhale out of such things as smel, and is carried in the Air. For dayly experience teaches, That odoriferous exhalations do sundry waies affect the Brain, and very often change the temper thereof, and sometimes qualifie and rectifie the same, other whiles cause heaviness of head, as Hippocrates hath it in his 5. Sect. of Aphorisms, Aph. 28. Yea, and this comes not to pass in the Brain only, but many times by odorous exhalations we perceive our Nostrils, Eyes, and Face to be gnawn as it were, and pained. Moreover, we see that odoriferous things by little and little do for the most part wast and consume away. And when an odoriferous thing is taken away, the smel remains many times a long while after in the Air, which cannot be done by the images alone, which do not remain when the object is removed. Al which things teach, that oftentimes there flows from odorous bodies a certain corporeal exhalation, which hath a power of heating, cooling, and doing other things, which cannot be effected by bare species and images. This therefore we grant, That from many things a certain odoriferous vapor exhales, and that corporeal savory vapors do flow from things that have smel: but yet we avouch that a spiritual species is required and presupposed to cause the sense of smelling. But whether or no both are alwaies necessary, and whether the species of the Odor, which is properly perceived by the sense of smelling, is alwaies joyned with some corporeal subject or vapor, without which it cannot be carried to the Organ of Smelling, is yet in doubt, and this is the main hinge of the Controversie.

Whether  
the species  
of smel  
need al-  
waies the  
carriage of  
a vapor.

We have spoke before in cap. 1. of the difference of sensible species, and have granted that odours for the most part are indeed carried to the smel with a corporeal substance: but we deny that this is alwaies necessary, and hold that the exhalation which comes from the odorous body does not alwaies reach so far as to the Nostrils, yea, and that sometimes no such thing comes from the odorous body, and that the smelling is cauted by spiritual qualities and images, of the favors proceeding from the odoriferous body to the organ of smelling. For if that same vaporous exhalation should be alwaies joyned with smels as their carrier,

Fishes

Fishes could perceive no smells in the water, nor could be allured thereby to seek the Bait: For since the nature of odoriferous exhalations does consist in a dry subject elaborated by heat, and the nature of exhalations is such as to ascend upwards, how should those exhalations come to the bottom of the water? or if they should come thither, how wil they retain their driness and the integrity of their nature in the water, since odoriferous things when wet are wont to lose their smell? Moreover, how can there be so great and so long an efflux of vapors from odoriferous things, as may suffice to fill most large spaces? The whole odoriferous things verily which are but small many times, if they were all turned into vapors, could not fill such distances. Yea, and we see many things do smell a very long time together, and yet are not at all consumed or wasted.

From the Premises also that Question may be explained; Whether Odors can nourish a man? For seeing the nourishment of a body ought to be a body, and we are nourished with the same things whereof we consist; and odors are qualities; we hold that they have no power to nourish. And whereas it is said that sick persons are many times refreshed with smells, and that *Democritus* for his sisters sake (whom he would not draw from the Feast of the Thesmophorist) did prolong his life three daies only by smelling to hot Bread; that must not be attributed to smells, but to odoriferous vapors exhaling from the Bread, and recreating the spirits. Nor is that true nutrition which is made by apposition of a like substance, viz. Of Blood elaborated in the Liver; but only a certain cheering of the Spirits.

As to the Organ of Smelling, though all agree herein, that the Nostrils are the Instrument of smelling; yet it is controverted betwixt the Physicians and Peripateticks, what is the chief Organ of smelling. For the most Peripateticks do hold the proper Organ of Smelling to be the Nerves dilated in the Nostrils. *Galen* holds smell to be produced in the foremost Ventricles of the Brain, in 8. de usu partium, cap. 6. de olfactus Instrumentis, cap. 4. Other Physicians say, That from the Brain near the Cavity of the Eyes, two Channels are derived to the bored bones of the Nose, whose ends seem like teats (whence they are called the mammillary or teat-like productions) and that in them as the proper instrument odors are discerned. Which Opinion is most agreeable to truth, and the greatest part of the best Physicians do follow the same. For the Brain is not the proper Organ of any external sense, but the common, as supplying spirits into the organs of the external senses. As to the Nostrils, true indeed it is, That odors are perceived by them alone, and that these are the only waies Nature hath appointed to carry smells to the Organ of Smelling: yet the perception and judgment of Odors is not in them, but in those mammillary or Teat-like productions, which are placed before the Ventricles of the Brain, as the examiners of smells. For if we attribute the faculty of perceiving Odors to the Nostrils alone, and the Nerves in them dilated, what should hinder us from smelling, so long as we have our Nostrils? Yet Experience shews, That when those processes are obstructed, as is wont to happen in the *Coryza*, the Smelling is either abated or quite taken away, without any fault in the Nostrils. Moreover, if Smelling were made in the Nostrils, we should perceive smells without breathing; whereas nevertheless we find by dayly experience, that the most odoriferous things being put to our Nose, we smell nothing unless we draw our breath; the reason whereof is, because those mammillary processes are placed within the Skul, so that smells cannot come thereto save by attraction of the Air.

The Medium through which Odors are discerned, is the Air and Water. As to the Air there is no doubt. But that in the Waters also smells are discerned by Fishes, this is an argument, that Fishes are allured by the smell of Baits; which *Aristotle* proves by many examples, in his Book de *Histor. Animal. Lib 4. cap. 8.* And to much may suffice to have said of the Sense of Smelling.

### Chap. 5. Of the Tasting

THE TAST is an external Sense, by help of the Tongue discerning favors. Which sense though some confound with feeling, and make it only to be a sort of Touch: yet they are questionless in an error, and we must acknowledg the TAST to be a peculiar Sense. For although the touch is sometimes generally taken for a sensitive power, which takes cognizance of an object, nor removed but applied to the Organ (and in this manner the TAST may be called a kind of feeling, and so it is by *Aristotle* in that sense called) for it does not perceive things distant as the sight does colors, but only favors applied to the Tongue: yet

that signification is not so proper; and the Question is, whether the Touch be the same Sense, with that power that perceives Tangible Objects: which is denied. For they differ both in the Object and Organ: for the Object of the touch is tangible Qualities, but of the Taste Savors: and the taste may be lost in the Tongue, while the Sense of Touching remains entire. And therefore their Organs are quite different; and though in the Tongue there be Touch, yet where ever there is Touch there is not Taste; but only in the Tongue; whole thin soft and spongy flesh, the like whereof is not in the whole Body, is the proper Instrument of Tasting.

The Object of Tasting is Savor. Touching the nature whereof, we pass over the Opinions of the Ancients, *Empedocles*, *Democritus*, *Leucippus*, and *Anaxagoras*. The Peripateticks do thus teach concerning Savor. No simple Body hath any savor or taste, it being only an adjunct of mixt bodies, and thereto three things are requisite: an earthy driness, a watry moisture, and Heat which is the Author of all operations in mixt bodies: Of which we have every where frequent signs and tokens: For Water which of itself is tasteless, if it be strained through some earthy dry substance, it becomes savory, as appears in Fountains, which receive divers tastes from the parts of the Earth through which they flow: and the water of Lye is bitter, because it is strained through Ashes. Howbeit the Nature of taste consists more in moist parts than in dry: and it is a quality affecting the taste, arising in mixt bodies from the permission of a watry moisture with a dry earthiness. And seeing the mixture of moisture with driness is various; and the watry moisture joyned with earthy driness which is the subject of Tastes is various, sometimes thicker, sometimes thinner, and the Heat which is the Cause of tastes is sometimes stronger, otherwhiles weaker, hence also sundry tastes do arise which are severally reckoned up, by several Men. Most do acknowledg chiefly seven simple tastes or savors; and from their commixture others may arise, or at least they may be referred to them: Sweet, Sour, Harsh, Rough, Salt, Bitter, Biting. These tastes may be considered two manner of waies, either in respect to the first Qualities Heat and Cold, or to the sense of Tasting which they affect.

The former way they are chiefly considered by Physicians, and they serve them to know the Qualities of medicaments by, and are divided into Hot and Cold. Into three Cold, Sour, Harsh, Rough; three Hot in excess, the Biting, Salt, and bitter, and one moderately hot, *viz.* Sweet. And thus with Physicians the Harsh and Biting tastes are the extrem tastes, the former the Coldest, the latter the Hottest of all others. The Philosopher considers them rather after the latter manner, and takes not their difference from the tangible Qualities, but from the Effect whereby they work upon the taste: and thus because that taste which is most contrary to sweet is the bitter Taste, and the one is most pleasant, the other most unpleasant: therefore these two are by Philosophers counted the extrem tastes, the rest are intermediate.

*Sweet taste* The sweet Taste therefore is most pleasing to the Palat, arising from the mixture of a watry moisture with an earthy driness, made commonly by a moderate heat. Such is in Bread, Milk, ripe Grapes, Figs, Licoris, Sugar, Honey. Although in these also some degrees may be observed in heat, for some are hotter than other some; and those that come neerest a mediocrity are most fit to nourish a man.

*A tart taste* An acid sharp taste consists in a matter thin and subtile, and arises from a weak heat, or because in the mixture there are many watry parts which cannot be overcome by the Heat, or because out of the mixt body the hottest parts, especially those that are most pure, namely the Aery, are exhaled. Such a taste is in Vinegar, Sorrel, Juyce of Lemons. An harsh

*An harsh taste* taste consists in a matter indifferently thick, and ariseth from a greater degree of cold, and a weaker heat than the Sour. If the matter be yet thicker and the Heat weaker, and the *A rough taste* Cold stronger, it causes a rough taste, which is in some unripe Apples, in Acorus, and Galls.

*Salt taste* A Salt Taste is in an earthy matter, not subtile, but rather thick and earthy: and it arises from an heat exceeding mediocrity. And therefore the first subject of a Salt taste is an earthy driness, through which a watry moisture is strained, adust, so that little of the watry humoc

*A bitter taste* remains therein: yet from a smal portion thereof a great quantity of Water may be infected. In a bitter taste Heat is commonly yet greater, and its matter drier and more earthy. Finally from the greatest heat arises the biting Taste, and it consists in a subtile matter: and therefore things so tasted have a faculty of burning, penetrating, and drying; such is in Pepper, *the biting taste* Ginger, Garlick, Onions.

Thus I say, the Peripateticks and the Galenists endeavor to deduce the kinds of tastes from the first Qualities. But as was said before from the *Exercit.* 297. S. 4. of *Scaliger*, Tastes do

do no more arise from the first Qualities than Laughter. And what lost labor it is to endeavor to give a reason of Tasts from the first Qualities alone, is learnedly shewn by *L. Grillus* in a peculiar Book *de Sapore amaro & dulci*. The Chymists more probably draw tasts from Salts, and teach that Salt is the first subject of Tasts, and that from the several kinds of Salts proceed the sundry kinds of Tasts, of which elsewhere in my *Traict. de Consens. et dissens. Chym. cum Aristotelicis & Galen Cap. 11.*

There is no external Medium required to tast, but if the tast of any thing is to be discerned, it must be applied to the Tongue. Yet the Internal medium is a spongy or rather porous Skin drawn over the Tongue, and the moisture of Spittle. For to this part the Tast is first communicated, whose representation is afterwards carried through the pores of the Tongue into the flesh thereof, and is there perceived by the Soul exercising the sense of Tasting. *And so much for the Tast.*

*The Medium of tast.*

### Chap. 6. Of the Touch.

**T**He last external Sense and the most common of all the rest, is the Touch, which perceives tangible Qualities. Touching this sense, no small Questions are wont to be agitated. And in the first place they are wont to enquire; whether the Touch be only one Sense in number; or whether there be one power of Feeling, as there is one of Seeing, one of Hearing, one of Smelling, one of Tasting, or more. *Aristotle* moves this Question in *2 de Anima Cap. 11.* and brings this reason of doubting. There is one Sense of one first Contrariety: and one Sense hath one proper Object, to which all that it perceives may be referred: But the Touch seems not to have one common Object, but many: for it perceives Hot, Cold, Dry, Moist, Heavy, Light; Hard, Soft; Clammy, Brittle; Rough, Smooth, Thick, Thin; which cannot be reduced to one common kind, or one common notion, according to which they are perceived by the Touch. Many being persuaded by this reason, have held divers Tasts; some two, one to perceive Hot and Cold; another to perceive Moist and Dry; others three; the two aforesaid, to which they attribute also Hard and Soft, Rough and Smooth; and a third to perceive Lightness and Heaviness: others hold that there are so many senses of Feeling, as there are differences and contrarieties of tangible Qualities. Others have yet added more senses of touching, to perceive Pain, Pleasure, Venerie, Hunger, Thirst. Others contrariwise do hold that there is one only Touch or Sense of Feeling, which though it hath divers Objects, yet it perceives them all under some common notion; just as the Sight perceives White, Black, Red, Yellow, Green, under the common notion of Colour.

*The touch: whether there be but one Sense of Touching?*

Now although it be hard to compose this Controversie, and most learned men have held, that no certainty can be determined in this Point: yet very many have thought it most probable that there is only one faculty of touching. And several men have severally endeavored to reduce the sundry differences of tangible Objects to some one common Nature. For some say, though the Object of Feeling be manifold: yet is it contained under one common kind, though it want a name. And that it is a Quality that primarily follows a body as a body, or which immediately depends upon sublunary Bodies, and necessarily accompanies the forms of the Elements, and of the bodies of them compounded. Others also attribute to tangible Qualities one manner of affecting the touch, and that they say to be a changing of the complexion of the first Qualities, and hence the sense of feeling is said to be a sense of the temperament: and that therefore the first Qualities are the chief object of feeling, and the rest pertain thereto after a secondary manner; and such things as cannot be reduced to these, are common sensible objects, which constitute no peculiar sense. Finally, others distinguish betwixt the external sensibles, such as are Hot, Cold, Moist, Dry, Hard, Soft, &c. and betwixt the internal, which are perceived in the Feeler, as Pain, Pleasure, Hunger, Thirst. They conceive the external are perceived by one only sense. For although they are many, yet they may be reduced to one common notion: and indeed we find by experience, that he who can by touch perceive one of those contrarieties, he can also feel the other by the same part: contrariwise he that cannot feel one of them, cannot feel the other. But they hold that Hunger, Thirst, Pleasure, Pain Corporeal, are discerned by another power; seeing these powers and acts are so separated, that in the part wherein the external are perceived, Hunger, Thirst, and such like are not perceived.

*As*

*the Organ  
of feeling:*

As to the Organ, it is not so easie to find it in this Sense as in the rest, and there are very great Controversies hereabouts, not only among the ancient Writers, but the later also: for some hold the Flesh, others the Skin, others some other thing to be the said Organ: but we conceive the true Organ of Feeling is a Membrane. For where-ever there is a Membrane, there is also Feeling; and where there is no Membrane, there is no Feeling. Hence the Brain feels not save by means of the Membranes; and the Membrane which compasses the bones being removed, the bones themselves have no more feeling. Moreover, because the Touch is a Sense most common, and is given to Living Creatures in their whol Bodies, to avoid the external injuries, therefore its Organ was to be spread al the body over, and that such an one as should have no other office in the Body: for every Sense hath its proper Organ. But if we consider al things in the whol Body, al have peculiar offices save a Membrane: the Nerves carry animal Spirit, the Veins Blood, and other parts (as is known) have other uses. And therefore this office cannot be assigned to them; and there remains only the Membranes which are both similar parts, and have no other use, but are given to Living Creatures only, that they might be the immediate Instrument of Feeling.

### Chap. 7 Of the Internal Senses.

**H**AVING explained the External Senses, we come now to the Internal, which are busied about matters sensible presented by the external Senses. For this is the chief difference betwixt the internal and external Senses, That the external are immediately affected by an external object, whence also they are called External: But the internal are not moved by the external sensible object immediately, but they are moved by the external Senses; and therefore they are called Internal. But as touching the Number of the internal Senses the Controversie is so great (as may be seen in *Francisc. Piccolhomineus, de sens. intern. cap. 3, 4, 5, 6, 7.* *Francisc. Toletus in Lib. 3. de Anima, cap. 3. Qu. 6.* *Collegium Conimbricense in Lib. 3. de Anima, cap. 3. quest. 1. Artic. 1, 2, 3.*) that it is a hard matter for a man to disintangle himself, being herein engaged. We retain the common Opinion, which is the most probable, and acknowledg three internal Senses, from the diversity of Offices and Works by them performed, viz. Common Sense, Phantasie or Imagination, and Memory.

*the inter-  
nal senses  
are three:*

*Common  
sense*

We must by al means hold a common Sense: For since Animals do know the differences betwixt the proper objects of sundry Senses; and the external Senses cannot perform this Office; since each of them knows only its own peculiar object: of necessity we must hold there is some internal Sense, which apprehends the objects of al the external senses (whence also 'tis called the common Sense) and discerns one from another, and does know that color differs from sound, sound from smell, smell from taste, taste from what is hot, that which is hot from that which is black, &c. For the chief Offices of the common Sense are, to perceive the objects of al the external Senses by help of the said Senses; to know and perceive that we are sensible of this or that; to know the difference betwixt the divers objects of the Senses; to judge the privation and absence of the objects, as of darknets, silence, &c. to move the Phantasie and to offer Images and representations of things thereunto. This Sense therefore is as it were the middle stickler betwixt the Senses internal and external, and receives images from the external, and communicates them to the rest of the internal. Whence it is not unfitly compared to the Centre of the Circle, wherein five Lines concur and meet together.

*Phantasie:*

Besides the common Sense the Phantasie must also be added. For since in perfect living Creatures it is not only necessary to apprehend things present, but also diligently to consider that which is no longer present, that they may be incited either to seek or shun the same; among the internal Senses we must also reckon Phantasie, which may retain the sensible representations perceived by the common Sense, or framed by it self, and diligently examine the same. And although it be altogether necessary, that the Phantasie be first moved by the external Sense; yet after it hath once perceived the object, and hath committed the image thereof to the memory, afterwards even in the absence of the external object, it can as often as it list review and imagine over again the same image. But of necessity the Phantasie must first be moved by the external Sense, and we can imagine nothing which we had not before perceived by the external Senses. And though we may imagine a Mountain of Gold and the Monster called a *Chimera*, which we have never totally seen; yet we have seen them



them by piece-meal; and except we had seen Gold and a Mountain we could not imagine a Golden Mountain: so unless we had seen a Lyon, a Goat, and a Dragon, we could not imagine the *Chimera* or Monster compounded of all those Beasts.

Finally, among the internal Senses the Memory is to be reckoned: For because the Fancy without knowledg cannot receive the species or representations of things; and it cannot take cognizance of many things at once: therefore there is need of a faculty, which itself does not take cognizance, yet is subservient to cognition, that is to say, which may receive divers sensible representations known by the Fancy, and reserve the same, and suggest and present the same thereto again when need is. Also Experience it self does witness, that in diseases of the inner Senses, one of them may be lost and destroyed or depraved, the other remaining safe and sound: and in Feavers it often happens, that the Patients their Memory being sound, do imagine that there are Fiddlers and other things in their Chambers, and seek to pick flocks and feathers or straws where there are none: and such like examples are frequent in the Writings of Physicians: which is an argument that the Fancy is a faculty distinct from the Memory.

Now some do make a twofold Memory, Sensitive and Intellective: but it is enough to say that the Memory is a Faculty common to Man and Beast. But after what manner the act of remembring is performed, is a very obscure point. They commonly hold that sensible objects do imprint certain images on the Brain or Organ of Sense, even as in Wax the Picture of the Seal is imprinted, which remains after the Seal is taken away. Whence they say, such as have an hard and dry brain have an hard apprehension of things, but retain them longer; but they that have it moist and soft, do easily receive, but cannot so long and faithfully retain.

But it is (peradventure) more advised to confess that in this point we are in the dark, than to hold such things; especially if you weigh that which *Scaliger* hath, in his 397. *Exercit. Sect. 28.* against this Opinion. For if Memory be made after this manner, since it is in a manner Infinite; in what spaces can so many Images be retained? in what seats can they be so disposed and ordered, that we may draw out, rank, direct, every one apart, and all together. Now why a dry Brain is more apt for Memory, *Scaliger* brings a new cause in the place forecited, which may there be seen.

Now there are two acts of Memory, or of the remembring Faculty: the one of which is called by the name of the Faculty, Memory; the other Remembrance. Memory is defined to be the iterated apprehension of a thing formerly known; or a repetition of what hath been formerly perceived by the Senses, just as it was perceived: For examples sake, if I am asked what's the name of the King of France, I can suddenly recite the same, as I have sometimes heard it named. But Remembrance is to go back from one or two things retained in the Memory, til we cal to mind somewhat which we had as it were forgotten: as if a man having forgotten a name, should go over all the Letters of the Alphabet, and joyn every Consonant to each Vowel once, and so make single syllables, til meeting with the first syllable thereof, he come thereby to cal to mind the whol name which he had forgotten. And therefore more things are required to Remembrance than to Memory; and Memory is common to the Bruits, but not Remembrance: For to Memory it is enough that we apprehend a thing again, after the same manner as we received it: but to Remembrance it is requisite, that the thing be first forgotten, and then that we hold another thing fast in Memory, whereby we are brought again to the knowledg of what we had forgotten.

Nor does it seem necessary to hold any more internal Senses. Some indeed do add the *Æstivative*, to discourse from that which is known to that which is unknown in particulars, or to perceive those things which the Senses could not perceive: for examples sake, when the Sheep sees only the color, bigness, and shape of the Wolf with its eyes, and yet does not for these things fly the Wolf, they conceive it necessary to add an *Æstivative* Faculty, whereby the Sheep discerns the enmity of the Wolf against it self, which falls not under cognizance of the external Senses.

But this Opinion seems not agreeable to truth: For the Faculty of Reasoning and Discoursing is only in Man alone; and for the apprehension of all sensible things, the Fancy alone is sufficient: nor must we hold a peculiar faculty which they cal *Æstiativa*, because of the enmity, pleasure, hate, or pain which Animals perceive from some things. For these are nothing in the sensible object it self, but passions and affections following upon the perception of a thing, and proceeding from a certain proper natural Instinct which is granted to living Creatures to stir up the appetite, either to seek or shun the object: For in the perception of all sensible things, these three things do follow one another in order: First the

the Me-  
mory:A twofold  
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brance.

perception of a sensible object under the proper notion of an object: Secondly, pain or pleasure arising from the said perception: Thirdly, a stirring up of the Appetite, which either seeks the object as pleasing, or shuns the same as displeasing. The two former do pertain to the same faculty, viz. The sense or Phantasie, yet with some diversity. For the Apprehension of the object under its proper notion, is the work of the Sense as Sense, and the Fancy as Fancy; and all Living Creatures do perceive the object under the notion of an object after the same manner, both with the external Senses and the Phantasie: as all Creatures discern a white color as white, none as black. But the Apprehension of the object as pleasing or displeasing, is not of the Sense as Sense, nor of the Fancy, nor do the same things seem pleasing or displeasing to all Living Creatures: but this belongs to the Senses as they are limited and determined by the proper form of every Creature; which because it is for the most part unknown to us, is by some called natural Instinct. Hence the sight of a Wolf is painful to the Sheep, which yet it is not to the Lyon, but rather a delight if the Lyon be hungry.

This Question is by *Zabarella* thus explained. But it may to the same purpose, yet peradventure more clearly, be thus briefly resolved. In all living Creatures there is not only the Vegetative and sensitive Soul; but also as was said before a certain peculiar specific form, whereby every Living Creature differs from others of another kind, as for Instance whereby a Lyon differs from a Man, an Horse, an Ox, &c. This in Man-kind is the Rational Soul; and in Brutes also, it is a peculiar soul, which though it be not a rational soul, yet it answers to the Rational Soul in Men, and is in some more noble, in others less noble; and to this all those more noble operations, which cannot be referred to the Senses, and are different in several Creatures, are to be ascribed.

And therefore their Doctrine is not true (among whom is *Piccolhomineus, de sensibus internis, ch. 11.*) who hold that it is one of the Offices of the Fancy, to ad subnotions, and to judge the objects to be agreeable or disagreeable to the Creature; also that it is the principle of sundry admirable works, which irrational Creatures perform, as the Swallows making her nest, the Spiders weaving her web, the Bees making her Honey-comb, &c. For as in Man, to reason is not a work of the Fancy; so in Brutes it is not the work of Fancy to act such things as are proper to their kind, but of a superior faculty, whereby every Brute is distinguished from other Brutes.

whether  
bruit beasts  
are ratio-  
nal? Hence that Question of some may easily be decided, Whether Brutes are Rational or no? That they are not Rational is certain, because they are not Men. Mean while as a man not by his Phantasie, but by Reason is differenced from other Living Creatures: so the soul and specific form of every Brute hath a proper faculty above the Fancy, whereby it differs from other Brutes. And hence there is so much variety in the actions and works of Brutes, and some are more ingenious and crafty than other some; the Fox than the Hog, Ox, or Ass; the Bee than the Fly: Of which matter he that would rightly judge, let him consider what is written of the Works of Elephants, Dogs, Silk-worms, Bees, &c. and what dayly accurs in Nature.

### Chap. 8. Of the Desiring and Moving Faculty.

what the  
Appetite is HAVING treated of the knowing Faculty of the Sensible Soul: we are now to speak of the Appetite. And although there are sundry Apperites, and as *Scaliger* in *Lib. 1. de Plantis*, writes, the Fire is said to have an Appetite to mount aloft, the Lion to joyne it self to the Load-stone, a Plant to augment its moisture, an Horse to Venery, a Man to blessedness; yet here we treat only of that kind of Appetite which they commonly call Sensitive; which is a power of the Soul, whereby a Living Creature hath an inclination towards something perceived by the sense. Its object is some good thing apprehended by Sense, whether it be really good, or only appear so. For the Appetite tends to an end; and every end hath in it the notion of goodness. But although the Appetite is said to seek good, and fly from evil: yet evil also belongs to the Appetite under the notion of good; for to fly evil seems to the Appetite a good thing. From the Appetite as its acts proceed the Passions and Affections so called.

The Mo-  
tion of li-  
ving Crea-  
tures. The Appetite of Living Creatures is followed by their voluntary motion; for unless the Creature had a power to attain what the Appetite desires, it were a vain thing for it to have an Appetite; but Nature doth nothing in vain, but hath granted a faculty to Animals springing

ging from the Sensitive Soul, whereby they can transfer either their whol Body, or some part thereof, from place to place.

Now to cause this Motion, five things are necessary.

I. An Object, which may excite the Creature to move, and for the sake whereof it is moved. For a Living Creature is not moved in vain: but the Appetite is stirred up by the Object as its end and good thing desired. *Motion how caused.*

II. There must needs be a directing Principle by which (being in the living Creature) the first motion is made. For voluntary motion is given to living Creatures, to seek out things profitable, and to fly things hurtful; which cannot be done, unless there be some power which may know the Object, and offer the same to the Appetite, and incite the same either to seek or to shun the same. And therefore this principle ought to partake of knowledg. Moreover, because a living Creature is moved not only to things present, but absent also; it ought to perceive not only things present, but such also as are absent. But these conditions do neither suit with the nutritive Soul, nor the external Senses, nor the common Sense: but only with the Fancy. For although the mind also may direct to Motion: yet it is a more remote principle of motion, nor does it move without the Fancy; whereas nevertheless the Fancy may move without the Mind; as we see in Bruits, which though destitute of Reason, yet are they incited to motion by their Fancies.

III. To come a little neerer, the Principle of Motion and that which commands the Motion is the Appetite. For because the motion of Animals is made to follow after some things profitable and convenient, and to fly some things adverse and noxious; and that to the Appetite belong the affections of Love and Hatred: of necessity in the next place the Locomotive or stirring Faculty is moved by the Appetite, so that the Appetite commands Motion.

IV. Besides the Appetite, there is need of an executive power, which may produce into act that motion which is commanded by the Appetite, and perform the same. For since Local motion is a different operation from the operation of the Appetite, and the operations of the Appetite are immanent, but motion a transient action: another power must be granted, which is the immediate cause of Local voluntary motion in Animals.

V. Finally, An Instrument is requisite by which the motion may be performed. For Experience shews, that those who have some Member maimed, although the object be at hand, and the Fancy do move the Appetite, and the Appetite command motion, yet they cannot stir, because of the unfitnes of the Instrument. Now though there is some Controversie among Authors, what is the Instrument of Motion; yet we hold that it is a Muscle. And whereas some make anxious Inquisition, which part in a Muscle is the chief Instrument of motion, whether a Nerve or a Tendon; they seem herein to busie themselves more than they need. For, as Aristotle hath it, 2 de Part. Animal. cap. 1. The power of sense is in the similar parts, but the Actions are performed by parts dissimilar.

The voluntary motion therefore of a Living Creature is made after this manner and order. In the first place an external object is offered, which as an immovable mover, being received by the external Senses and the common sense, is communicated to the Phantasie, and is thereby known what it is. Afterward more attently and punctually it is known whether it be convenient and acceptable, or hurtful and unpleasing. This knowledg is followed by Love or Hate, or an Appetite to lay hold on a thing grateful and delectable, and to avoid a thing hurtful. This Appetite in Bruits is presently followed by motion. *The manner and order of the motion of a living Creature.*

But in Man, before motion be made, some things do yet intervene, For the Appetite and these motions of the internal Senses are offered to the Mind, that they may be thereby approved or disapproved. If they be approved, and the mind understands that the Appetite of the Senses is right, presently motion follows: but if it be rejected as false, a contention and fight arises betwixt the sensitive appetite and the rational, til the one vanquishes the other; and that which overcomes is the principle of the motion, and commands the motive faculty to move. The motive faculty being implanted in all the Muscles of the whol Body, does contract such Muscles as are needful: the Muscles being contracted draw the Tendons to them, the Tendons being drawn draw the Bones: finally, the Bones being moved, the Member or whol Body is transferred from place to place.

## Chap. 9. Of Sleep, Waking, and Dreams.

**S**leep and Waking are Affections of the Senses hitherto explained. For we perceive a Man is awake, by the exercise of his external senses; and that he is asleep by their cessation from operation. And therefore sleep seems to be a privation of waking: and sleep and waking belong to the same faculty, viz. the sensitive: and sleep and waking are affections of the sense, agreeing to all Animals and to them alone. And therefore things destitute of a sensitive Soul neither sleep nor wake, as Plants. Again no Living Creature doth alwaies sleep, nor alwaies wake. For because all things must necessarily be weakened in their Operations, and the Spirits are consumed by the operations of the Senses; Sleep is also necessary to repair the strength and restore the Spirits. And though this be not so manifest in the more imperfect Animals, which are not furnished with all their Senses; yet manifest experience convinces that the more perfect Animals do sleep. Of which see *Aristotle* in his 4. *de Hist. Animal.* cap. 10. *Pliny* in *Lib. 10. Nat. Hist.* cap. 75.

the Cause  
of Sleep.

Now Sleep is not every cessation of the Senses, or impotency in the exercise of the Senses: for even in swooning fits also, and other Diseases, the operations of the Senses cease: but when there is an inability to operate in the first Organ of Sense. Sleep therefore is a natural cessation of the common sense and the other senses, caused for the good of living Creatures, or as *Aristotle* saies in his *B. De Somn. & Vigil.* cap. 3. *It is the Cessation of the first original of sense, as being unable to act,* of which definition see *Scaliger* in *Exercit.* 289. Now the common sense is chiefly affected in sleep; and it resting the other external senses rest also. But the other internal senses do not alwaies necessarily rest in sleep: but if they do, it is because the external rest. For if the Fancy doth sometimes not operate in sleep, that doth not therefore happen because sleep is an affection or adjunct thereof, but because there is nothing brought unto it from the external senses to busie the same.

Now what the Cause is which thus binds as it were the external senses, is worth our Enquiry. The cause whereof is nothing, but that the animal spirits do not flow from the Brain into the Organs of the Senses. But what should hinder the Influx of the spirits is somewhat obscure. *Aristotle de Somno & Vigil.* cap. 3. held that this was caused by obstruction of the passage of the common sense, through which the animal spirits as a common Instrument of the Soul are sent into the Organs of all the senses. Now the obstruction he saies is caused by vapors, chiefly such as are carried out of the Stomack into the Brain. For they when the living Creature rests, whereby the Brain becomes somewhat colder, are condensed, and become more thick and heavy, and so begin to descend again, and stop the passages of the Nerves, so that the animal spirit cannot be carried into the Organs of the Senses, of which thing there are many tokens: for after meat, especially if we have eaten liberally, we become sleepy, and Persons that are drunk sleep exceedingly: contrariwise, such as have fasted long cannot sleep a nights, and most sleepy medicaments do send many vapors into the Head, or cool the Brain, that the vapors may be therein somewhat thickned, and so may stop the passages. Others contrariwise, conceive the sleep is not caused by vapors, nor by such things as stop the passages of the Nerves, but because the soul draws back the spirits to it self, lest by continual operation the animal faculties should be destroyed. Hence not only after Meat sleep comes; but Musick, Weariness, Darknets, and Quiet cause sleep.

But both these Opinions ought (I conceive) to be joyned together, and thus Sleep is bred. The living Creature being composed to rest, the Soul finding a kind of languishing feebleness, by reason of the operations of the senses all day long, dissipation of the spirits, and absence of the quickening heat of the Sun, endeavors a restauration and recreation of the strength and spirits to the preservation of the living Creature in Health. And because the animal spirits have their original from the Vital, that the Vital may first be restored and repaired, the Heart draws to it self some Heat, which is scattered into the other parts. Hence the remote members, and especially the Brain, becomes a little colder, to which the coldness of the nights Air, and the Ceasing of the bodies motion, which causes heat, do lend an helping hand: but the Heat about the Heart and parts thereabouts is encreased. The Heat there encreased raises out of the Aliment certain sweet vapors, which being carried to the Brain, by the coldness thereof are a little thickned, and begin again to descend; and slipping into the roots of the Nerves they fill and stop their passages, and are the cause, both that the vital spirits and Heat cannot ascend out of the lower parts into the Brain, and that the animal spirits

cannot

cannot be distributed into the Organs of the Senses: for want of spirits all the members do hang loose, and all the operations of the external Senses do cease.

The End therefore of Sleep is to restore the strength of living Creatures. For because much spirit is consumed by motion, and the operation of the external senses, that the Creature may not be endamaged in point of health, they must of necessity be restored. Scaliger in *Exercitat.* 289. adds another End, in these words: *Sleep was made by God, not only (as is well said) to refresh and repair the Body, but for the Liberty of the Mind. For because if you regard the offices of life, when we sleep we live but the life of Plants; it was his pleasure that then we should truly live: For the Servant at that time is free, yea and becomes a Master sometimes in his Dreams. The Minds of evil men are punished in Dreams, those of good and wise men become divine, by the searching out of truth and performance of laudible offices. For being freed not from the Body, but from its service, they do their own work: for they move themselves, and also advance themselves to the Pattern of their End which they shal in time see face to face.* *the End of Sleep.*

To Sleep, *Watching* is opposed, which is nothing but the Activity or Freedom of the Senses. Now a living Creature is wakened from sleep two manner of waies, either of its own accord, or being disturbed and troubled by some external Cause. The first manner is most natural, and comes to pass when the Heat which had hid it self within, for the digestion of the aliments, and reparation of the spirits (concoction being finished, and the spirits repaired) doth again break forth into the outward parts, and discusses those vapors which were an obstacle to the Spirits, that the Spirits may freely pass into the Organs of the senses. Now although sometimes the living Creature is awaked of it self, before concoction be finished (if sharp vapors arising from bad humors be carried into the Brain; or through some other Causes) yet this manner aforesaid is most common and natural.

Now the wakening of a man out of sleep by external things, (as if a man be rouzed by crying aloud and pulling) is caused by perception of external sensible objects. For although in sleep there is a defect of spirits in the Instruments of the senses: yet the Organs are not quite void of animal spirits, but there are some yet remaining in them, which are sufficient to perceive vehement sensible objects. Therefore the sensitive soul in sleep being stirred up and provoked by a vehement external object does begin to exercise its senses, and at first it obscurely perceives the object, but afterward that it may more clearly discern the same, it gives out a greater quantity of spirits; which seeking way to the Organ of that sense which is affected, they break through the passage of the common sense; and so way is opened to the Organs of all the Senses, and consequently the sleep ceases. Hence they who in sleep have the passages of their senses obstructed by many thick vapors, which is usual in such as are drunk; they are hardly awakened, nor can their spirits easily find their passage: but those who abound not with thick vapors are easily awakened. For the same cause the first sleep is more sound and deep; because the vapors in the first concoction are more plentiful and thick, which afterward are by little and little consumed and attenuated.

In sleepy Dreams do happen, which are no passion of the external senses. For in such as sleep (who only Dream) all the external senses are bound and tied up. Nor is a Dream a passion of the rational Soul: for Dogs and other Creatures Dream as well as Man-kind. But a Dream is an adjunct of the internal senses, and especially of the Fancy: and it is defined to be a Phantasm or Apparition happening to such as sleep. *what is a Dream?*

And because in such as Dream the Fancy is busied, and some apparition appears there-to; and we Dream not only of things which we have done in the day time, but also of things a great way off, and which we have neither seen nor heard, nor perceived by any of our senses, yea and of things never yet done, but which are hereafter to come to pass: The Question is how the Images of things absent, never perceived by our senses, and which are not yet come to pass, can be offered to our Fancy. The Epicureans held (as appears out of *Lucretius, Lib. 4.*) *That certain thin Images do come from the outside: of visible objects, which are as it were their Skins and Barks, having the representation of the things from whence they came. And these they thought did insinuate themselves into Persons asleep, and toreshew things to come.* But this Opinion hath been long ago rejected.

The conceit of *Cælius Rhodiginus* is not much better, who in the 27. Book of his ancient readings, Chap. 11. denies that there are any such Images flying up and down in the Air, as the Epicureans imagined: yet grants that there are certain motions which exercise and work upon us in stead of Images, and that they do proceed from the Beginnings of certain things after wards to be said or done, the Air being first changed, which being afterwards through the

the Nostrils and Ears transmitted to the Heart, they cause us in Dreams to foresee the events of future things. And that these motions cannot at any other time make themselves sensible save in the night. But what motions can there be of things which are not? or how can things absent fifty or a hundred miles all along affect the Air? or why should not these motions affect any persons that sleep, but only such as are concerned to know the thing revealed?

We refer all such Dreams which are of things which we never before perceived with our Sense, or arise from causes which are not in our bodies, unto a more Divine power. Thus therefore we conceive Dreams are to be divided.

The Differences of Dreams.  
Animal Dreams.

Dreams are some Natural, others Supernatural or Divine. The Natural are such as proceed from Natural causes. And these again are by some divided into Animal and Natural peculiarly so called. Those are called Animal which are conversant about such things as have been presented to us while we were awake. For certain species or Images of sensible things are imprinted upon the internal Senses, which remain even then when the Senses work not, and when sensible objects are absent, and raise dreams. These though they do not alwaies appear to persons awake, being busied about other objects: yet in persons asleep, the Senses ceasing to operate, they again arise, and present themselves to the Fancy. These Dreams do not alwaies present things to us just as they were acted: for nothing can be imagined so foolish, absurd, and monstrous, which is not presented unto us sometimes in Dreams. For the Soul being not wrought upon by external Objects, revolves the Images of things formerly presented, and joyns this with that as each offers it self, and of many and divers things compounds one; also it wonderfully confounds the order and circumstances of things. And to this the plenty of bad vapors is a furtherance. For as bad vapors and humors in persons awake, as in such as are melancholy and mad, by disturbing the Brain are a cause of absurd cogitations; so they do the same in persons asleep; so that it is rightly said, Dreams are the Ravings of persons asleep, and Ravings are the Dreams of such as are awake. Hence melancholick persons, and such as have over eaten, have absurd and terrible Dreams. And for the same cause, such as are drunk, and those that first compose themselves to sleep, have for the most part no Dreams; because there is in them so great store of vapors that their Brain is filled, and all the images overwhelmed: But towards day, and after the Meat is digested, the Dreams are more clear, because the vapors arising from the Meat are attenuated and for the most part dissolved.

Natural Dreams.

But Natural Dreams are such as arise from some hidden cause in the Body, as the humors, temperaments, &c. For if such a cause be vehement, it may even in sleep also affect some external sense, and present an image of it self to the Fancy; yet it seldom does it distinctly, but by the appearance of some other thing like to it, or joyned with the appearance of a like thing. So, as *Galen* relates *de Prasag. ex Insomniis*, when a certain man dreamed that one of his Thighs was turned into a stone, a while after unexpectedly he was taken with a palsy in the same Thigh.

Supernatural Dreams.  
Divine Dreams.

But to Supernatural Dreams we refer all those which are sent into us by higher and supernatural causes; whether it be by God, good Angels, or Devils. Such as are infused by God and good Angels, are termed Divine, of which some examples are extant in the holy Scriptures. For the most good and great God is wont to present to men in Dreams, either new Images of things, or so to order and joyn such as were in them before, that they may become warnings of things to come. Also the Angels are wont to excite and aptly to dispose such Images, Spirits, or Humors as are in the Body, as that they may admonish a man of some necessary and profitable thing. But Diabolical Dreams are caused after the same manner as the Angelical, but to a different end: For the Devil studies to do men mischief, and endeavors even by Dreams to possess them with vain Superstitions; which the Oracles suggested in Dreams do witness; some examples whereof are related by *Tertullian* in his Book *de Anima*. *Caelius Rhodigin. antiq. Lect. lib. 27. cap. 14.* or by ungodly and lascivious Dreams he endeavors to allure men to lusts and unlawful pleasures.

Diabolical Dreams.

From the Premises it is apparent how even absent and future things may be presented to us in a Dream. The Platonists conceive many Dreams may be caused by the Geniuses and Spirits which they conceived did attend upon every man, and admonish them of many things; and the Divines refer them more rightly to Angels, which many think every man hath to attend him. But this seems fit to be added to what hath been said out of *Tertullian*, who in his Book *de Anima* thus writes; the liberality of Divine Dreams is also wont to drop down upon prophane persons, God making the Sun to shine upon the just and unjust. For even *Nebuchadnezzar* had a Divine Dream. And as Gods goodnels vouchsafes it self to Heathens,

Heathens, so also the tentations of the Devil do follow even holy men, whom he abstains not to tempt by day, or to molest when they are asleep, if he cannot do it when they are waking.

From what hath been said it is easie to collect what we are to think of Divination by Dreams. For Dreams are either Significant, which foretel somewhat; or Non-significative, which foreshew nothing. Again, significant Dreams are either Theorematical, which cleerly express the Nature of the Event; or Allegorical, which express the thing foreshew-ed wrapt up in figures and Allegories. To explain these latter is not in the reach of every one; but they are the best expounders of Dreams, who can best discern the similitudes and resemblances of things: whereof the Books of Interpretations of Dreams do treat.

*Touching  
Divination  
by Dreams.*

The Dreams infused by God and good Angels do questionless foreshew somewhat to come: but al cannot expound them, only they that have it granted them by God. Most Diabolical Dreams are vain, and sent to allure men to sin; and if any of them be true (for the Devil also can sometimes conjecture things to come, knowing them by their superior Causes or Signs) he does also by them endeavor to draw men to some false Religion. But Natural Dreams, which arise from the Constitution of our Bodies, do also afford signs thereof; and Physicians are wont to observe them; and what Dreams do argue such and such Constitutions of Body, is taught at large by Hippocrates, *de Insomniis*, and by Galen in his Treatise *de præsagiis ex Insomniis*: and seeing these are most frequent, it is well said by the Preacher, *Ecclesiastes 5. In the multitude of Dreams and many words there is much vanity: but fear thou God.*

Chap. 10. *Of the Differences of Living Creatures.*

HAVING spoken of the Form of Bruit Beasts, we should now speak of their Bodies. But forasmuch as Man of al Animals or living things (for we trouble not our selves whether these terms do differ, of which see Scaliger, *Exercit. 216.*) is the most perfect; and in every kind the more imperfect are to be judged by the most perfect: Moreover, the parts of al Animals or Living Creatures are not yet known and described; but in the description of the parts of Mans Body Anatomists have been as diligent as can be imagined: Such things as should have been said of the parts of Living Creatures in general, must be fetcht from the History of the parts of Man; and such things wherein the parts of other Creatures differ from those of Man, must be taken into consideration. We shal here therefore treat rather of the differences of Animals; where also some things wil fal in our way as touching their parts. And seeing every living Creature consists of a Soul and a Body, we wil weigh and consider the chief differences which flow both from the Soul, and from the Body, and from the whol Creature, consisting and made up of both.

And first as to the Vegetative Faculty, three things are therein considerable: Nutrition, Augmentation, and Generation. And as for Nutrition, there is no Bruit Beast which does not eat some kind of food or other: for some eat flesh, as the Wolf, Tigre, &c. some eat divers kind of things promiscuously, as Dogs; some Herbs and Corn, as Horses, Harts, &c. some feed on Worms, as very many Birds; and some on Fishes. And of these again, some hunt for their living, and prey upon other Creatures, as the Crocodile, the Lyon, the Wolf, &c. some lay up their Meat in Summer, as the Pismires; some seek their Prey night and day.

*The dif-  
ferences of  
Living  
Creatures  
in respect  
of the Ve-  
getative  
faculty.*

As to Generation, Bruit Beasts have doubtless a Faculty (which they received from the blessing of God at the Creation) of multiplying themselves by mediation of a certain Seed, whether it be properly so called, or analogically, in such things as are commonly said to be produced by equivocal Generation. For we find by experience that Insects and such like things, which are said to be produced by equivocal generation, are not generated in any, but only in some peculiar sort of matter. For a Beetle is not bred of any, but only of some determinate sort of Matter. Hence also it comes to pass that Beasts generated of a putrid substance, containing therein a fitting Seed, are not found to differ from other Creatures of the same name. For besides that they agree altogether in form and figure, they do moreover possess the same proprieties, and perform the same operations, and can beget their like.

For living Creatures are produced three manner of waies: Some by a mutual Conjunction of male and female; some out of the putrid matter of a corrupted body, but containing in it a seed fit to propagate such a Creature: and some are produced both waies, viz. both by Copulation

*A three-  
fold Gene-  
ration of  
Living  
Creatures.*

Copulation and by putrefaction, as Mice, Locusts, Beetles, Flies, &c.

Moreover, Brut Creatures engender after sundry manners; some produce live Creatures, and are therefore called *Vivipara*, as Does, Bitches, Dolphins, Vipers; some bring forth Eggs, out of which cherished with a benign gentle Heat, are hatched Chicken, Birds, Fishes: Finally, some bring forth a Worm.

What an Egg is.

*Aristotle* defines an Egg, that thereout an Animal does exist, not from the whol, but from one part thereof only, the rest being turned into nourishment: and a Worm he defines by saying, that the whol grows up into an Animal. And so *Aristotle* divides an Egg into two parts; which in perfecter Creatures are manifestly different and distinct in color; but in the imperfecter sort of Creatures they are not seen distinct, but both are confounded and jumbled together into one substance.

Of which part of the Egg the Creature is made.

But of what part of the Egg the Creature is made, is a controverted point. *Hippocrates*, or the Author of the Book *de Natura pueri*, saies, That it is made of the Yolk; *Aristotle* saies of the White. If we consult with experience we shall find it as *Aristotle* saies; and thus we shall find it to be: If you shall open an Egg the second, third, or fourth day after the Hen hath sat upon it, and diligently view the same; you may easily observe that the Heart is the principal Member: For it is easie to see that the rude Chick is first formed, and in it, first the Heart, which sends forth two veins; and after the generation of the yong Chick, the Membranes which are thereto subservient are evidently seen to grow together. And indeed on the eighth day, the heart is not only apparent, but together with the Veins, being of the same red color, it is manifestly seen to move and beat. On the fourth day the bodies of the Membranes being now confirmed and grown thicker, begin to be less transparent: on the seventh day by reason of their compactness, they obscure the whol Chick in a manner, or cover the same; yet the Heart is seen by its conspicuous red color, as also the Veins, and by its motion. Mean while, the Liver does not yet appear, but on the seventh day there is first seen a liquor or yellowish slimy Matter underneath the Heart, which is the beginning of the Liver growing together, and in the following daies it makes up this Body of the Liver; till which time there remains much of the Yolk, yea, when the Chickens are hatched. And in this place of the Liver for nine whol daies together, after the first formation, no blood is seen; the heart notwithstanding in the mean while being full of blood, as also a most large Vein, drawn under the heart, the whol Bodies length. By al which it appears manifest, that the Soul sticks in the Heart as in its Root, and that the Heart is the first thing which lives, and is the Creature as it were.

But of which part of the Egg the Chick is framed, and with which part it is nourished, is not so plain: yet thus the matter seems to go. Much about the middle of the Egg longwaies, where the Yolk is joyned to the White above, the second day after the Hens sitting, there is a certain whitish beginning, more compact than the rest of the White, and as it were through a glass there is the appearance of a Chicken, the head being most conspicuous, and near the Head a red point dilating and contracting it self: The daies following, from that red point a very red Vein is drawn al along the Chickens back, every day further and further; from which afterwards Veins proceed to the skins drawn about the yolk. By which it may be conjectured, that the Chick is first made of the White; and that the aliment to be turned into blood is made of the Yolk, and carried through the Veins to the little skins stretched about the Yolk, and perfected in the Liver, which Liver hath also a similitude with the Yolk. Yet if any man shall hold, that the Yolk gives nourishment to the blood and parts nourished with blood; and the White to white parts bred of it self, and like to it self, till the Liver grow so strong as to be able to afford nourishment to al the parts, and that therefore the place of shaping is in the confines of the White and the Yolk, I shall not contend with him thereabouts.

Howbeit some Creatures there are, which engender not only often, but bring forth many yong ones at a time, as Swine, Hares, Pidgeons, &c but some bring forth few yong at a time, and seldom also. And al for the most part by mediation of the two Sexes; nor are the Sexes confounded in any kind of Creatures, so that the male should be female, or the female male; which some confidently affirm of Hares. Although it may be perhaps granted, That Hermaphrodites are more frequent in this kind of Creatures than in any others.

The difference of Creatures according to the sensitive faculty.

Secondly, There is also some difference in Creatures with reference to the Sensitive Faculty: For every sense is not allowed to every Animal; howbeit the Feeling, as the first sense, is granted to al Creatures. And those that have only this sense and want al the rest, are called *Zoophita*, Plant-animals. All other Creatures have more Senses. Nor do we think fit to deny Sight to the Moles; for to what end have they Eyes if they cannot see? For

although



although they have no need of sight, to see under the ground, yet they have it given them to avoid the light and the bright air; of which see Scaliger in Exercit. 244.

Howbeit, some Creatures excel in one sense, some in another; some in seeing, others in smelling; some in one are more excellent, some in another, both external and internal Senses.

Finally, there is great difference in living Creatures, with reference to their faculty Locomotive, whereby they remove from place to place: For every Creature does shife place, but some after one manner, and some after another. Some only in part, as was said of the Plant-animals, which though they are alwaies fixed in the same place, yet they contract and dilate themselves. But others move their whol bodies, some after one manner, others after another: For some Beasts go, and that either on two feet, on four, six, or more, as Spiders; some move themselves by swimming, as Fishes, and some that live both on Land and Water; others by flying, as Birds; some by leaping, as Grasshoppers; finally, some by creeping and crawling, as Worms and Serpents, who by contraction and dilatation of their bodies do move themselves from place to place.

*The difference of Animals in respect of the Locomotive faculty.*

Moreover, in respect of their parts, there is a great variety in Animals: For as Aristotle hath it in 1. de Hist. Animal. cap. 2. Parts of Animals are the same and divers, either in form, or sort, or exuperance, or analogie, or scituation. And in the first place the parts by which they take their nourishment, and whereinto they bestow the same, are common to al Creatures. For the necessity of food is common to them with Plants: which Plants indeed have from the Earth, and therefore sticking in the Earth they have nourishment enough. But Animals (seeing they are more perfect than Plants) they were to have more exquisite diet than such as the Earth affords. And therefore they had not only tast given them to try their meats, but also members wherewith to receive the same, and turn it into juyce fit to nourish the body, viz. The Mouth and Stomach.

*the difference of Creatures in respect of their parts.*

Now this Aliment received is in several Animals severally changed into Nutriment properly so called, or an humor which is the immediate aliment of the body, which when either by Nature it self (the heat in process of time devouring the same) or by violence (as in sickness and other cases) it comes to be consumed, the life is extinguished. Now this Humor, the next aliment of the body, is in some blood, in others a fatty and bloody moisture, like Sanies or Blood-water running from hurts of the body; as also the part wherein this aliment is contained is in some a Vein, in others a Fibre. Hence Animals are divided into such as have blood, & such as are bloodless. In the more perfect sort of animals, intended for nobler actions, and therefore needing more heat, this Humor is red and is called Blood. Yet there is in some bloodless Animals a certain red humor which is not blood, but an excrement, as in the *Purpura*. But other Animals whose bodies are more imperfect, do also need a less perfect nourishment; if moist, an white; if dry, a more obscure humor: which humors having no proper names, they are termed *Ichores*, and are blood as it were newly begun to be made and imperfect. As also in Creatures that have blood, when the blood is not wel elaborated, it puts on the nature of an *Ichor* as it were, as we see in *Cachectical* persons.

Also al Living Creatures have an Head, except the *Polypus*, who instead of an Head carries as it were a Hive. Limbs are wanting in some Insects; in others the fore feet are instead of fingers. The Elephant instead of hands hath his Trunk let down from his Mouth. Fishes have no necks. Most Creatures have Tails, and they are of several fashions, which Man hath not. Instead of Teeth Birds have Bills of a boney nature, wherewith they do break their meat; instead of Nostrils they have only two holes; as also two passages instead of Ears. Moles have their Eyes obscurely buried, yet are they not without Eyes. Instead of a Tongue many Creatures have a fleshy substance in their Mouths; and many with an external sharp tool spungy and hollow do both tast and draw their meat to them. All Creatures that have Blood have Skin. There is in all Creatures having blood and heads properly so called a Brain, which on the fore side is divided into two parts. The Seeing, Hearing, and Tasting Nerves, with the other parts which make up the whol Organ of Sense, are found in al perfect Animals. And the Heart, or at least somewhat answering thereto, is in al living Creatures. There is no Lungs in Fishes; instead of members of generation, Fishes and Serpents have certain holes ordained for their seed. Most of the Guts and Bowels are to be seen in perfect living Creatures; but in the imperfect they do not exactly agree with those of a Mans body, and for the most part they differ in Fishes and Serpents. Fishes instead of bones have a spine. Insects have a condition proper to themselves; for they have a cloven flesh obliquely directed, and something of a middle nature betwixt nerves and flesh, which is to them in-

*the Polypus.*  
*the Elephant.*

stead of Bones and Spines. Proper Spirits are given to every living Creature, which the Soul doth immediately use to exercise sensitive actions.

*Difference of Living Creatures from the place where they live. whether any Creatures live in the Fire* Moreover there are other Differences of Animals from the places wherein they live, and their Actions. For first, some inhabit only one Element and live thereof; in the Air the *Manucodiata*; in the Water the *Apua*; in the Earth the Toad. But whether there are any Creatures that live in the Fire, Authors are at variance. Some hold that the Salamanders and *Pyraustæ* live in the Fire, as *Aristotle*, *Pliny*, *Ælian*, *Austin*. As to Salamanders they are so far from delighting in Fire, that they are found no-where but in places both cold and moist, and they put out most hot burning coals, either by their coldness or clamminess of substance, before they can be burnt. That the *Pyraustæ* live in the Fire *Scaliger* eagerly defends, *Exercit. 9. 23. and 194. sect. 4.* But others hold there is no Animal which is not burnt and kil'd in the Fire; and that the *Pyraustæ* indeed are bred and fostered in little holes about Furnaces, but never bide in the Fire, whereinto being cast they are burnt: which is probable. Some Living Creatures live in two Elements, and find their meat in both, as Bats or Flitter-mice, which catch Gnats in the Air, and plunder the flitch of Bacon on Earth.

All these may again be included under three kinds, Birds, Fishes, and Land Beasts. The *Manucodiata* (a Bird) lives only in the Air: In the Ocean of *Brasile* there are Sea-Geese which live only in the Water, and never fly out, of a black Colour. In *Mare del Zur*, towards *China*, there are footless Birds, which never forsake the Water. The Ostrich lives only on Land. The Hern lives on Water and Land. The Bat lives in the Air and Earth; The Swan lives, but feeds not in all three Elements.

Fishes that live in the Water and Land are the *Polypus* and Crabs. Those that are in two are also in three; for they are in the Air, Water and Earth, that are in the Earth and Water; for they cannot be on the Earth, but they must be also in the Air.

Of Land Creatures which *Aristotle* terms *Peza* (which word cannot easily be rendred in Latine) some live on the Land and Water, and seek their Food in both Elements, as Otters; some which are very greedy after Fish cannot endure to touch the Water, as Cats: some live only on the Earth.

Living Creatures are after another manner thus divided. By reason of their Food, some are Land Creatures, and others of the Water. Those that live in the Water, do either take in the Water, or they do not. Those Fishes take in the Water that are fenced with Gills. Those which take not in the Water do draw in the Air, or they do not draw it in. Those that draw in the Air and have Feet, are the Otters, Crocodiles, and such like; of those that have not Feet and draw in Air, is the Water-snake; such as of this kind have Wings, are the Cormorant, Sea-gul, &c. Those that draw not in the Air are the *Urtica*, and all Shel-fish. But of Land Creatures, all that have Blood and Lungs draw in Air; but Wasps, Bees, and all Insects do not.

Again, of Land Creatures some fly as Birds, Bees; some go only on the Ground, either with Feet or some other way.

Such as pass upon the Ground, are either Goers, or Creepers, or such as draw their Bodies. Goers use Feet, amongst which Leapers are reckoned: But the Creepers by twisting their long Bodies, and bearing on two sides, as four-footed Beasts on two Legs of a side, do so move themselves. Such as draw themselves, are those which put forth their former parts and draw their hinder parts after them and so win Ground.

*The Difference of Creatures in respect of their actions.* As to their Differences in the actions of their Life and Manners, some Creatures live in Flocks and Companies, others live single and solitary, and some live both solitary and in Companies. Birds that live in Companies are Pigeons, Cranes: the solitary are all Birds that have crooked Talons, none of which live in Companies. Among Fishes the Runners, the Tuny-fish, Whittings, Mackerels. Now Creatures live solitary being necessitated thereto for getting their food. For though all kinds of living Creatures do fly those of another kind and think they may live more safely with those of their own kind, being allured by likeness: yet Beasts that have Scarcity of food, and meet seldom with their Prey, as Birds with crooked Talons, cannot converse with many of their own kind: For as some that meet with plenty of food, live in Flocks, as Pigeons: so to these (and to these alone) by reason of the scarcity of their food Nature hath given both Strength of Body and Fierceness of Mind; and the scarcity of their Foot compels them to Prey upon other Creatures.

Again whether they live in Flocks or Single, some do alwaies inhabit the same Country, some do go out of one into another, and return back again.

Again of those that live in Companies some are Political, others are not, but mind only their own business. The Political are such as observe a civil Policy, which requires that publick

publick works be orderly performed by all, and that there be a Communion of the Profits acquired; and thus do the Bees, the Pismires, the Doves; but the Sparrows observe no such Order. For though they fly in Companies, yet each one by it self seeks its own livelihood, and labors not at all for the whol Society, which the Bees and the Pismires or Ants do.

Again, some Creatures are Flesh-eaters, others feed on Grass; some are Fish-eaters; others Worm-eaters, some All-eaters that will down with any thing, some have a meac peculiar to themselves, as the Bees, of which we spake before.

Moreover, some live in the open Air under the Canopy of Heaven, others live in little holes or Nests. And some have their Nests above, others under Ground; and of those that live under Ground, some make themselves holes, others shelter themselves in furrows made to their hands. Those that live above Ground some live in Walls and Rocks; others make themselves peculiar Houses and Nests. Again some keep themselves in their Nests all day, and at night come out to seek their food, and when it grows light they withdraw themselves into their smal Cottages: others again do what they have to do by day light, and mew themselves up when night doth come.

Again some Creatures are tame and gentle, others wild; and of the wild, some are alwaies so; but some may be and are tamed.

Living Creatures do also differ much in respect of their Voyce. For some utter a Voyce, others have no Voyce at al. Those that have a Noise or Voyce given them, have it to the End to express their Passions or their Necessities. Now these three differ, Sound, Voyce, Speech. Sound is the most common of the three: for every sound is not a Voyce, but only that sound which is made in Creatures, by help of the Lungs, Chest, Wesand, and chiefly the Head thereof, which is the immediate Instrument of the Voyce. Now some Voyces are expressed by Letters, and articulately distinct, other some cannot be expressed by Letters. The latter is simply called a Voyce, the former a Speech, which is proper to Man alone: for although brute Beasts and irrational Creatures, can by Lowing, Squeaking, Barking, Neighing, Crowing or any other way express their Cheerfulness, Fear, Pain, Desire: yet Man alone is able to express all he feels in his mind, with a Voyce made up of Letters articulately distinct, and can communicate the same to others whom he hath been born to live with.

*The Difference of Creatures in respect of Voyce. Sound, Voyce, Speech, how they differ.*

Howbeit; though there are many differences of Animals, they may be reduced to certain kinds, as is apparent from what hath been said. Some are imperfect, others perfect: and the perfect are Land Creatures, Fishes, and Fowls. And if we were to speak of them all, we should pass from the Imperfect to the Perfect, til we came to Man, the Perfection of all Living Creatures.

*Animals some perfect, others imperfect.*

Among Living Creatures *Zoophyta* or Plant-animals hold the first place, because they are of a middle nature betwixt Plants and Animals, for in the shape and figure of their Body they come near to Plants, but in their sense of feeling, and a certain motion, they agree with Animals. For they have the sense of feeling, and being touched do forcibly contract themselves. And though they cannot pass from place to place: yet are they endowed with a power of contracting and dilating themselves.

*Plant-Animals.*

Of these some stick alwaies in the Earth like Plants, as a Tree which grows in the Country of *Pudifeta*, and seems to discern when things approach thereto. For when a Man or other Creature draws neer, it shrinks in its Boughs; and when they go away, it spreads them forth again; and therefore the Inhabitants call it the Bashful Tree. And *Apollodorus* the Scholar of *Democritus* writes of an Herb of like nature, which he therefore calls *Æschbinomene*; because if you put your hand to it, it would avoid the same by shrinking in its Leaves, as *Scaliger Exercit. 181. sect. 28.* does write.

*The bashful Tree.*

*The sensitive Herb.*

Also some cleave perpetually to the Stones or Sands; as the *Pulmo Marinus*, the Sea-Nettle, the Sponges, the *Holothuria* or prickly Fish. And some stick so long to the roots and fibres of Trees, til they attain their just growth, as the *Mytuli* or *Limpins*, which are said to grow on the Stalks of Sea-weed, and to stick exceeding fast to them at first; and having attained their full growth and just bigness they fall from their branches: but they are not generated as other Shel-fish are of themselves.

*Mytuli or Limpins.*

Next after these, and the most imperfect, are Creeping things which grow upon live Animals, either without, as Crab-lice, Lice, Fleas, Ticks which trouble Dogs; but they say that they are not bred upon them, but they catch them as they hunt in the Woods; of which see *Scaliger, Exercit. 195. sect. 7.* or within, and not only in their Guts, but in other parts also; for Physicians have observed that there is scarce a part in the whol Body wherein Worms do not breed.

*A Tick.*

Hereto belong those Insects and small Animals which are bred out of the Carcasses of other Creatures and out of Plants; as Wormes, Wasps, Gurgulions, Flies, Hornets, Coss-Worms, Wood-lice, Moths, Glow-Worms, Wig-lice, Horn-Flies, Grats-Worms. of kin to which are Spiders, *Phalangia*, *Tarantula*, Scorpions, and such like.

*Bees and Silk-worms* Now among these kind of Creatures the most noble is the Bee and the Silk-worm; the former making most sweet and useful Honey; the latter spinning Silk wherewith the great ones pride themselves.

Then follow those kind of Locusts which *John* the Baptist fed upon: Nor is there any need that we should interpret the word *Acrides* so as to signify the tops of Trees, or any Shrub, or river Crabs; seeing we are informed likewise by ancient Authors that some Nations did feed upon Locusts, as *Strabo* in *Lib. 16. in Descript. Arabia*; who also describes the manner how they caught them: and *Pliny* in *Lib. 11. Cap. 29.* who saies the Persians delight in them: and in *Lib. 6. Cap. 30.* that some People of *Æthiopia* have no other Meat but Locusts, which he saies they salt and dry in the Smoak to that end: and among late writers *Cle-nardus* in his *Epistles* writes, that at *Fex* and *Morocco* whol Cartloads of Locusts are dayly set to sale.

Next to these come sundry sorts of Serpents, Frogs, Toads, Salamanders, Locusts: To which are next in name and shape certain Sea-Insects, Flies, *Scolopendra*, Caterpillars, Sea-Stars, and such like.

*Shel-Fish* After them march the Shel-fish of two kinds, for some have their shels open but twined  
*Purple.* strangely about, such as the Purple, and the Periwinkle, and an innumerable sort of Shel-fish,  
*Oysters.* whose shels are shaped like Turbants or Steeples; others shut their shels like two folding  
*Lobstars.* doors, that they cannot be opened without great force, such are Oysters and others of that  
kind, as Muscles, Cockles &c. of kin to which are Crabs, Lobstars, Cray-fish, the Sea-Locust  
and such like.

*Fish.* Next come the other kinds of Fishes smooth and without scales; then the scaly, the Prick-ly, the Sea, the River, the Lake-fish. Of Fishes (besides others) read *Scaliger*, *Exercit.* 218. and *Exercitat.* 223. 226.

*Creatures which live in the water and on the Land.* After these come your *Amphibia*, Creatures which live partly on Land and partly on the Water, as the Tortoise, the water Salamander, the *Scincus*, the Crocodile, the *Cordylus*, The *Hippopotamus* or River-Horse, the Castor or Bever, the River-Crab, the Water-Mouse and Rat. Amongst which there is none that is partly made like a Fish and partly like a four-footed beast save the Bever.

*Birds.* After Fishes Birds must be explained. Now every Animal that flies is not a Bird, but only that which hath blood in it, and is furnished with a Bil and Feathers. Hence Flies, Beetles, Bees, Hornets, and such like are no Birds; as neither the Bat or Flitter-Mouse, which is of a middle nature betwixt Birds and Mice, and may be termed the flying Mouse.

*The Swallow.* Now there are sundry differences of Birds, which *Scaliger* hath collected in *Exercit.* 227. In the first place come Swallows, which fly most swiftly of all others; of which also there is some difference. These beeing commonly not fit to be eaten, neither can they themselves in the winter find their own meat, viz. Flies and other Creatures that glide about in the Air: after the end of Summer when flies are gone, they fly from these parts of the world, *Germany*, *France*, *England* &c. unto the shores of the Baltick Sea, and under huge high Rocks that hang over the Sea, they hang mutually embracing one another until the Spring return, and then when the Bird-Winds blow they return each to its own Country.

After the Swallows come the Sparrows, the Mag-pies, Chaffinch, Tirmouse, and the singing Birds, as the Nightingale, the Lark, Goldfinch, the Linet, the Thrush, the Gnat-snapper, the Red-breast, the Bulfinch; also the prating Birds as Parrots, Black-Birds, Mag-pies, Starlings, Jack-daws, Jays or Gays.

After these come Pigeons, both tame and wild, as the Wood Pigeon, the Stock-Dove, the Turtle-Dove and others.

And then the kinds of Cocks and Hens, and Birds of kin to them, as the Pheasant, the Partridge, the Woodcock, the Quail, the Ostrich, the Peacock.

Then follow Water-fowl, both the flat-footed, as the Swan, and several sorts of Geese and Ducks, The Bittern, the Water-Crow, the Cormorant, the Sea-mew, with the flat foot; and the cloven-footed, as the Hern, the Kings-fisher, and the rest.

*The Eagle.* Then come the ravenous Birds, the Choughs, the Daws, the Crows, the kinds of Vultures and Hawks, the Kite, the Buzzard, the Owl; and finally the Eagle, the Queen of Birds. Concerning Birds see *Scaliger* in his 227. *Exercitat.* and those that follow.

The Bat or Flitter-mouse is of a middle nature betwixt birds and beasts, being a winged Mouse; which is of a wonderful greatness in some places: For Scaliger writes in *Exercit.* 236. Sect. 3. That in *Catigan* an Island of *Mare del Zur* there are Bats as big as Eagles, which the Natives eat, and they tast like Hens. And that in Caves of *Mount Atlas* there are Bats as big as our Pidgeons.

And here we must not omit to speak of the Basilisk or Cockatrice. Now that there is such a Serpent called a Basilisk, is apparent from the holy Scriptures, *Proverbs* 23. ver. 32. *Esay* 11. ver. 8. and 14. verse 29. and 15. verse 5. *Jerem.* 8. verse 7. As also from *Pliny*, *Lib.* 8. cap. 7. and *Lib.* 29. cap. 4. *Solinus* chap. 30. *Lucan* Book 9. *Dioscorides* *Lib.* 6. cap. ult. *Galen* de *Theriaca ad Pisonem.* *Aetius* *Tetrab.* 4. *Serm.* 1. cap. 33. although Authors do not accord in their Descriptions thereof.

But whether there be such a Basilisk as is hatched of the Egg of an old Cock is doubtful: Many count it for a fable: But it is commonly reported that there was once such an one at *Vienna* in *Austria*, and that the Picture thereof is extant on the wall of a certain house; as also at *Basil* and *Zwiccavia*, as *George Agricola* relates in his Book de *Animalib. subterraneis.* But there is a remarkable story which *Job. Pincier* in *Lib.* 5. *Ænigmat. Enigm.* 23. relates from the report of *Dr. Mosanus* chief Physician at *Cassels*: which because few (peradventure) have read that Book, I shal here transcribe word for word. At *Warsovia* in *Poland* it fel out in the Year, 1587. That the Son of a certain Sword-Cutler, and the Daughter of a neighboring Citizen, being both of them five years old apiece, with others their equals in yeats, not enduring to be out of action, after the manner of children they would needs pass the time in sports, and seek hiding holes where their play-fellows should not find them out. There was not far from the place where they played, a Cellar left desolate by reason the House had been burnt which stood over it thirty years before; into which by help of the half-rotten stairs one might make a shift to creep down. Into the said Cellar the two foresaid children going down, they fel down on the lower stairs and died. When Supper-time was at hand, the two Mothers each enquiring for her child could bear no tidings thereof: And therefore the Wife of the Sword-Cutler sent her Maid out, who having long sought them, at last spied them upon the stairs of the Cellar as aforesaid, and presently she cried out, See where they lie. But neither of the children stirring at al, she began to suspect they were fallen asleep, and with a loud voyce called by name, sometimes the Boy, and sometimes the Girl; to see if by this means she might waken them. But when she saw (though she cried til she were hoarse) it was to no purpose, she also went down into the Cellar, thinking to awaken them by jogging and pulling: But see what follows, presently also she falls down by the children and dies. Her Mistris saw the Maid when she went down into the Cellar, and perceiving that she staid over long, al amazed she ran unto the Cellar, and sees the Maid lie on the ground with the children: Therefore she also falls to call aloud sometimes upon the Maid, then upon the children. And when she had done thus also in vain, and none of the three did either answer or stir, she concluded they were dead. Presently a rumor flies about the Town, and the Citizens come running, but know not what to do til the Magistrates and Council of the City being made acquainted therewith, did command that their bodies should be drawn out with long hooks, such as they use to pul down houses in the time of fires. They being drawn out were found swollen like Drums, their lips and tongues were swollen, their color was brown, their eyes stuck out of their eye-holes as big as half Eggs. There came to behold this sad Spectacle the *Palatine N.* and an ancient man the Kings chief Physician, named *Benedictus.* He conjectured that some most venomous Serpent did lurk in that desolate Cellar, by whose deadly breath the air inclosed therein was infected, and that the weak nature of man could not bear the same; and that therefore most like it was that the children and maiden were thereby killed. Also that it might be that a Basilisk or Cockatrice might there lie hid, which Naturalists say is bred of a Cocks Egg hatched by a Toad, whose venom is so powerful that whoever looks upon his eyes dies forthwith. Being demanded how the certainty might be known, he made answer, That somebody must be sent into the Cellar covered round with looking Glasses, the right sides of the Glasses being outwards: For the Basilisk if he saw but his own picture or image would presently die. There were at the same time two Malefactors which three daies after were to be executed, the one being a *Polander*, the other a *Silesian* called *Johannes Faure-rus.* To them it was proffered, That he that would go down into the Cellar and hunt out the Serpent should escape his allotted punishment. *John* presently accepted the condition: And therefore he was covered al his body over with Leather, and Glasses were tied before his eyes, which he could wel see through; in one hand he had an iron Rake, in the other a lighted

the Bas.

The Basilisk or Cockatrice

whether there be such a creature as a Basilisk or Cockatrice.

A memorable story of a Basilisk or cockatrice.

ted Link; finally, to all parts of his body before and behind Looking-glasses were fastened. Thus furnished he entered into the Cellar, more than two thousand people looking on. After he had for above an hour searched all the holes and corners of the Cellar, and could find no Serpent, he called upon them to throw him down another link into the Cellar: for there was another Cellar close by, but the way was so stopt up with rubbish that he could not get in; but he would now see to clear the way, and search there also. And as he was doing that, he chanced to turn his eyes to the left side, and unawares espied the long lookt for Beast in the shape of an Hen, lying dead in a certain hole of the wall: which when he had declared by a shout to them that were without, the Kings Doctor bad him with his Rake to bring it out into the light, which he presently did before all the people. The Doctor presently judged that it was a Basilisk or Cockatrice. It was as big as an ordinary Hen, its head was like that of a Turkey-cock, his Comb resembling a Crown was sprinkled partly with yellow, and partly with blue spots, and his Chotters hanging under his Throat were of the same color. His Back was starred with many eminent spots resembling Toads eyes, the colors of virulent Beasts being every where sprinkled between, but chiefly yellow: The same colors also were on the outside of his Wings: Under his Wings he was all yellow, as also under his belly, where nevertheless blue and green and other wonderful colors were intermingled. He had long Legs like the Legs of a Cock, and yellow as a Quince-Apple; before and behind these two Legs there grew out other two Legs like the Legs of a Toad in shortness and shape. His Tail bowed and turned upwards, and was full of such spots on the top as we said were on his back; lower it was yellow, and in the lowest part like a Toad in color. More may be seen concerning the Basilisk, in the foresaid Book of *Pincierus*, and the place fore-alleaded.

Lastly, There are four-footed Beasts, which come nearest to a Man both in the parts of their bodies, and the faculties of their souls. And among these are such as chew the Cud, that is to say, the meat which they have eaten, and is slip't into one Cavity of their stomach, they fetch it up again through their throat and chew it over again, and so transmit it into the other cavity of their stomach, better ground and prepared for further digestion: For what Nature hath denied them in the want of upper Teeth, that she makes amends for by this double chewing.

Moreover, all these Creatures have coverings given them instead of cloaths; for some have hairs, some more, some fewer; others have bristles, others wooll, and some furr. Again, some have solid, others cloven hoofs.

The lowest and most imperfect kind of these Creatures are Moles, Mice, Marmots, which *Scaliger* describes *Exercit.* 203. The more perfect are the sorts of Weezels, Hedg-hogs, Cats, Dogs (of which see *Lipsius* in his Centuries of Epistles, *Cent.* 1. *ad Belgas Epist.* 44.) Wolves, Sheep, Goats, Rams, Hares, Foxes, Asses, Hogs, Oxen, Apes, Harts, Bears, Elephants (of which see *Scaliger*, *Exercit.* 204. And *Lipsius* in *Epist. miscell. Ep.* 50.) Horses, Elks, Cammels, Leopards, Rhinocerots, Unicorns, and others; finally, the King as it were of all brut Beasts, the Lyon.

Only I must speak somewhat of the Unicorn, of which sundry men are of several minds. *Ambrose Parey* in the 20. B. of his *Chyrurgery*, *cap.* 39. where he disputes largely of this matter, after he hath brought the Narrations of some Authors touching this Beast, and observes that they agree not one with another, he concludes at last, That the word *Unicorn* is not the name of a real Creature in the world existing, but only a Fiction fained at the pleasure of Painters and Writers of Natural History, for the delight of the Readers and beholders.

But in very deed this is an absurd Opinion of his; it is also a rash thing to deny that which so many learned men affirm; and also the holy Scripture it self, *Job* 39. verse 9. *Esay*, 34. verse 7. *Deuter.* chap. 33. ver. 17. *Psalms* 22. ver. 22. and *Psalms* 29. ver. 6. *Numb.* 23. ver. 24.

This rather is apparent from those manifold differing Narrations and Descriptions, That there is not only one Creature that bears a single Horn, but divers: For in the places cited, the Unicorn is made to be a Beast swift of foot, fit to be hunted; which is not true of the Rhinocerot, which is a thick beast with short Legs. Moreover, the Horn of a Rhinocerot is much smaller in compass than that which goes about for the Unicorns Horn. Also *Cæsar*, *Lib.* 6. *de Bello Gallico*, makes mention of an Ox in the Hercynian Forrest, out of the middle of whose forehead betwixt his Ears there grows one long Horn. And indeed there are Five kinds of Beasts that are thus single-horned. The Ox with one Horn in the Hercynian Forrest mentioned by *Cæsar*; And *Pliny* writes that such are found in the *Indies* *Lib.* 8.

whether  
there be  
such a  
beast as  
the Uni-  
corn?

there are  
five kinds  
of uni-  
corns.

1.  
the one  
horned Ox

Lib. 8. cap. 21. Secondly, the same *Pliny* in the same place describes the Unicorn. *Ælian* 2. The Monocerot. Lib. 16. de animalib. cap. 20. in the third place describes a Rhinocerot that hath one black horn in his forehead as thick as the smal of a Mans Arm, of rare vertue against poyson. 3. The Rhinocerot. Fourthly, There is the Indian As, who also carries one horn in his forehead, of whom *Aristotle* speaks in 2. de Hist. anim. cap. 8. and the 3. de part. Animal. cap. 2. *Ælian* in 4. the Indian As. Lib. 4. de animal. cap. 5. *Pliny* Lib. 11. cap. 37. & 41. Fifthly, The same *Aristotle* in the same place, and *Pliny* makes mention of a Beast with one Horn called Oryx. 5. Oryx. So that there is no doubt but there are Creatures that have but one Horn: only the Question is, Which of these Creatures Horns they are that are commonly given out for Unicorns Horns? For the variety of them shews, that they are not al of one Beast: and therefore it cannot be known but by the effect to be good against poyson. *Ælian* attributes that vertue to the Horn of the Indian As, rather than of the Monocerot, to be good against many Diseases and Poysons.

But touching al Animals or living Creatures, to reckon them up in this Compendium is impossible; and here again Nature is so vast of extent, that no mans wit sufficeth to take a muster thereof. And the Nature of this work makes us set Titles for Dishes before our Guests, which *Scaliger* taxes *Pliny* for in *Exercitat.* 107. Let the Student of Natural Philology consult hereof with *Aristotle* in his Book de Historia part. & generatione Animalium; *Conradus Gesnerus* de Animalibus; *Edvardus Wottonus* de differentiis Animalium; *Rondeletius* de Piscibus. And those that have written of some sorts, as *Andreas Libavius* in his Book de Agno vegetabili Scithiæ, of the Lamb that grows in Scythia; his two Books of Silkworms; his two Books of Batrachiorum, of Frogs. *Baldus Angelus Abbatius*, de Vipera Natura & facultatibus: and many other Authors who have writ of Animals.



THE  
EIGHTH BOOK  
Of MAN.

Chap. 1. Of the Rational Soul.



**M**T remains now that we should treat of MAN; who being the Rule and Measure of al Living Creatures, and being compared with the rest, may be said to comprehend them all, because he is furnished with al their faculties and endowments; with the consideration therefore of Man we shal conclude our Treatise of Natural Philosophy.

Now a Man (as other living Creatures) consists of a Body and a Soul. We shal speak of his Soul in the first place. And seeing every Soul may be considered under a twofold notion; first as a Principle and one part of a Compound, or as the Form of the Body; Secondly as the Efficient cause of al operations: We wil treat thereof also under both respects; and in the first place we wil consider how the Rational Soul stands in reference to the Body of Man: and afterwards what operations it doth work.

*the Essential parts of Man.*

No

whether  
the Ratio-  
nal Soul  
be the in-  
forming  
Form of a  
Man.

No sound Philosopher denies the Rational Soul to be the form of a man. But seeing there is a twofold Form, one which is called the informing Form, which is the Principle and one half of the Compound, and gives the thing its specific being, and as a difference distinguishes it from all other things: another which is called the assisting Form, which does not give the specific being to a thing, but is added to a thing already constituted in its specific being, for the performance of some nobler operations, which of it self it cannot perform; (such a form as the Marriner is to the Ship, who gives not the Essence to the Ship, but is adjoyned thereto after it is perfect in its Essence, to cause it to sail, which it could not do of it self:) The Question is, Whether the Rational soul be the informing form of a Man, and the half of his Essence? or only an assistant form, which is added to a man after he is perfect, and hath his specifick form to cause in him some more noble operation, viz. Understanding.

*Avenrois* was of Opinion that the Cogitative Faculty (by him so called and distinguished from the Fancy) was the form of a Man, and by vertue thereof a Man became a particular sort of Living Creature; but that the Rational Soul was only an assistant form. But most of the Latines hold the Rational Soul to be the true form of a Man, and one of his constituting parts; which Opinion we retain as the more true: For if the Rational Soul were not the informing form of a Man, he could not rightly be called Rational; even as a Ship, though the Sailer therein do reason, cannot be called Intelligent or Rational, which were absurd. Or thus, which is the same in effect, that whereby any thing does primarily operate, is the form of the thing to which the operation is attributed. But to Man as Man Understanding is attributed: Therefore the Intelligent Soul is the form of Mans Body. Nor does that answer satisfie, when they say, That the Understanding is joyned to a Man by the Phantasms or Images of the Internal Senses: For the Phantasms are to the Understanding as colors to the Eye. As therefore neither the Color, nor the Subject of colors do see; so neither the Phantasms, nor the subject of the Phantasms do understand; but rather are themselves understood. Thus therefore we conclude: That whereby one thing differs specifically from another is the form thereof. But by the Rational Soul a Man differs from all other living Creatures; that therefore is the form of a Man. *Aristotle* also seems to have been of the same mind, as appears out of the 2. *de Anima*, cap. 1. t. 7. 8. cap. 2. t. 24. 25. 26. cap. 4. t. 36. 37. as *Zabarella* does shew at large in his chap. 7. *de Mente Humana*.

whether  
there be  
one Ratio-  
nal Soul in  
all Men.

From the Explication of this Question another Question may easily be answered, viz. Whether the Rational Soul be one in number in all men? or there be in every one a peculiar Soul? Some that hold the Rational Soul to be an assistant form, do hold that it is not multiplied according to the number of Persons, but that in all Man-kind there is one only, which is the cause of Understanding in all Men. But in very deed this Opinion is many waies contrary to the truth: For every informing Form, such as we have already shewed the Rational Soul to be, is multiplied according to the multiplication of particular persons. And if there were only one Soul in all Men, all should be but one; for they should have but one Form. Moreover, the operations, or understandings, or second acts, are multiplied in Men according to the multitude of Individuals; and my Understanding is one, and thine another, a third Mans another. Therefore the Soul the first act is manifold: For the diversity of operations depends upon the diversity of Forms. Finally, in one and the same Understanding there would be contrary operations: for one man is of one Opinion, another of another about the same thing.

whether  
the Ratio-  
nal soul be  
immortal?

And since we have averred the Rational Soul to be the Form of Man, here arises a Question, whether or no it be immortal? or, Whether it can without perishing be separated from the Body? As for us, according to the Tenets of our Religion we hold, that our Soul is immortal; and the Immortality of the Soul is counted one of the Hinges upon which Christian Religion turns. But whether or no it may be proved by Philosophical Reasons, and what *Aristotles* Opinion was concerning the same, hath been carefully enquired into by many.

A thing  
two waies  
immortal.

In the first place, this we must hold, as *Scaliger* hath it, *Exercit. 61. Sect. 5.* and *Exercit. 307. Sect. 20.* that only God is truly immortal, and incorruptible. And therefore a thing may be said to be immortal two waies; either because it cannot perish at all, because it is most simple, and hath its Essence of it self, and depends upon none; and such is only God, and in respect of him all other things may be called corruptible: For although Angels and the Rational Soul, which are said to be immortal after the second way, are never actually corrupted, have no contrary, and are separate from their subject; yet seeing they are not without Cause, and they have not the Cause of their Essence from themselves, but are by another, and



and by another may naturally come to be no more. For every dependent may be changed by that on which it depends, if it be a voluntary principle, and at the pleasure of the first principle it may be depoted from its Essence wherein it was thereby instated. Now some things are not corrupted, because the Creator wil not have them so to be, who hath created nothing in them contrary, whereby they might be corrupted, nor hath plunged them so in matter, as they can neither be, nor operate without it. And that the Soul of man is of this kind, and that it may be separated from the body without corruption, *Marsilius Ficinus* endeavors to prove by many Arguments, *de Immortal. Anim. Lib. 5. Tolet. Lib. 3. de Anima, cap. 5. quest. 16.* *Franciscus Piccolhomineus Lib. 2. de Humana Mente, Colleg. Conimbriensis. in tract. de anima separata, disp. 1. Artic. 3.* and others.

We shal briefly thus determine the matter: Every thing is known by its operations, and every form discovers it self what it is by its operations. And therefore since the actions of Man are so noble that they cannot proceed from a mortal substance wholly plunged in the matter; it is plainly to be hence gathered, that the rational Soul from which they proceed is immortal and separable from the matter: for the Understanding abstracts and severs things from the matter, and knows without conditions of matter, without quantity, without figure; it understands things free from matter; it is not offended with the multitude and vehemency of the Objects as the Sense is; it can conceive things infinite; and although it knows very many things, it may alwaies know yet more, and can encrease a number though never so great; and not only knows a thing, but also knows it self, and understands that it understands what it doth understand; it can wil and refuse, hath an unsatiabie appetite of eternity, knowledg, happiness; which because it cannot be satisfied in this life, it is credible that it shal enjoy another condition wherein those appetites shal be satisfied; also it performs operations without corporeal Instruments. See *Francisc. Piccolhomineus de humana Mente, cap. 6.* *Aristotle* also seems to have been of this opinion, as appears in his *Phyicks, Lib. 7. cap. 3. text 20. 1. de Anima cap. 3. text 49. cap. 4. text 64, 65, 66. 2. de Anima, cap. 2. text 21. 3. de Anima, cap. 4. t. 3. 4. 7. 12. cap. 5. text 19. 20. 7. de part. animal. cap. 1. 12. Metaphys. t. 17.* of which see *Francisc. Piccolhom. Lib. 2. de humana mente, cap. 2. et sequent.*

Thus far we have shewed how the rational Soul is refered to the body of man: we are now to explain the nature thereof, as it is a principle of operation. Now *Aristotle* expresses the nature thereof, in this respect, in *Lib. 3. de Anima*, when he saith; that the rational soul is unmixed. Now the Soul must be unmixed two manner of waies: first, in respect of the Objects, so that it must not have their nature in its essence, but only a power to receive them. For because it ought to know the Objects, and it knows them by receiving them, it must needs of it self be free, unaffected and unmixed, since nothing receives that which it hath already; and that which is within hinders the ingress of another. And this immixture (that I may so speak) is common to the rational Soul with the Senses, which also have not their Objects actually in themselves, but only a power to receive them: save that the senses are respectively unaffected and unmixed, viz. with some sort of being, as the sight (for example sake) within colour, seeing they are not conversant about every kind of being: but the rational Soul is quite free from the natures of al other things, as being directed to al things, and its office being to understand all things.

Again, the rational Soul is after a peculiar manner free from Organs, nor mixed therewith; that is to say, when it operates by understanding or willing, it makes no use of the body, but performs those functions without it. For, inasmuch as to perform the actions which are done in and by the body there is required a certain temper of the qualities (seeing every body any waies tempered and disposed doth not receive every thing) and consequently also a certain Organ; since the several parts of the body have several temperaments; and the rational Soul is not tied to any temper of the first Qualities, nor any waies affected by the qualities, nor is there any proper Organ thereof in the body: we must doubtless therefore beleve that it depends not upon the body, in respect of its operations, nor that it is after any such manner mixed therewith.

From this other immixture we may gather, what kind of operations those of the soul are. For since in its acting it is no way mixed with the body, and the actions of the body have nothing to do with the action of the mind: it is manifest that the Understanding and the Wil are inorganical faculties, and act of themselves; so that to understand and to wil, are actions proper to the mind; nor doth the mind understand by the body, or any Organ of the body, as by a medium wherewith it acts. The Soul indeed hath need of a Phantasm; since

The rational soul is unmixed.

The Operations of the rational soul are inorganical.

since the Soul while it is in the Body never understands without a Phantasm, *Lib. 3. de Anima, cap. 7.* but it useth the same not as an Organ, but as an object; because an intelligible master must be presented to the mind by the Senses. And therefore if any have affirmed that the actions of the mind are organical, and that the rational Soul doth use the help of the Brain, Spirits, and Senses, as corporeal Organs, that is not to be admitted save in this sense, viz. that the soul doth not understand while it is in the body, without the foregoing operation of the Organs of the body, and before its own operation: or that in subordinate operations it uses an organ, and needs the brain, and spirit: but while it is in working of it self, or while it purely understands, and purely wills, it needs them not, nor doth it understand by organs, but this mind only is the subject of understanding, as also of the act of willing, which our barbarous Authors call volition, by a new necessary and fitting word, as *Scaliger* saies, *Exercit. 307. sect. 3. and sect. 9.* and though when the Brain is hurt Reason is depraved: yet that is done for no other cause, but that the administering or the subordinate faculties, which are organical and depend upon the constitution of the Brain, are hurt.

*The rational Soul hath two proper faculties.* And although the rational Soul be furnished with all those faculties which we have hitherto attributed to the vegetative and sensitive Soul: yet hath it besides two proper and peculiar faculties, whereby it excels Plants and other Animals; the Understanding, whereby we apprehend and know things; and the Will, whereby we are carried out to such things we understand to be good. And there is a manifest difference betwixt these faculties, seeing it is one thing to know, another thing to desire the thing known; and these two are performed by a several way of working; the former by passion and reception of the species, so that the things may be carried to the mind: but the latter by following, so that the mind is carried and drawn to the object. Finally the diversity of the object severs the power of knowing from the power of willing, seeing we know things as *Entia* or Beings; but we desire them as good.

*The difference of the understanding.* The Understanding is therefore actually none of all the other Beings that are: yet it can spiritually receive and know them all. And although in respect of its essence it is one and the same, as being an inorganical part of the soul, which hath no variety from the Organs: yet according to certain respects it is divided into sundry differences. And in the first place *Aristotle* calls one the active Understanding, another the passive, supposing that in our mind besides that which is apt to be made every thing, viz. by understanding, and which is as it were the matter, there is somewhat in the nature of a form which is apt to make all things, that is to say, actually intelligible.

*What the active understanding is.* But what the active Understanding or the *Intellectus agens* is, is an obscure point in Philosophy. Very many hold that the active understanding is God, or some Angel who is assistant to a man. But these mens opinion seems to differ both from *Aristotle* and the Truth. For the Intent of *Aristotle* (in *Lib. de anima*) is to speak of the humane understanding, and he plainly in *Lib. 3. de anima, chap. 5.* calls the active understanding a difference in the Soul. Again, that understanding which proceeds from the *Intellectus agens* or active Intellectual faculty is in our own power, nor doth it proceed immediately from God or any Intelligence or Angel. Moreover seeing God when he first made our understanding could put as much light into it as he pleased, there is no need that he should alwaies be assisting the same, like some Judge at the Assises, as *Scaliger* saies in *Exercit. 307. sect. 19.* But the active understanding is (according to the opinion of the Philosopher) a difference of our Soul not informing, which of things potentially intelligible makes things actually understood. For as to a natural affect there is required an agent of the same kind, and for artificial effects there is need of Art: so for the work of the mind, viz. Understanding, an agent is required, not separate from the Soul, but which is a part, or some difference of the soul.

And although this Agent Understanding seems to some unnecessary, who would have it banished out of natural Philosophy: yet it seems altogether necessary to hold an Agent Understanding, for this cause, seeing every thing that is done is done by somewhat and in somewhat, so that *that by*, and *that wherein*, do differ. Universals are made in the passive understanding, therefore there must be besides it another power to make Universals. For since every Patient requires some Agent, and nothing in nature brings it self from power to act; and our understanding is constituted in a possibility actually to understand, and by receiving intelligible objects doth actually suffer: clear it is, that holding a passive understanding, we must withall hold an active, and taking away the latter we deny the former. The Agent understanding therefore is for this cause necessary, that it may do or make all things, viz. as to their intellectual being, that is, that it may transfer the object from one order to another. For seeing the Object or Phantasm is material, and so under an opposite

opposite condition to the intellectual faculty, which is abstract from all matter; it cannot be by the said faculty understood, unless it be made proportionate thereunto, viz. abstracted and immaterial: now this cannot be done save by an abstract Virtue, and an Intelligent nature.

From whence it is apparent, that it is the Office of the active understanding to act, that <sup>The Office of the active understanding</sup> is to draw from power to act, and of things potentially intelligible to make things actually intelligible. This Office of the understanding Aristotle expresses by the analogy it bears to Art, Nature, Habit, Light. For it is as it were the eye and sight of the mind, and it is to the Phantasms, as light to colours. For it illustrates the Phantasms, being enveloped with material conditions, which like darkness do hinder their being understood, so as they may put on the nature of things intelligible, and may be diffused to the passive understanding: even as Colours by means of Light do send forth a Picture of themselves unto the sight: yet this illustration of the Phantasms is not performed formally, so that any quality is imprinted upon them; nor objectively only, but effectively; because the Agent understanding like external light by imparting its Ray yet doth actively elevate the Phantasms, to the production of an Intelligible species; nor is the Agent Understanding requisite only in respect of the object, but it hath also another office, viz. in reference to the passive understanding, that it may produce therein the act of understanding, representing thereto an object in a species intelligible, which it performs when together with the illustrated Phantasm it produces a species of the thing to be understood, into the passive understanding.

Whence we may collect, upon what and how the Agent understanding doth act. For <sup>The Subject</sup> it is requisite in respect of both actions, viz. that it may act upon the Phantasms, and upon <sup>ject</sup> the passive understanding. But it acts upon these in a different manner; for it is joyned to the Phantasms before Intellection, and indeed while they are yet in the Fancy, where illustrating them it becomes their form, whereby they are made a moving object of the passive understanding: afterwards, the adjoyned Phantasms being illuminated, it acts upon the passive understanding, by producing therein an intelligible species or representation, and by consequent the act it self of understanding: But the Agent understanding it self as it is an Agent doth not understand; since it doth not receive the intelligible species or notions, though it produce them, nor is in aptitude to understand; but the act of understanding is in the Passive Intellect, as in its subject. This therefore is called formally the Intellect; the other only effectively, because it makes the understanding or Intellection.

The Passive understanding is as it were the subject and matter, whereon the intelligible species are imprinted; and therefore 'tis called Patient and Passive, because it suffers by receiving the species, through means of the Phantasms. It is also called *Intellectus possibilis*, the <sup>The passive understanding what it is</sup> possible understanding, and the mind in power; because it may be made all things, though it is actually none of them.

And here in the first place we must remember that the passive understanding is indeed in respect of the object a passive power; seeing it acts upon no other thing: but compared with the Intellection it is a power, both active, inasmuch as it works Intellection; and also passive, inasmuch as it receives the said Intellection. For an immanent action must be received in the same power by which it is produced.

Moreover we must observe how that it is to be understood that *the understanding when it understands, is made all things*, which in the most elegant words of Scaliger, *Exercit. 307. sect. 6.* thus we explain. *In the first place (quoth he) I deny that the Philosopher saith, that our understanding is all things essentially or formally as they use to say. But it is all things, subjectively, even as the first matter is, which is not made the Essence of an Horse under the form of an Horse: but it remains that which it was, a certain substance, of which and the form this thing is made. But the information of the understanding is after another manner: for it is not a meer possibility, as the first matter, which may be reduced to be actually this or that by the form. But it is our form substantial, separable, incorruptible, eternal; of which as a subject essentially perfect, and the species which it receives, is made the formed intellect, not another from it self; save as Caesar being learned differs from himself unlearned, by reception of accidental species. It is not therefore made the understanding simply, nor is it made the species it self, but under the species.* So far Scaliger.

And so much shal suffice to have said of the first difference of the understanding: where <sup>The Agent & passive Intellect do not really differ</sup> this again is to be observed: that the Agent and passive understanding are not really and essentially distinguished, but only respectively; since two internal forms are not knit together by new accidents, and to the receiving and effecting of an immanent action (such as understanding

standing is) such a principle is requisite as is essentially one. And therefore we must conclude that the Essence of the Agent and Passive Intellect is al one, and that one Understanding in Essence, inasmuch as it makes things intelligible, or illustrates the Phantasms, and repositis them in the Passive, is Agent; but inasmuch as it is the subject receiving the abstract Phantasms, it is called the Patient.

the Under-  
standing  
in habit:

Besides the Differences reckoned up, there are also other notions of the Understanding, as the Understanding in habit, and the Understanding in act; which indeed are not divers Understandings, but one that hath divers degrees, which *Aristotle* calls differences. For the Intellect in habit is that which hath the Phantasm reserved in the Phantasie; and it is in a more perfect degree than the possible Intellect: for this is in aptitude to the first act, the other is in aptitude to the second, or to the operation, and therefore is very like to him that hath science, and does not contemplate. Howbeit *Zabarella* seems to think otherwise in this point, *Lib. de speciebus Intellectus. cap. 8.* after this manner; That our mind is first born rude and unfit for the knowledg of things; but afterwards by multiplied acts of Understanding it acquires a certain greater ability and aptitude to understand things, so that it can without any labor when it pleaseth turn to the Fancy, and presently understand a thing: and that the Understanding being furnished with this ability is called the Intellect in habit. But when the Passive Understanding does actually operate, and actually perceives the thing offered, it is called the Intellect in act.

the specu-  
lative and  
practical  
understand-  
ing:

Finally, the Understanding is distinguished into Speculative and Practical; by which terms nevertheless there are neither made two faculties of understanding, nor are the differences and degrees of the same Faculty intimated; but each Faculty of the Intellect is signified by the Theoretick or Speculative, the Understanding properly so called, and by the Practical the Will. For seeing the Understanding in respect of the apprehension of a thing, also in respect of Affirmation and Negation of that which is true or false, cannot be otherwise called than Speculative; of necessity that difference must arise in respect of a third attribute of the Practical Understanding, viz. Desiring and avoiding, which belong to the Will.

the Oper-  
ation of  
the Under-  
standing:

The operation of the Understanding to which al the Functions of its degrees do tend, is Intellection, which is not one and the same thing with the Intelligible Species, but really differs therefrom, and is more rightly defined by reception of Intelligible species (in which sense it is by *Aristotle* termed a kind of Passion, *3. de Anima, cap. 4.*) and passing judgment thereon. For the Intellect exercises a twofold operation about its object; the former of which is simple Apprehension and Cognition; but the other is termed Composition and Division, and it is compound Apprehension and Judgment, which consists in Assent and Dissent. And hence Intellection is said to be twofold; Simple when the Intellect knows that which is simple and incomplex, as they call it: and Compound, when it knows a proposition true or false.

Intellecti-  
on is two-  
fold:

The Object of Intellection which at once moves and terminates the intellect, is a Being or thing Universally taken, comprehending things material and immaterial. To which nevertheless some conditions must needs be added. And in the first place Universality: For that a Being may be perceived by the Intellect, it must be abstracted from al singularities. Then Secondly, Intelligibility, or abstraction from the conditions of matter. Thirdly, Verity. This Object as it is fitted and proportioned to the Mind by the Agent Intellect, is called an Intelligible Species; as that which the Senses receive is called a Sensible Species.

Intelligi-  
ble species  
what they  
are.

Now the Intelligible Species are illuminated Phantasms, that is to say, freed from the conditions of matter, and by the Agent Intellect imprinted upon the Passive, and consequently spiritual and indivisible accidents: For a Substance is not received into the Sense, as *Scaliger* would have it, *Exercit. 303. Sect. 7.* but only accidents. And therefore only accidents do make the Species or Image in the Intellect; amongst which are both time and place, and the finite Unity of quantity, which being removed by the operation of the Intellect it self, there remains an Universal substantial Species: As if you see a man armed and disguised; first you apprehend the Arms the disguise, and afterward having removed them you conceive the Man himself.

whether  
or no, and  
how the  
understand-  
ing per-  
ceives par-  
ticulars?

And since we have just now asserted, That such things as are offered to the Intellect, and received by it, must be separated from matter and al particular conditions, the Question is; How the Intellect understands particular things, or whether it be capable only of universals? We answer, That the Mind of Man does also know particulars. For since al knowing Faculties being subordinate, are so joyned that the end of one action is the beginning of another,

cher, and what ever is known by the Inferior Faculty is also known by the Superior; and the Senses and Fancy know particular things, the Mind also must needs know the same. And by means of this knowledg it comes to pass that a man is able to compare a singular with an universal, and that the mind can frame singular propositions, collect universals from them, and frequently correct the judgment of the Senses about singular things, viz. As oft as they (by reason of an evil disposition of the Object) do commit any error. Now the manner of knowing singulars is also by accidents; because out of the proper singular accidents we draw out a notion or phantasm proper to the single Objects; even as out of the notions proper to a sort we draw out a notion proper to the same sort.

Intellection is commonly divided into direct and reflex. It is termed direct, when we only know somewhat, and make no further enquiry, but the Species gives a stop to the Intellect, as when the Understanding stiaies at the first apprehension of a Man, an Ox, an Horse, &c. but that is termed Reflex, or doubled and reciprocal as it were, whereby the Mind knows it self, viz. That it knows, and hath the power to know and Understand; or when we understand the Intellection it self, and the Understanding knows that it is an Understanding, viz. That it self is an Essence and an unmixt one, and knows that it understands, because that it is able to know it understands.

*under-  
standing  
Direct.*

*Reflex.*

And here you must observe, what it is to abstract. Now Abstraction is the separation of one thing from another, and the apprehension and understanding of one thing without the apprehension or understanding of others. For in Abstraction all things are not known which are in a thing, but that only which is abstracted: for examples sake; To abstract the Living Creature from the Horse, is to consider only the Nature of a living Creature in general, not regarding the particular Nature of an Horse.

*what it is  
to abstract*

Finally, The Will (that we may also speak briefly thereof) is the other Faculty of a Rational Soul, whereby we follow or avoid such things as are known by the Understanding; or (as Scaliger hath it, *Exercit. 307. S. 3.*) The Will is the Understanding extended to the having or doing what it knows. Others call it the Rational Appetite. For as after the knowledg of Sense there follows a Sensitive Appetite; so after the knowledg of the Mind an Appetite follows proper thereto, which to difference it from the former, they call it *Voluntas*, the Will; and that this Rational Appetite differs from the Sensible is hereby apparent, because they are frequently at enmity one against another.

*The will  
what it is*

The Object of the Will, is Good known by the Understanding and presented to the Will, and the contrary Evil: Hence it follows the Good, and shuns the Evil. The Actions of this Faculty are to Will or Desire, and to Nill or Refuse. Now the Actions of the Will are twofold; *Drawn out*, and *Commanded*. The *Drawn out*, are those which the Will puts forth and performs of it self, and not by the inferior powers. The *Commanded* are those which the Will commands and enjoyns the inferior Faculties to perform. Now the Will hath command over the Locomotive Faculty, and the Sensitive Appetite: for at the word and command of the Mind and Will we move and rest. But the command which the Will ought to have over the Sensitive Appetite is much weakened by sin, and that same harmony disturbed betwixt the two Appetites; so that many times the Sensitive Appetite casts off the command of the Will and right Reason, and that saying becomes true:

*The ob-  
ject of the  
will.*

*Its actions  
twofold.*

*1. Drawn  
out.*

*2. Com-  
manded.*

*Hurry'd the Coach-man is, and the Coach away, by the Horses.*

But the Will hath no command over the Vegetative Faculty, and it acts meerly naturally, nor can we be nourished or grow according to our own will and pleasure.

## Chap. 2. Of the Body of Man, and its Functions.

NOW the Soul of Man, since it is the Rule (in a manner) of all things living, as Scaliger, *Exercit. 102. Sect. 5.* hath it; it must also of necessity have the most noble Body of all; which ought now to be described, as the Rule of all the rest. But since the dignity thereof, yea, and the necessity that there is of its knowledg, hath stirred up many to seek the knowledg thereof, so many Volums are written concerning the same (wherein both its parts are accurately described, and the uses of all of them laid open) that it is an impossible thing to Epitomize the same. To name a few Authors: Galen hath written many Books of this subject; of the Dissection of the Muscles, Nerves, Veins, Arteries, vocal Instruments, Womb, of the Bones, of Anatomical Administrations, 9 Books; of the use of the Parts, 17 Books, and others. Very many men of this Age have diligently written of Anatomy,

amending

amending and encreasing the Doctrine of Galen. And amongst them chiefly *Vesalius, Fallopius, Columbus, Sylvius, Piccolhomineus, Laurentius, Platerus, Baubinus, Casserius, Fabricius, Riolanus, Spigelius*, and very many more, all whom to reckon up the Nature of this short work wil not permit. We shal therefore in this place only with brevity name the Parts of the Body whereby al the actions thereof are performed; the Description whereof may be seen in the Authors aforesaid, which are in the hands of every one.

the disposition of the parts of the Body wherein it consists? the Constitution of the similar parts.

Now that the parts of our Bodies may be fit to perform their actions, they must needs be rightly disposed. Now that disposition consists in three things: For since the parts of our Body are considered either as similar only, or as dissimilar and organical; in both of them Unity is required, and it is necessary that every part be one and entire. Moreover, particularly in the similar parts there is required temper; in the organical composition and conformation; necessary for the actions of the Body; which is in divers parts different, according to the diversity of the actions by them to be performed.

the temperament of a Man, twofold.

Now what in general a Temperament is, and what are its differences, hath been already declared in Book 3. chap. 4. But as to what concerns the Temperament of a Man, in him (as also in other Creatures, of whom he is as it were the Rule and measure) is found a twofold Temperament; the one of a Body, considered simply as a mixt Body; the other of a living Body. For when a man dies, that temper which he had as a living body does withal vanish; yet in the Carcass til it rot the parts do for a while retain the composition and temper which they have from the Elements.

Each part hath a peculiar temperament.

Concerning the Temper of a mixt Body we spake before in the Book newly cited: but the Temper of a living Man, which results out of a certain harmony of al his parts, although it be hot and moist, and Life consists in Heat and Moisture; yet there is a great diversity in the Parts. The Skin is the most temperate, especially that in the Hand.

Hot parts:

Among the Hot Parts the chief is the Heart: after the Heart follows the Liver, the Spleen, the Flesh of the Muscles, the Kidneys, the Lungs, a Vein, an Artery, Fat and Suet.

Cold parts:

Among Cold Parts, the first are the Bones, then the Gristles, the Ligaments, the Tendons, the Membranes, the Arteries, the Veins, the hard Nerves.

moist parts:

The Moist parts are, Suet, Marrow, Brain, Spinal Marrow, Stones, Dugs, Lungs, Spleen, Kidneys, Flesh of the Muscles, Tongue, Heart, soft Nerves.

Dry parts:

The dry are, Bones, Gristles, Ligaments, Tendons, Membranes, Arteries, Veins, hard Nerves.

the inbred Heat whereof it consists.

Now this Temperament of a living Body is twofold, or consists in two things; Innate, and Influent Heat. Innate Heat is in that which is the inbred hot juyce natural: For by innate heat we understand not a bare quality, but a quality with its subject. This Innate Heat consists of the inbred Spirit and original moisture: and is nothing but the Primitive Moisture filled in al parts with the implanted spirit and heat. For these three, Heat, Spirit, and Radical Moisture, or Natural Balsam as some cal it, are sojoynd together, as that they cannot be easily separated. For this is that Body which is more Divine than the Elements so called, and is a substance bearing proportion to that of the Heavenly Bodies, as Aristotle terms it in his 2. de generat. Animal. cap. 3. and by which the seeds of things are made fruitful, as the same Aristotle informs us.

the Subject of the inbred heat:

This inbred heat is principally in the Spermatick Parts, which are called the first Parts. But it is chiefly found in the Heart, which therefore Galen calls the Hearth or Chimney of the inbred Heat. And this innate Heat is the chief instrument of the Soul, whereby it performs and perfects al actions. At the beginning of a Mans Life, and in his yonger yeers, it is much in quantity; and as he grows older, the Radical Moisture is gradually consumed and dried up, til at last being quite spent, the Heat is also extinguished, and natural Death follows.

what the spirits in the body are?

Now this inbred Heat is cherished and fomented by the influent Heat, through means of the Spirits, which are a most thin, hot, and movable body, bred of the most sincere and subtil part of the Blood; and being joynd with the inbred Heat they are the immediate and chief Instrument of the performance of al actions, and are a cause that the faculties of the Soul exercise their operations.

they do not conweigh the faculties:

It is commonly taught by many, That these Spirits are the conveighers of the Faculties from the principal Parts to the rest of the Body: but this is a false Opinion. For seeing the Faculties are inteparable Properties of the Soul, and the Soul is in all the parts, it is every where furnished with its Faculties, not borrowing the same elsewhere.

the number of the Spirits:

Now touching the Number of these Spirits, several men are of several Opinions; and some make

make one, and others more. But we have reason to hold that there are divers Spirits. For although the more subtile part of the Blood be the first matter of them all; yet they receive a diverse form in sundry parts, and are fitted for divers uses.

Now the Spirits are three, Natural, Vital, and Animal.

Touching the Natural many doubt. We although we admit them into the number of Spirits, yet we acknowledg no smal difference betwixt it and the other Spirits, and that the name of Spirits does not so properly belong to them as to the others, nor that they have the same Office. Now it is generated in the Liver, and is contained in the Veins, and is the thinner and more spirituous part of the blood, bred of the vaporation of the blood, and affords matter to make the Vital Spirits of. *The Natural:*

All grant a Vital Spirit, which is generated in the left Ventricle of the Heart of the thinner part of the Blood, or Natural Spirit, flowing into the Heart, and first of all attenuated and elaborated in the right Ventricle; and of the Air drawn in by breathing, and by the dilatation of the Arteries. This Spirit is not only in the Heart the chief Instrument thereof, together with the inbred heat of the Heart; but also being spread abroad through the Arteries into the whol Body, it cherishes the inbred heat of all the parts, excites and encreases the same, and gives perfection as it were thereunto. And therefore some call it the influent Heat. Also this Spirit affords matter for the Animal Spirits. *the Vital:*

Many indeed deny the Animal Spirit; yet we have reason to admit the same, seeing it is wrought in a peculiar Member, viz. The Brain, nor can the Vital spirit perform those uses which the Animal does, and in a part full of Vital Spirit we see sense and motion taken away for want of Animal Spirits, as in the Apoplexy, Palsey, and stupidity. *the Animal:*

For this Spirit is the immediate Instrument of Sense and Motion; and it is generated of the purest part of the Vital Spirit, carried by the Carotick and Cervical Arteries into the Basis of the Brain, and thence into the Brain it self, and mingled with Air drawn in by the fetching of breath.

Moreover, The Organick parts have also their proper Constitution, viz. A due composition and connexion of the similar parts into one form and shape, fit to exercise the action. Now there is required to the composition of Organick parts; first a just number of parts compounding; secondly, the greatness fit for the said parts; thirdly, a decent conformation, which comprehends a figure fit to perform the action, cavities and passages, and that the surface be rough or smooth, as the Nature of the part requires; fourthly, scituation and connexion with other parts. *the Constitution of the Organick parts:*

These things whereof we have hitherto spoken being common to all parts, and necessary for all actions; we will now furthermore briefly recite how and by what parts the several actions are performed.

And seeing the Vegetative Faculty is the lowest, we will first treat thereof. Now it contains under it, Nutrition, Augmentation, and Generation.

And as to Nutrition and Augmentation in the first place, seeing in them Aliment is joyned to the Body from elsewhere (and the Aliment is in the first place unlike of substance) it must be elaborated by divers Concoctions, and be first made fit for the Body.

This Concoction is twofold; Private, which is performed in the several parts; and Publick, which is ordained for the use of the whol body, and is performed in the stomach chiefly, and in the spleen. *A double Concoction in the body private & publick.*

The first Concoction therefore is performed in the stomach; and for the same cause a double Appetite is given to the stomach; a Natural, whereby it desires food for it self alone; and an Animal Appetite, whereby it desires food for the whol body. *the first Concoction*

For by Appetite and hunger a Man is pricked on and provoked to eat, and then the first preparation of the Meat is in the Mouth. For in the Mouth it is by the Teeth broken and ground; which for that cause (although they serve also to form the Speech) are given to a man commonly thirty two in number, in each Jaw sixteen; of which some are called Cutters, others Dog-teeth, others Grinders. The Cutters or foremost are four in each Jaw; the Dog-teeth two; the Grinders ten. Moreover, by the Mouths heat, and the mixture of spittle, the meat is altered. The Meat being thus broken, ground, and prepared in the Mouth, is by the Tongues motion thrust down the gaping Throat into the Stomach, which the stomach by help of the oblique fibres does imbrace and retain til by the Concoctive Faculty thereof and its proper heat it be turned into a Mass not unlike Barley Cream, which is called Chylus. *the making of Chyle.*

The Chyle being wrought in the stomach is sent out by the lower Orifice into the Guts, and is by them stil more elaborated. Now the Guts are of two sorts, the Thick and the thin. *Distribution of the Chyle:*

thin: The thin are three, *Duodenum, Jejunum, Ileon*; the thick also three, *Cœcum, Colon, Rectum*.

*the Excrements of the first digestion.* And seeing no Meat can be turned wholly into Nourishment, but hath some parts in it unprofitable to nourish the Body: Nature in this, as all other Concoctions, separates what is unprofitable, and breeds here a two-fold Excrement, the one thick, the other waterish.

*the Dung* The thicker Excrements are the Dung, whose expulsion is through the Belly by stool: the Guts partly by their circular and transverse fibres (with both which both their Coats are furnished) contracting themselves above the same; partly by help of the Muscles of the Belly, whereby the Belly is squeezed; and so the Excrements are forced downwards.

*The thin and watry excrement.* The thin and waterish Excrement is not presently voided forth, but remains mixed with the Chyle, that it being thereby made thin may the more easily pass the narrow Veins of the Mesentery and Liver.

*The second Concoction or blood-making.* The first Concoction being finished, the Chyle is received out of the Mesaraick Veins, (whose Offices reach into the Guts) is altered and changed a little, and is hence carried to the Roots of *Vena Porta* and to the Liver.

And that the blood may be bred more pure in the Liver, after the Blood hath received some rudiment in the Mesaraick Veins, that which is therein thick and dreggy is drawn by the Spleen through the Splenick Branch of the *Porta*, out of the Trunk of the Mesaraick Veins before it pass to the Liver; where the Spleen alters it as much as it can and the matter will bear, and thereof breeds for it self and the ignoble parts in the Belly a thick and dreggy blood. But that which is quite excrementitious, and cannot be turned into Aliment is evacuated, partly by the Hemorrhoidal Veins and *Porta's* Trunk, and partly by the Splenick Arteries.

The Chyle after it hath received some rudiments of Blood in the Mesaraick Veins, and is by help of the Spleen purged from the more dreggy parts thereof, it receives the form of perfect Blood in the Liver; and is thence distributed into all the parts of the Body to nourish the same.

*Excrements of the second digestion.* And since in every digestion Excrements are bred, there is also in Sanguification a two-fold Excrement; yellow Choler, which is collected into the Gall-bladder, and is thence voided by the Guts, exciting them by its acrimony to purge themselves: and the serous or wheyish excrement, which is drawn through the Emulgent Veins by the Kidneys, and is transmitted through the Ureters into the Bladder, and is by it voided forth and called Urine. *1. Yellow choler:* For the Urine is nothing else but that watry moisture in the Chyle that served to make it pass more easily, and the salt which was superfluous in the meat and unfit to nourish the Body. Which appears not only by the taste, but also because store of salt is drawn out of Urine, the watry moisture being separated.

*The blood consists of divers parts:* The Blood which is distributed into the whol Body to nourish the same, although it is contained under one form or shape, and is all useful to nourish the Body; yet its parts are not quite alike, but some temperate, which are peculiarly called blood; others hotter and drier, which are called Cholerick Blood; others colder and moister, which are called Flegmatick Blood; others colder and drier, which are called Melancholy Blood; but vulgarly these parts are called, Choler, Flegm, and Melancholy.

And of these parts none is Excrementitious, but all are useful to nourish the Body; and in the Body of a sound Man there is nothing Excrementitious, but only Alimentary blood is contained in his Veins, and all the parts of our Bodies are nourished only with blood.

*the third concoction* This Blood in the several parts is elaborated according to the Nature of each part, and at length assimilated to the said parts. And seeing in that elaboration the blood undergoes some mutations, Physicians do say, that in the third Concoction the four secondary humors are generated; whereof the one follows the other, and by these mutations the blood is turned into the substance of the Body. The first is called the Nameless, the second Dew, the third Glew, the fourth Cambium.

*the secondary humors.* In this Concoction two Excrements are generated, the one more gross, which is the filth that gathers about the Skin; the other more thin, which is discussed, partly by invisible transpiration, and partly by sweat. For the evacuation of which excrements the Skin was furnished with pores.

*the generative faculty.* Moreover, That a man might propagate and multiply himself, he received from the Creator the Faculty of Generation. Now Generation is caused by seed elaborated in the stones, unto which out of the rest of the Body the best part of blood, spirit, and heat, is transmitted by the Veins, Arteries, and Nerves; and is by them reduced into a white froathy body, full



ful of spirits, which is called seed and is a compendium as it were of all the Heat and Spirits in the Body.

This Seed is sent forth both by the Man and Woman: for seeing Women are furnished with the same Instruments, both to make and vent Seed; and when they are provoked by Lust they desire Copulation, and void seed: we must needs grant that they contribute seed to Generation. And their seed goes to the making up of the Child: for the male and female are not two sorts of Creatures: yet neither of their seeds is alone sufficient for Generation, but this order is appointed by the Creator, that of both their seeds as two partial causes, one principle and one total cause should arise, from which one motion (though in a certain orderly disposition) should further the production of the Child.

The Seeds conceived in the Womb are by the inbred faculty thereof cherished, and the faculty lurking in the seed is stirred up, and the shape of the Organs begins to be expressed; and so conception is said to be made, and then it is termed a Conception. Now the membranes encompassing the Child are first formed, in which the nobler part of the seed and spirit is included; and they are two, one called *Chorion* compasses the whol Child, props up the umbilical vessels, and by their their means it totally adheres to the Womb: the other immediately compassing the Child is called *Amnios*; which Coats seeing in the Birth they seem to be but one, are termed the After-birth, because they come away after the Child.

Now the spermatick parts are first formed and that all at once. And afterwards every part is finished, as the dignity and necessity thereof requires. At first there appear as it were three bubbles, and innumerable threads, being the underwoof of the solid parts. These parts do afterwards receive encrease from the mothers blood. And hereupon the Creator hath ordained, that from the fourteenth yeer commonly of a Womans age, to the five and fiftieth, there should be some superfluous blood as it were, bred in women, and afford matter for the Child in women that have conceived: or if a woman be not with Child that it should be sent unto the womb, and from thence purged away.

Since therefore the Child after it is once formed in the Seed is furnished from the mother with all things it stands in need of, there were navil vessels made, viz. a Vein, two Arteries and the *Urachus*, which about the navil grow together into one. The Vein is a branch of *Vena Porta*, to which it is contiguous, being the Nurse (as it were) of the Infant: the two Arteries (branches of the *Ramus Iliacus*) descending do spring from the *Aorta*; whereby arterial blood and spirit are communicated to the Infant, and by which the Infant draws breath. The *Urachus* is carried from the bottom of the Bladder to the Navil; when the Child is born, there being no longer use of these Instruments for these intents, they grow together, and perform the office of the Ligaments as it were.

The Navil-vessels  
The Vein.  
The Arteries.

The Urachus.

Now the whol time from the Conception to the Birth is divided by Physitians into two parts; the time of formation or shaping, from the Conception to the time the Child begins to stir; and the time of perfection, which is from the time it begins to stir, to the time it is born: yet others divide it into three parts, viz. into the time of Formation, which *Hippocrates, de natura pueri*, determines to be of Girls in forty daies, of Males in thirty: the time of motion which is commonly said to be of Males in the third month, of Girls in the fourth: and thirdly, the time of birth.

The time of Formation.

The time of Motion.

Now as to the time of birth, that is various in mankind: yet experience teaches, that no Child is born alive before half a yeer be past. The Child born in the seventh month may live: but no Child born in the eighth month can live according to *Hippocrates*; yet some hold that the eighth months Child does sometimes live. But the most orderly and frequent time of childing is the ninth month, and most Children are brought forth from the 15. of the ninth month, to the 15. of the tenth.

The time of Birth.

And although Physitians have observed that some have been born in the eleventh month and after the eleventh month: yet such births are to be reckoned amongst rare accidents.

How the months are reckoned.

Now the months according to which the times of Child-birth are reckoned are the solar months, or months of the Sun; from which nevertheless the lunar Conjunctions (consisting of twenty nine daies and twelve minuts) do not much vary. Nor must this laborious frame of mans body be tied to such smal observances of time.

After the Natural faculty comes the Vital, being distinct from the Natural and Animal, both in actions and peculiar organs, and hath its seat in the Heart. Now under the term of vital faculty divers powers are comprehended; and there are in the Heart three faculties, the Wrathful, the Breeder of spirit and vital Heat, and Pulsing faculty which is subservient hereunto.

three faculties in the Heart

*the wrathful faculty* From the wrathful faculty proceed all the passions of the mind, Anger, Mansuetude, Boldness, Fear, Hope, Dejection, Joy, Sadness, and others of this kind which follow the former. Now some of these are caused materially (that I may so speak) or in way of an efficient cause, by expansion of the Heart, Spirit and Blood, as Anger, Joy, and the like; some by the Concentration or gathering inward of the said Blood and Spirits, as Fear, Sadness, and the like: and formally they are all no other than Appetites; and these motions do follow an appetite, either of prosecuting that which delights, or of avoiding that which is hurtful; the former of which causes an expansion or spreading abroad of the Heart and Blood, and the latter causeth them to retire inwards. Now these motions cannot be made, save by agitation of the Heart and Arteries, and of fervent and spirituous Blood. Whence it is apparent why the wrathful faculty needs a very hot Bowel, and which is in continual motion.

*the use of the Heart and its Ventricles.* Now the Heart is seated in the middle region of the Body, viz. in the Chest, that from it as a fountain the vital heat and spirit may readily be diffused into the whole Body. Now the Heart hath two Ventricles, the right and left: the right Ventricle out of the wide mouth of the *Vena cava* draws in Blood by its *Diastrale*, which it perfectly concocts and attenuates: the thinner portion whereof is transmitted into the left Ventricle of the Heart, by those holes in the partition wall betwixt the two Ventricles; which nevertheless some deny: but the remaining and greatest part passes through the *Vena arteriosa* into the Lungs; some part whereof is spent in nourishing the Lungs, but for the greatest part is carried through the *arteria venosa* into the left Ventricle of the Heart.

*the motion of the Heart.* Now these things are performed by a certain wonderful and perpetual motion of the Heart, whereby in the *Diastrale* its extrem parts are contracted, and the point of the Heart is drawn to the Basis, and so the Heart becomes more short, but the sides thereof are dilated: but in the *Systole* the Heart becomes longer, and narrower. And seeing for the breeding of spirits and Arterial blood there is need both of Air and Blood, and these two substances cannot be drawn with one motion: besides the Ventricles which draw the Blood, on each side at the Basis of the Heart there are two notable cavities, ending into the upper part of the Ventricles, which by a peculiar motion of their own do draw to themselves Air to cherish the Spirits and fan the vital Heat, which are termed the Hearts Earlets. For although others say their use is to be as it were Store-houses of the Blood and Air flowing in, and guard the *Vena cava*, and the *Arteria venosa*: yet some conceive, that by a peculiar motion they draw in Air; and *Hippocrates* himself, *Lib. de corde*, holds that they cool the Heart like a pair of Bellows.

*the Pericardium.* And that the Heart may not be hindered in its motion, it hath allotted unto it a large and membranous Mansion, which they call *Pericardium* the Heart-bag, which hinders any thing from pressing upon the Heart or troubling the same in its motion.

*the four Vessels of the Heart.* But seeing nothing could go into or come out of the Heart unless it had been furnished with certain conveyances: therefore in the Basis of the Heart four remarkable Vessels are seen, two in the right, and as many in the left Ventricle: In the right, the *Vena cava*, and the *Vena arteriosa*; in the left, the *Arteria magna*, and the *Arteria venosa*. The *Vena cava* is at the right Ventricle of the Heart, and pours Blood into the Heart, for the Generation of arterial Blood and vital Spirit and the nourishment of the Lungs. Howbeit others think the Blood which is wrought in this Ventricle is also distributed through the whole Body. Then there is the *Vena arterialis*, which carries blood out of the right Ventricle to the Lungs for to nourish them, as also to become the matter of arterial Blood and vital Spirit; the *Arteria venosa* carries Air from without and prepared in the Lungs, and Blood brought out of the right Ventricle of the Heart by the *Vena arteriosa*, into the left Ventricle, and expels smoaky exhalations, and distributes a portion of the vital Spirit into the Lungs. Finally there is the *Aorta* or *Arteria magna*, which distributes the vital Spirit and Arterial Blood bred in the left Ventricle through the whole Body: And these are (as *Hippocrates* saies) *Pegai Phusios Anthropou*, the *Fountains of the Nature of Man*.

*the Valves* And seeing these Vessels have each of them two uses (for examples sake, the *Arteria venalis* doth not only draw Air out of the Lungs into the left Ventricle of the Heart, but it communicates vital spirit and arterial blood to the Lungs, and expels smoaky vapors) lest the substances entering the Heart should fall back the same way they came in before they have gained their perfection, or that which is shed out of the Heart might return thither again, there are eleven Valves placed in the orifices of the Vessels; three in the orifices of all the other Vessels, and only two in the *Arteria venosa*: Of which Valves some are open outwards and shut inwards, namely those that pass the matter to the Heart; others are open within, shut

shut without, being such as pass matter from the Heart. In the orifice of the *Vena cava* are three Valves, open outwardly, shut inwardly; contrariwise, in the orifice of the *Vena Arteriosa* there are as many open within, shut without: in the orifice of the *Vena arteriosa* there are as many, open within shut without: in the orifice of the *Arteria venosa* there are two, which are open without, shut within; in the orifice of the *Arteria magna* are three Valves, open within shut without.

And because the Heart distributes Heat and Spirit through the Arteries into the whole Body, there are passages made to carry the same, viz. the Branches of the great Arterie, which themselves also are dilated and contracted, and by the pores of the Skin draw in Air, expel smoaky vapors, and communicate to the whole body vital Spirit, Heat, and Arterial Blood; and this motion of the Heart and Arteries is termed the Pulse.

Now the Pulse consists of two motions, Systole and Diastole. By the Diastole or dilatation the Heart is filled, and draws Air and Blood out of the Lungs by the *Arteria venosa*; and the Arteries by their orifices, which end in the Skin, do draw some of the ambient Air: but by the Systole or Compression the Heart distributes vital Spirit and Heat through the whole body, by the *Arteria magna*, and expels fuliginous excrements to the Lungs, by the *Arteria venalis*: also the Arteries expel fuliginous excrements by their orifices, which action is termed *adolor diaphnoe*, insensible Transpiration.

But because the Air, which is drawn by the Heart, was to be altered before it came thither, therefore the Lungs were given, and Respiration ordained. The chief Organ of respiration is the Lungs. For although the Chest and other parts do also serve for respiration: yet that motion is primarily performed by the Lungs, which have a peculiar faculty to dilate and contract themselves, as the Heart and Brain also have: which may easily be observed in the dissection of Live-anatomies. Nor is respiration a voluntary motion, so that the Lungs should dilate themselves upon the motion of the Chest, to avoid Vacuum; but the Lungs are moved by a proper power of their own, and the Lungs and Chest are moved together, because they conspire both to one end. For the Lungs by an inbred faculty are dilated: and that it might be done more conveniently, and that it might have room wherein to dilate it self, when the Lungs move, the animal faculty at the same time moves the Chest. And indeed these two motions hold proportion one to another. Nor are the Lungs distended because they are filled, as a Bladder that is blown up; because Air is not from any place blown into the Lungs: but they are filled because they are dilated, after the manner of a pair of Bellows.

Now respiration consists of two Motions, Inspiration and expiration. By Inspiration the Lungs and Chest being widened, Air is drawn in by the Mouth and Nostrils for to cool the Heart and to make vital Spirit: and by Expiration, the Lungs and Chest being compressed, fuliginous excrements are voided at the Mouth and Nostrils. Hence, that much Air might be attracted and retained therein, the Lungs exceed all the Bowels in greatness, and have a rare and porous substance.

And because the Air was to have an Ingress into the Lungs, therefore was the Wind-pipe [*Aspera arteria*] or Wind-pipe made; whose larger Trunk might receive Air, partly by the Mouth and partly by the Nostrils; and other branches innumerable are distributed into all the parts of the Lungs, that they might be totally replenished with Air; which Air the Vessels coming from the Heart to the Lungs, being large and great, do receive at their ends, and carry it into the Ventricles of the Heart.

And because a man perpetually needs to draw in the Air, the Wind-pipe is made of solid gristly rings, that it may be kept perpetually wide and gaping.

But lest the Meat or Drink in passing over the Wind-pipe should fall thereinto, whereby a mans life might be endangered: on the top thereof a soft and sharp-pointed Gristle is placed sticking out, which they call *Epiglottis*, which covers the passage of the Wind-pipe, while Meat or Drink slips over it.

Now the Chest, since it was to be partly a defence of the vital parts and partly the Instrument of Respiration; it was to be neither quite fleshy nor quite boney. Therefore the Chest doth consist of twelve pair of Ribs, which that they might come and go to dilate and contract the Breast, sixty five Muscles were made, thirty two whereof distend, and as many contract the Chest.

But because there are no Ribs in the lower part of the Breast; that there might be in that place also a part that might be distended and contracted, and might likewise separate the vital Organs from the lower Belly, a certain partition wall is interposed of a musculous or fleshy substance, which is called the *Midriff*, which when the Air is breathed forth

*the Branches of Arteria magna.*  
*Of what motions the Pulse doth consist.*  
*the chief Organ of Respiration.*  
*on no voluntary motion.*  
*Respiration made up of two motions.*  
*the Aspera Arteria.*  
*the Epiglottis.*  
*the Chest.*  
*Its Ribs and Muscles.*  
*the Midriff.*

is raised up, but being loosened it is dilated, and depressed in Inspiration or drawing in of the Air, or fetching wind. And because through the *Diaphragma*, near the Back, the Gullet, the *Arteria magna*, and *Vena Cava* do pass, left by the perpetual motion of the *Diaphragma* these parts should be straitened and agitated, the middle of the *Diaphragma* is Membranous, and contains no fleshy substance, that though the musculous part of the Diaphragme or Midrif is moved, yet that part may not be contracted.

Having done with the Vital Function, it follows in the next place, that we enquire by what means and with what Instruments the operations of the sensitive faculty are performed. And in the first place, that the Instrument of feeling which is the most common sense is a Membrane, hath been said already in Book 7. Chap. 6. But as to the Skin, 'tis true indeed that it is folded about the whol Body, not only that it may cloath the whol Body, and defend the other parts from external injuries, and that it may fasten and bind al the parts together; but also that it may be the Instrument of feeling, and may perceive external objects and injuries every way incident. And *Galen* rightly said 1. de temper. cap. 9. that the Skin, especially that in the hand, is the Rule of al sensible objects, and an Instrument of feeling properly fitted for so prudent a Creature as Man is. Yet nevertheless in that the Skin feels, it does it because it is Membranous, or receives fibres and little Nervous Membranes from the parts beneath it.

The parts and use of the tongue The Tongue is the Instrument of Tasting, whose flesh is spongy, rare and loose, covered by a most thin Membrane, common to the Mouth and Pallat, into which the Nerves of the third and fourth Conjugation are expanded. Now the Tongue hath three pair of Nerves; the former two are disseminated through the Coat thereof, and serve the Tasting Faculty: the third is spred into the Muscles of the Tongue for to move the same.

That the Organs of the Smel are the Mammillary Processes, was said before in Book 7. chap. 4.

The Organ of Hearing, its parts and use. The adequate Organ of the Hearing is indeed the whol Ear. But what is the chief part in the Ear that contributes to Hearing, Authors are at great variance, while some say the implanted Air, others a certain Nerve is the immediate Instrument of Hearing. But if we shal diligently weigh the matter, these Opinions may be some waies reconciled, as was said Lib. 7. cap. 3. For it is altogether probable that a certain implanted Air or aery substance is required to cause the Sense of Hearing. For as to receive the visible Species the Organ of Sight is shining and lightsom; so also to receive sounds, 'tis credible that the Organ of Hearing is Aerial. But seeing the Organ of a Sense ought to be a part similar and animated, simple Air cannot be the Organ of Hearing; but it must be a certain Aery substance, bred of the most pure and Aery part of the Seed and maternal blood, such as may have affinity with the external Air, and may receive the sounds brought in. But whether this ingrafted Air be in the expanded Nerve, or in some Cavity, can hardly be determined; since Anatomy in this point affords little help, and after death we find nothing obvious to the sight. Whence also it is that that same other Question can hardly be resolved; Whether this Air be only an internal Medium, to receive and transmit sounds to the true Organ of Hearing, which is the widened end of the Auditory Nerve? or, Whether (which is the Opinion of *Capivaccius*) this Air it self seated in the expanded Nerve be the Organ of Hearing?

The external Ear All the other parts of the Ear have each their use in Hearing. The external Ears by their sticking out do receive the sound, and cause it to rebound into the Auditory passage. Hence those that are crop-eared, or have their Earlaps cut off, they do not hear exactly, but perceive sounds like fluctuating Water.

The auditory passage or hole. From the outward Ear or Earlap, the sound comes first into the Auditory hole, which is boney and covered with a thin Skin compact and smooth, and which sticks exceeding fast to the bone, fit to receive sounds. At the end of this hole or passage is a Membrane which they call the Drum, made to this end, That the external Air might not slip into the Cavity of the Ear, and so disturb the Hearing.

Now this Membrane is exceeding dry that it may rightly receive sounds: for Instruments of Musick teach us, that the driest things are most apt to sound.

The three little bones of the Ear No man can easily tel the use of the rest of the parts of the Ear, viz. The Cavities, the three little bones called the Mallet, the Anvil, the stirrup; since we have no such helps here as Looking-Glasses, Optical Glasses, and such like do afford us in our explication of the Instruments of sight.

The parts of the Eye, and their uses. Somewhat we have spoken concerning the sight, Book 7. chap. 2. Its Instrument is the Eye; which hath many parts, each of which hath its peculiar use. The first is the *Cornea Tunica*, or Horny Coat of the Eye, which is transparent and void of al color, that the visible species

species may pass there-through into the Eye, and that pure and uninfected with any strange color. It is thicker than the Air, that the species coming out of the Air (a thinner Medium) into a thicker might be refracted.

Betwixt the Horny Coat, and the Crystalline Humor, the watry humor is placed in the middle, transparent and void of color for the Reason aforelaid touching the *Cornea*. Now it is thinner than the *Cornea*, that here also may be a new refraction of Raies. *the watry humor.*

Next the watry humor comes the *Uvea Tunica* or Grape-skin Coat, which is furnished with such a blackness as is not to be seen in all the body besides, to the end the species might become more clear, and appear better in the Crystalline humor. For weak Lights do more appear in an obscure darkish place than in a light som. Also this Coat seems to have another End, *viz.* That over much light which might enter in at the Apple of the Eye, and offend the Eye and the sight, might by this black Coat be intercepted. *the Uvea tunica.*

In the *Uvea* or the Grape-skin Coat, there is an hole which is called the Apple of the Eye, being the door as it were by which the visible species do enter into the Eye. This hole (that the sight may be more perfect and distinct) is much less than the compass of the *Cornea*: Yet in some it is larger, in others narrower; and those that have it narrower do see more sharply, those that have it broad are weak-sighted. *the Apple of the Eye.*

Now the *Pupilla* or Apple of the Eye is straitened and widened, and in a light place appears narrower, in an obscure place wider: For seeing too much light hurts the sight, and a weak light is not sufficient for sight, and in an obscure place the visible object is not sufficiently discerned; this Window (as it were) is made in the entrance of the Eye, which may be widened and narrowed, and by widening let in so much light in an obscure place as may be sufficient for sight; and by narrowing exclude too much Light which may offend the sight. *why it widens and narrows.*

And in regard of this Constitution of the *Uvea Tunica*, there are three natural manners of sight; one is most perfect, being constituted in an indivisible point, and whereby we discern distinctly the smallest things: The other is perfect, when we see visible objects at a just distance, and can distinguish them though we do not discern the smallest part of every of them: The third is imperfect and confused, whereby besides things just against us (which we see perfectly) we do also confusedly discern things on either side of us; and for this sight's sake the Horny Coat is broader than the *Uvea* or Grape-skin Coat, to the intent that at one view we may behold divers things, though not all distinctly.

Now this is the Cause of this Difference. Seeing the comprehension of a visible thing is made by a Pyramid; and the certification by its *Axis*; and only that perpendicular Line which is called the *Axis*, and which is not refracted, does effectually, plainly, and distinctly represent the thing; but other Raies, by how much they are neerer to, or further from it, by so much the stronger or weaker they are in representing: hence doubtless it comes to pass that when the Apple of the Eye is narrower, only the perpendicular in the Pyramid of sight does enter, or with it the Raies which are nearest the *Axis*; when the Apple is wider, more Raies (oblique and refracted) do enter with the perpendicular.

Next the *Uvea* is the Crystalline Humor, which is not seated (as some imagine) in the Centre of the Eye, but in the fore part, and the Membrane compassing the same divides the Eye into two unequal parts, the foremost whereof is fourfold lesser than the hindermost. And as to the use and office of the Crystalline Humor, Authors do not a little vary: For some (and the greatest part) do hold that this Humor is the chief Instrument of sight, and that therein only the species are received and discerned: Others (seeing that the Glassie Humor is also transparent, and much greater than the Crystalline, and placed behind the same) are of Opinion that the sight is not terminated in the Crystalline, but that the visible species passing through the Crystalline are received in the Glassie Humor, and being refracted are gathered into one point, and received by the Optick Nerve: which Opinion seems to be very probable. For seeing refraction is exceeding necessary to sight; all this furniture of the Eye, and the variety of transparent parts therein was contrived, that divers refractions might be made. And hence also the Crystalline Humor is more compact than the Watry, that a new refraction might be made therein. *the Crystalline Humor.*

This Crystalline Humor is seated in the fore part of the Glassie Humor, so called because it resembles melted Glass. Its substance is softer than the Crystalline, and less fluid than the Watry. The Quantity hereof is so great, that it takes up almost three quarters of the Cavities of the Eyes. *Galen* and many others have hitherto thought, that this Humor was made to nourish the Crystalline; but falsely: For what need was there of so great a quantity of the Glassie humor, if it were only to nourish the Crystalline? also the Crystalline Humor *the Glassie Humor.*

mor might be nourished by a much readier way; nor needed so laborious a contrivance of the Glassie Humor, if it were made only for nourishment: nor is there any example in the whole Body of one part nourishing another, but they all draw their nourishment from the Veins, whether they be white or red. The Opinion therefore of others seems to be truer, who hold, That the Vitreous or Glassie Humor hath received this shape, place, and quantity, that therein the visible Images or Raies being refracted out of the Cristalline into the Glassie, which is less compact than the Cristalline, might meet together in one point, and after that manner be offered to the sight.

*the Optick Nerves.* The Optick Nerves arise from the hinder part of the Brain, and going forward a long way, they are at last inserted into the Eyes. These Nerves after they are gone a little from their original are joyned together, not by sticking one to another, or crossing one another, but by an absolute Union; but soon after they are again separated, and being divided, the right goes to the right Eye, the left to the left. And some will have the reason to be, lest visible objects should appear double because there are two eyes. But seeing these Nerves are not joyned in their beginning, but on their way, it is more probable that the reason thereof is, That the Optick Spirit (when need is) might be sent totally well near into one Eye, that so the sight may be stronger in one Eye; which comes to pass when we shut one eye, that we may see a thing more accurately with the other.

But since Sight is made right forward, if the Eyes were immovable, we should be able to see only such things as are just against us. To the end therefore the Eye might see more things and that distinctly, it is furnished with Muscles whereby it may be moved. And because the Eye was not capable of all the differences of motions; such as they want are supplied by the motion of the Head. But that one thing seen by the two Eyes may not appear double, both the Eyes are always naturally moved to the same differences of position: and therefore the Nerves by which they are moved arise from the fore part of the Spinal Marrow, joyned together in one point as it were, that so they may agree together in every motion.

*the Eye-lids.* There are also besides, certain outward parts ordained to assist the Sight, viz. Two Eye-lids, the upper and the lower: of which the upper is only movable; the use of which is to defend the Eyes from external injuries, as Air, Wind, Smoak, Dust. Howbeit, some add also another use, viz. To purifie the Eyes: For since sight requires a pure transparent body, and the Horny Coat is easily dimmed by reason of the moisture which sweats out of the Kernel, as also by the external Air: in the opening of the Eye they conceive the Eyelid wipes all foulness from the *Cornea Tunica*.

After the external Senses come the internal, of which we have spoken, Book 7. chap. 7. The immediate Instrument by which, and in which they are exercised, is the Brain, which for the performance of these Functions is furnished with a peculiar substance, the like whereof is not to be found in the whole Body again.

*the Brain.* Now the Brain of a Man, the substance whereof is soft and white, in respect of the bulk of his body is exceeding great; because Man-kind is more exercised in Animal actions than other living Creatures, and therefore needs great plenty of spirits, which cannot be bred but of much matter, and in a large place.

*its use.* Now the Brain is made to perform the actions of the inner Senses, and of the Rational Faculty, and to generate Animal Spirits, which are the immediate Instrument of these actions. And the Brain is moved by a Natural and peculiar motion for the better generation of Animal Spirits, and like the Heart in its Diastole it draws matter for the generation of spirits, and in its Systole it pours out the Spirits into the Organs of the Senses.

*its parts.* Now the Brain is divided into three parts. And the first is divided by the *Dura Mater* into the foremost and hindermost part: The foremost, in which the Spirits are chiefly generated, is called by the name of the whole *Cerebrum* or the Brain: the latter *Cerebellum*, the Brainlet or petty Brain. Moreover the Brain is again divided by the *Dura Mater* into two equal parts, the Right and the Left. The Brain hath also its Ventricles and other parts, which are all most diligently described by Anatomists, nor can they be here briefly recited, nor well understood without ocular inspection and figures.

*In what part of the Brain the Animal functions are exercised.* But let us here first enquire in what part of the Brain the Animal actions are performed. The vulgar Opinion is, That they are performed in the Ventricles: in which also they hold the Animal Spirits are generated of the Air drawn in and fetching breath, and carried into the Brain by the Organ of Smelling, and of vital Spirit sent up from the Heart by the Carotick Arteries; and so they commonly hold the Ventricles of the Brain to be the Store houses as it were of the Spirits Animal. But late Anatomists having diligently weighed the Conformation

tion of the Brain, have left the said Opinion. For seeing nothing reaches into the Ventricles of the Brain, besides the Kernels, and that they have no passage save as the Tunnel and the kernel thereof (which by the consent of al receives flegm out of the Brain) it easily appears from hence, that those two remarkable Cavities (which are called Ventricles) were made to receive the excrements of the Brain: and that therefore they cannot also be the Shop and place of Animal Spirits. And therefore more likely it is, That the Animal Spirits are bred in the substance of the Brain it self, and that therein they are contained and perform their Functions.

Moreover, it is also controverted; Whether al the Functions which belong to the Brain are performed in one part thereof? or whether they are exercised distinctly in distinct places? Some wil indeed have it, That the Faculties have several places, and they quarter the Fancy in the fore part of the Brain, Reason in the middle, Memory behind. And this makes them think so, because one action being hurt, the rest do remain sound. Others quarter al these actions together, seeing they are exercised about the same objects: Who indeed deny not that one action may be hurt, and the rest unhurt; but they say, this does not therefore happen because they are in several places, but because each action requires a peculiar disposition in the Organ; whence it may happen, that one preternatural Disposition may hurt one action more than another; as for examples sake, moisture is more hurtful to the Memory than to the Fancy.

*whether the principal Faculties have different places in the Brain.*

Now although it is hard to determine any thing in this Case, and we must needs confess as in most other things, so in this, as *Scaliger* hath it, *Exercitat. 307. Sect. 21.* We like the Wolf deluded by the Stork do lick the Glass, but cannot touch the Gruel: yet it seems most probable that the common sense is placed in the fore part of the Brain, seeing there al the external senses concur, whose Centre (as it were) the common sense is. But the other actions seem not to differ in their seats, seeing they are conversant about the same objects.

*The common sense in the fore part.*

*The Memory, Fancy, & Reason not distinguished*

There remains the most noble and proper action of a Man, Ratiocination, or Intellection, which is performed (doubtless) without the help of any Corporeal Organs. For the Mind does not understand by the Body or any part thereof, as the Medium wherewith. The Mind of Man indeed stands in need of a Phantasm (because the Soul while it is in the Body never understands without a Phantasm) but uses the same, not as an Organ, but as an Object: For if the Intellect were tied to any Organ, by help whereof it acted, it could not understand al things: but according to the determinate disposition thereof it should act and only understand some things: as the Sight by the Eye perceives only colored things, and nothing else.

*The Memory, Fancy, & Reason not distinguished in their seats.*

*Ratiocination is performed without corporeal Organs.*

And although after this manner we cannot assign any place to the Intellect: yet by accident and consequentially a certain seat is ascribed thereto, viz. That wherein the Imagination is made. Imagination and Ratiocination are joynd together in one Seat, and Reasoning is said to be performed in the Brain, rather than in the Foot or Liver; because in the Brain Phantasms are offered thereunto, which it contemplates, but not in the Foot or Liver.

*the seat of the understanding.*

After the knowing Faculty of the Soul, there remains yet Appetite and local motion, of which we spake in Book 7. chap. 8. where also it is said, That a Muscle is the Instrument of voluntary motion. And seeing there are four motions of Muscles, so that they are either contracted, or extended, or transferred, or remain bent, as *Galen* teaches in *Lib. 1. de motu muscul. cap. 8.* Yet Contraction, whereby a Muscle is drawn towards its head and proper Original, is the proper action thereof, by which the parts are turned any way as occasion requires. Now there is a great number of Muscles, by reason of the variety of the parts to be moved, and their sundry motions; and some move the Thighs, others the Arms and Hands, others the Back, Breast, Head, Jaws, and other Parts.

*the Instrument of Animal Motion.*

Motion flows from the same Principle that Sense does, viz. From the Brain; howbeit, from the hinder part thereof peculiarly termed the Brainlet or *Cerebellum*; and the Nerves arising therefrom are more solid, and are diffused through the substance of the Muscles.

*Its Fountain.*

And that the Body might be transferred from place to place, a Man hath Legs given him which are made of most strong Bones, to support the whol Body, and carry it from place to place; which that they might not be too heavy, are made hollow within.

*the Legs.*

And that a Man might stand firm and upright, and not totter as he goes, he hath Feet joynd to his Legs, which are hollow in the middle, so that a Man staies himself upon four props as it were: For when a Man moves forward, he sets the former part of his Feet more firmly to the ground, and bears most upon them.

*the Feet.*

And that the Feet may be variously moved, divers articulations are made. For we go to low places by bending our Knee; after lying or sitting we raise our selves up: which could

*their joints.*

not

not be if our Leg and Thigh were not joynted. So we set our Foot more forward or backward, as the ground is up-hill or down-hill. Also the hollow part of the Foot when we go upon pointed things, or uneven bodies, laies hold on them as it were an hand; and after the same manner also we go up a ladder. And therefore the Foot (as a Hand) is divided into five Toes, which when we go do fasten upon the ground like hooks; and are also the cause that we can go upon rough and uneven places as well as those that are plain and smooth. Now in the Toes of the Feet, the great Toe is not set against the other four as in the Hand, but they are all placed on a row after the same manner. For the Hand being the Organ of taking hold, and the Foot of walking; as in laying hold a great variety of motion, so in walking the firmness and security of support is requisite. Moreover, that the Feet might accommodate themselves to the variety of the ground whereon a Man goes; besides Toes they are compounded of divers Bones, in respect of which they are sometimes bended, sometimes extended.

*the Hand.* And because Man only of all living Creatures is endued with Reason, he also alone hath an Instrument of laying hold or taking up, which are the Hands, the Instruments of Instruments, by which only he can supply himself with whatever other Creatures naturally have more than he, as to defend or cloath themselves. Now two Hands are made, that if one will not serve to hold a thing, both may. Again, they are variously distinguished, that we may take up great things and little things, and bodies of what figure soever. Likewise against the four Fingers the Thumb is placed opposite; because whatever we handle, either we enclose it circularly with our hand, or fasten our Fingers upon it on the opposite sides.

*Speech & the usefulness thereof.* Moreover, from the Motion of the Will Speech hath its original, wherewith we may conclude this our Epitomy: which as it is proper to man alone; so is it most profitable, and most highly necessary to preserve the Societies of Man-kind: For Speech was given us that we might demand of others such things as we wanted; and signifie what we had that we were willing to impart. And as *Scaliger* saies, in *Exercitat. 256.* from *Aristotle*: *Reason is the Hand of the Understanding; and Speech, of Reason; and the Hand, of Speech. For the Hands perform what they are commanded; the Commands obey Reason: Reason is the force of the Intellect.*

*the remote Instruments of the voyce the near or immediate Instruments:* Now the Instruments of the Voyce and Speech, are some remote and common, others near and proper. The former are the Instruments of Respiration, the Lungs and the Chest, and those parts pertaining to these, the Midriff and the Intercostal Muscles; which do not frame the voyce, but afford Spirit and Air which are necessary to the formation thereof. Now the near are the Wezand, the Larynx, the Muscles which open and shut the Larynx, the recurrent Nerves, the *Epiglottis* and the Tongue. To which some others are subservient, as the Palat and the *Uvula*. Amongst the most immediate are the Larynx, and especially the *Epiglottis*, which is like the tongue of a pipe: For a pipe without a tongue is useles, nor can the voyce be framed unless the passage of the spirit or air be made narrow.

For Air and Spirit are required as matter to frame the Voyce: Instruments are necessary to drive it forth, which are the Lungs and Chest: there is need of an Instrument wherein it may be smitten, and wherein being smitten the Air may sound; which is the *Larynx*, whose orifice being straitened, and the Air smitten, the Voyce is caused. And because the Case so required that a man was not alwaies to speak, but when he listed, the *Larynx* hath many Muscles, by which the chink of the *Larynx* may be widened and straitened as we please, and so sundry Voyces framed.

But because the Voyce of Man was to be articulate, to signifie the conceptions of his Mind, therefore his Tongue was framed with Muscles to move the same, wherewith being moved it variously opposes it self to the voyce issuing out of the *Larynx*, and so frames an articulate speech: to the formation whereof the Lips do also serve, which do themselves also oppose the voyce, and with their motion precede, accompany, or come after the motion of the Tongue, as the Nature of the Articulated Speech requires.

F I N I S.





# N A T U R A L- P H I L O S O P H I C A L D I S C O U R S E S.

## The I N T R O D U C T I O N.

**I** hath been both by me and others elsewhere at large declared, That there are two things which chiefly draw the minds of men from Truth, and hinder the growth of all Disciplines; viz. A Servile kind of Credulity, and a rash desire of Innovation. How much hurt both of these have done to other Disciplines, let those speak that are skilled in them. That I may speak of Natural Philosophy and Physick which belong to my Profession; it cannot be denied but that much hurt hath been done to both these; especially to Natural Philosophy, whiles some Men little regarding Reason and Experience, have solely adhered to the Authority of other Men; others out of a desire of novelty have endeavored wholly to overthrow the foundations of ancient Discipline. From both these courses I freely profess my self to have been alwaies averse: For neither would I be of the number of those rash Innovators, whether Paracelsians or Chymists, or how ever otherwise called, who endeavor wholly to banish from the Schools the ancient Philosophy, which is come to us chiefly from the Writings of Aristotle: nor yet would I be reckoned amongst them who are not ashamed in this Age of ours publickly to profess, that they had rather err with Aristotle and Galen, than speak the Truth with any later Author. The Innovators aforesaid I pass over at present. Touching these latter, I conceive Julius Casar Scaliger hath well written in Exercit. 306. That those Wits are most unhappy which stiffly maintain, That our Ancestors knew all things. I do not verily envy Aristotle those praises wherewith the same Scaliger every where adorns him. Let us grant that Aristotle is a man that hath deserved more than all mortal men besides, of all the parts of Humane Knowledge; that he is the Father and Captain of our Wisdom; that he is the chief Dictator of Learning, the Emperor of Philosophers; that he is the Eagle of the Philosophical Kingdom of Wisdom, and Literary praise; that he is the Hercules, the Prince, the Tribunal of Truth; that he is the god of Philosophers; and in a word, greater than all praise, and above all Calumny: yet neither he nor any mortal Man can be made the Rule of Truth. Let it be counted a comely and a decent thing to cite the Testimonies of Aristotle as of a prime Philosopher for his Opinion, and to produce as many of them as may be: but if weighty reasons be not added, a mind desirous of the Truth will not be contented with these alone. Their Course therefore is by no means approvable, who taking no care for reasons, contend only with Authorities. Yet this is a fault common enough. For if we look into the Writings of some Men we see nothing brought to prove their Matter, but the Authorities of Hippocrates, Aristotle, and Galen; and oftentimes many interpretations are alleaged touching the sence of some one place, and all those rejected, and at last another substituted, perhaps no better than the former, and so in disputing thereabouts pro and con, so many Pages are taken up, that he must have abundance of leisure that would read them all. And which is a ridiculous thing, the contention is not so much about the mind of the

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Author

Author speaking in his own Language, as the Interpretation of a barbarous and faulty translation, which is obtruded for the mind of the Author; and so they play at Blind-mans Buff.

So much reverence ought indeed to be afforded Aristotle, that if any thing seems by him inconveniently expressed, it be softened with a fit Interpretation. But if the matter be plain, (only some opinion of Aristotle doth not agree with the truth) 'tis vain to labor to fix another sense upon Aristotle. And that which is the top of all the mischief, you shall find such opinions given out every where for Aristotelean, which are no where extant in Aristotle, being the Inventions of School-men, whose custom hath been to delight themselves in disputing at things pro and con.

Which thing, as I said, doth not a little hinder the progress of all discipline; while both our time is lavishly wasted, and consumed without profit, of which we ought to be sparing Stewards, since life is short and Art is long; and we wander from the way of finding the truth. For there are two Principles only of finding out all truth, and Touch-stones of all opinions, Reason and Experience. He that follows these two doth not easily err: but they who neglecting these do fly to that external Argument, viz. Authority, and like Slaves swear to the sayings of one man, and of a Man make a kind of God, who cannot be deceived; they easily slip into sundry Errors. Hence (to speak nothing of Physick or other parts of Philosophy, but to keep me to natural Philosophy, for whose sake I speak all this) amongst the Expounders of Aristotle (whom all the Philosophers well nigh of all Nations for some ages last past have believed so to have perfected this part of Philosophy, that there needs no further labor but to understand his writings) so many dissensions and so many indissoluble objections, to and fro, have arisen, which in so many ages of years have not been ended, but that daily they have divided into many sects, while disputing upon the suppositions of several sects, one man will maintain one way, another man another; this man being for Averrhoes, a second for Thomas Aquinas, a third for Scotus, a fourth for another; that you cannot tel whom to give credit to. And that is true of Euripides, One man sees not all things. And no man hath ever been found, that hath not erred and mistaken, or as Galen hath it: It is hard for him that is a Man not to offend in many things, viz. being quite ignorant of some, judging amiss of others, and negligently letting down other things in writing. And therefore when free and excellent wits, and prudent Men had observed, that the Authorities of the Ancients had hitherto more hindered than furthered the Advancement of Learning; and saw that thereby a Bridle was cast upon the Understanding of Man, and upon many excellent wits; they endeavored to cast off this yoke of Bondage, and to seek the knowledge of things from the things themselves.

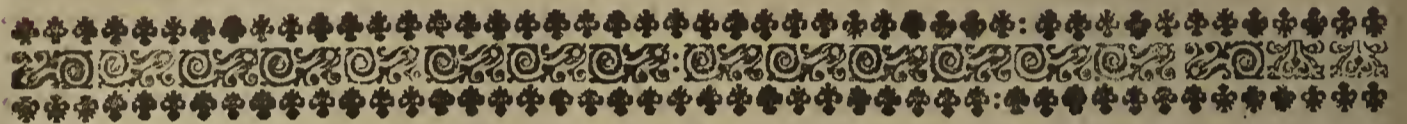
Yet they themselves also who have not followed only Authorities but weighed the Things themselves have not all happily touched the white of Truth. For seeing, as hath been said, Reason and Experience is the Rule of Truth in matters of Nature: Experience must of necessity precede, and when a thing is so found out, Reason is to prove the same: wherein nevertheless many offend; for seeing many neglect Experience, and rely only upon Reasons, & give too much credit to their speculations, they must of necessity be very often deceived. Of which thing we have every where remarkable Documents; some of old trusting to certain sleight reasons denied there were Antipodes; amongst whom was Lactantius, who largely inveighs against those Philosophers who held there were Antipodes, in Divin. Institut. Lib. 3. cap. 24. & counts those men fools who believed there were such Antipodes who hung by their Legs, and whose Feet were higher than their Heads: and calls it folly & vanity to hold there were Men in the world who went with their Feet just against ours. And Augustine de Civitate Dei Lib. 16. Cap. 9. counts it fabulous to believe, that there were men on the other side of the Earth, who went with their Feet against ours. Yea and Aventinus relates, that there was one Vigilus a learned Man, who could not avoid the thunder-bolt of Excommunication, for holding that Men lived about the Globe of the Earth and went with their Feet one against another. For Pope Zachary writ to Boniface, to drive Vigilus from the Church as an Heretick, and to deprive him of his Priesthood, unless he would abandon his perverse Doctrine. So, in the foregoing ages some endeavored by sleight reasons to persuade that the torrid Zone was not inhabited; both which Experience and late Navigations have taught to be false. So some idle Monks and others of the last ages preceding, taught many things, trusting to their speculations, concerning the Body of Man, which Experience and Anatomy do shew to be false. Jacobus Zabarella a most learned Interpreter of Aristotle acknowledged this Error, who in Lib. 2. de proposit. necess. cap. 17. thus writes:

All these things are so true, that all men ought to know them by Inspection of the things themselves, if in these daies we had Philosophers, who Philosophised by searching diligently into the Natures of things; and did not only addict themselves to the words of Aristotle, and chose many times misunderstood, to which they are wont to accommodate the things themselves; seeking nothing else but what Aristotle saith, and taking their Arguments for the knowledg and proof of all things, only from his words. The Premises considered, not out of any desire to inveigh against and carp at Aristotle (whom I reverence as much as any man can) or any other Persons, but only out of desire to find out the Truth, I began more diligently to examin certain things referring to some Controverted Heads of natural Philosophy. For although somewhat above thirty years ago, I collected a certain Epitomy of natural Philosophy, and afterwards published the same: yet the reading of other Authors and especially of Physicians (who have handled natural Philosophy inore diligently than other men, and are therefore called Physicians, that is to say, Naturalists) the Consideration of natural things, and exercise of chymical Operations, and in a word, Experience hath taught me many things; so that to use the words of the Comick Poet, Such things as I thought I knew, I am ignorant of, and such things as I had an high conceit of, Experience teaches me to reject. I conceive indeed, that the most things I wrote in that smal Epitomy are agreeable to Nature; but yet I suppose there are some things which may be more rightly, or clearly expressed. Whereof, I think I am not to be blamed for admonishing my Reader; since very many most learned men have done the same before me, which therefore I thought fit briefly to comprize and joyn as an auxiliary Appendix to the foresaid Epitomy, and those things especially, which concern the Principles and Foundations of natural Philosophy, not only general, but special also. For the chief cause why natural Philosophy is so little improved, I conceive to be, that in the former Ages those who accounted themselves the most acute, consumed the greatest part of their life in those general Questions, concerning the first Matter, Form, Privation, Motion; and such like, and wasted the time in repeating those Disputations over and over again, after a most tedious manner; but things particular or the sorts of natural things (out of the Observation whereof they ought nevertheless to have constituted their principles) they never medled withall to any purpose. And hence it came to pass that so many Wainloads of Commentaries arose upon Aristotle's books of general natural Philosophy, filled for the most part with Questions rather Metaphysical than Natural, and many times with vain speculations. But few were found that would read or Comment upon Aristotle's books of Meteors, of the History of living things, of the Parts of living things, of the Generation of living things, or of Plants; scarce so many in number,

As Gates of Thebes, or Heads of fruitful Nile.

And although I know, that by these my endeavors I shal lay my self open to the Calumnies of many, and that I shal be counted an Innovator and an Inventaer of Paradoxes: yet I have not thought fit therefore to forsake the study of truth. For Aristotle wel saies in 1. Ethicorum cap. 4. It is a good thing, yea and our Duty, for maintainance of Truth, to change and abolish our former Opinions and Tenets. Which things he taught not only by word and writiug, but by Deed and Action. For although Aristotle heard Plato teach twenty yeers together; yet he suffered not himself to be brought into bondage by the Authority of his Master, but he freely enquired into the Tenets of him and al other Philosophers before him, opposed them at pleasure and rejected them, substituting in their rooms such things as he thought most probable. And therefore we that follow, do ow no more Reverence to Aristotle than he did to his Predecessors; but we ought so to follow Aristotle, as that we do not love him better than the Truth. Galen boasts of himself that he was alwaies of a free spirit, and preferred Truth before the Doctrine of Hippocrates, Plato, Aristotle, and the wits of other Men. And are we all born Servants and Slaves to other Mens opinions? 'Tis excellently spoke by Seneca: They have done many things who are gone before us, but they have not done all. There remains yet much work behind, and much wil remain; nor shal any man born a thousand Ages since want occasion to add somewhat. And above all things this shall be my endeavor, that all my Discourses of Natural Philosophy may tend to the honor and Glory of the most good and great God. Concerning whom I am admonished by St. Paul, Rom. 2. verse 20. His invisible things are seen by the Creation of the World, being understood by the things which are made, viz. his Eternal Power and God-head, to the end they might be without excuse. And Mercurius Trismegistus: Man is made a Spectator of the works of God, and he hath wondred at them and acknowledged the Creator. And again in his Book de Pietate & Philosophia: there

can be no more true Godliness than to Understand the things that are, and glorifie the Creator for them: *and presently after*; Be Godly O Son; he that is Godly is a Philosopher in the highest degree. For it is impossible to be eminently Godly without Philosophy. But he that learns what things there are in the World, how disposed and by whom, and for whose sake, he wil give thanks to the Work-Master as to a good Father, tender Nurse, and faithful Steward: and he that gives thanks is Godly. And he that is Godly wil know where the Truth is, and what it is; and the more he knows the more Godly he wil be; *viz.* With such a kind of Godliness as may be attained from the Principles of Natural Philosophy, Theoretical and Practical. For who can choose but be Godly who truly discerns the immense Omnipotency, Goodness, and Wisdom of God? For he is (as Austin saies) without place, and in every place; invisible, and beholding all things; immutable and changing all things; alwaies working, and evermore quiet; he fills all things and is not shut up; minds all things, and is not troubled; is great without quantity, and therefore infinite; good without quality, and therefore good in the highest degree.



# THE FIRST DISCOURSE.

*Of the Principles of Natural Things.*

Chap. i. *That it is necessary for a Natural Philosopher to know the Creation of the World.*

Two manner of Principles of Natural things.

The Natural Philosopher must know God to be the first Principle of all things:

the second Causes:

**H**E that would treat of Natural Things must make it his chiefest care to handle the Principles of Nature; the Doctrine whereof being not rightly laid down, all things built thereupon must needs fall to ground. Now two kinds of Principles of Natural things must necessarily be considered and understood, *viz.* Those of their Original and first Creation, and those of their duration or continuance. The first kind of Principles must by any means be diligently considered, and he that enquires into the first Principles must necessarily enquire into God himself. For he is the First of all, and the Principle of all other Principles, having created all things Natural, and preserving them when created; so that they remain to this very day that Essence which he gave them at their first Creation. And herein chiefly most of all the Heathen Philosophers are deficient or very barren, and no mention at all (or but on the by) of God the first Author of Nature; and they so describe the whole Course of Nature as if all were performed without a first Cause, only by the action of second Causes, and indeed contrary Principles. *Socrates* raised his mind a little higher, when a little before his death, as *Plato* relates in his *Phædo*, having heard out of a certain Book of *Anaxagoras*, that there was a certain Mind which disposes and rules all things, and is the Cause of all; he said he was much delighted with this Cause; adding moreover, that those men exceedingly erred who rested in the second Causes and neglected the first. And he calls the Mind, or God, the Cause indeed; as without which the other Causes termed second Causes, are no Causes.

As to what concerns these second Causes, or the Continuation and Conservation of things created; since some Natural Things keep their Essence entire, such as they were created at the beginning of the World without any mutation; but other things are preserved only in their

their kinds, their particulars being subject to continual Corruption and Generation; we must also consider the latter kind of Principles, viz. The Principles of corruption and Generation.

As to the first kind of Principle, since all things (as all in their Wits grant) are governed by the Providence of God alone; they must also of necessity depend on him as their efficient; and seeing before any Natural things were made, there could be nothing but the most good and great God, we must needs hold that he is the first Author of all Natural things; who, when there was nothing besides himself, and there was no matter for him to work upon, by his Infinite Goodness, Wisdom, and Power, he commanded those things that were not to be made. Which thing also the more sound Philosophers granted after their manner, although they did not clearly enough explain the matter itself. Not to speak of others, *Plato* truly approved of the Original of the World, although he withheld his assent from some things concerning the same. For he constantly affirms, That the World did not proceed from Nature, nor from Fortune, nor was made by Hap-hazard, but that it flowed from the Will of God, not bound by any necessity. But whether from Eternity a certain Matter did proceed from God, and was all at once formed into this variety of things, or being at first unformed, after an infinite tract of Time, he did adorn it with so many Forms, or, which is the only thing that remains, he performed both in Time, he neither saies nor denies, and reasons in such a manner of the Original of the World, that which way soever you turn and wind all that Disputation which he makes thereof in his *Timæus*, it wil seem to favor all these Opinions. Which also may be said of the Opinions of other Philosophers before *Plato*. And hence it came to pass that the Philosophers which came after *Plato* were of sundry Opinions hereabout. *Aristotle* truly, though he acknowledg God to be the Maker of the World, when in the 2. *de Generat. & Corrupt. cap. 10. text. 19.* he writes; *God hath filled the Universe*: and in the 30. Section of his Problems, the 5. Problem; *God hath given us two Instruments in our selves, by help of which we might make use of external Instruments*: yet he endeavors confidently and openly by divers Reasons to deny, That God made the World new and in time; and to overthrow the Opinions of the Ancients touching the Original of the World. And therefore though he acknowledg God the Author of the World, yet herein learned men conceive he contradicts himself, since Eternity is a duration proper to God alone, nor can a Creature be co-eternal with the Creator; nor can there be two Infinites, nor wil right Reason allow us to make the World equal to God. And hence a grievous controversie hath been raised amongst the Peripateticks concerning the mind of *Aristotle* in this point, nor have they as yet wel decided the Controversie. For there are two things principally which all Philosophers in a manner cannot understand, viz. How the World could be made of nothing, and how it could be made in time; for when they saw other Artificers make their Works by mixing some things, and taking away other things; they imagined that God also had thus made the World. And therefore though they granted God to be the Author of the World; yet they held there were before the Original of the World certain bodies, either floating up and down in the immense Space, or lying hid in a certain confused Chaos and Medley. But they were both ignorant who made those bodies: and if they grant God to be infinite, they might believe he could produce something even of nothing; especially since there was nothing before any matter imaginable, but he.

Another thing which offends them is, That they think it absurd that God should be so long a time idle before the Worlds Creation, and at last set himself upon a new work. But since in Eternity there is neither fore nor after, it could not be made before it was made, unless it should be made from Eternity. But to be made, and to be made from Eternity imply a contradiction. And if you ask why the World was made five thousand years ago, and not twenty thousand years ago? I ask again, Supposing it was created twenty thousand years ago, why not an hundred thousand years ago? and if an hundred thousand years ago, why not an hundred thousand thousand years, and so itil forwards, unless it had been made from Eternity, which cannot be? For Eternity is a point wherein there is no going before or coming after. But the Philosophers could not by the reasons meerly of Nature and their own understandings, come to know the power of the most good and great God, who acts above the powers of Nature. But we may know these things very wel out of the holy Scriptures, the use whereof is by the goodness of God afforded unto us; and therefore those things in which the Philosophers are defective must be supplied from them. For though the holy Scriptures are not written to interpret the things of Nature: yet inasmuch as those things which are written by *Moses* touching the Creation of the World, were dictated by Inspiration of the holy Ghost; we must needs think that all those things which we read in the History of the

The world created by God:

The world created of nothing

the world was made in time:

the use of the holy Scriptures in natural philosophy

the Creation are most true: and that it is impious to suppose any thing there said to swerve an hairs breadth from the Truth. And suppose (which I do not now dispute) that every where in holy Scripture we meet with some things which are spoke according to the Opinion of Men, and either Tropically or otherwise Figuratively according to the Capacity of the common people: yet that cannot any waies be said of the Creation of the World, because God would have that made known to Men only as it is comprehended in this Writing of *Moses*, even to the end of the World. And although the primary scope of the holy Scripture is to propound the means to eternal Salvation: yet the History of the Creation of the World is not to be excluded from those means, as the Apostle teaches in the *Romans*, chap. 1. verse 20. seeing withal there are therein such Revelations of Natural things, as to which no sharpness of Humane Wit could ever be able to attain. An Example whereof the Creation of the World, and *Aristotle* himself, do afford. For let us suppose as *Julius Caesar Scaliger* conceits, that Nature hath in *Aristotle* made ostentation of all the Wit Humane Kind is capable of; yet he could never attain to know the Creation of the World, as the most learned Peripatericks confess. And therefore to depart from the evident sense of Scripture and to assent to Pagans, is neither Lawful nor Godly. And although it be indifferent as to Eternal Life, what Opinion any Man holds in the things of Nature, and in this darkness of the minds of mortal men it can be no prejudice to a mans attainment of Eternal Life, if out of weakness of Understanding he err in this point: yet if any man does wittingly contradict the holy Scriptures, and esteems the Authority of an Heathen more than the holy Writ, I conceive that questionless he sins very grievously. Truly *Galen* cannot (nor ought he by any Christian Philosopher or Physitian) be excused who in his second Book of the difference of Pulses, chap. 4. carps at the School of *Moses* and of Christ, as delivering Laws not founded upon any Demonstration. And in his Book 11. *de usu partium*, where he disputes of the Hairs of the Eye-brows, he derides *Moses*, as if God the Creator had commanded these Hairs alone to keep alwaies an even size, and that they as fearing the power of the prescriber, or reverencing God himself that gave them that command, or being persuaded that it was best to do thus, they did as they were commanded. And afterwards he reprehends *Moses* for supposing that God could make all things, although he would make an Horse or an Ox of ashes; and he holds and determines that God himself never undertakes any thing which Nature cannot effect, and affirms that the Hairs of the Eyelids would not have been such as they are if they had sprung out of the soft skin, though God should have willed and commanded the same a thousand times. Well therefore did that same famous Philosopher and Physitian *Franciscus Vallesius*, who in the Proeme of his Book *de sacra Philosophia*, is not ashamed ingenuously to confess, That when he was a yong man he wrote Matters Philosophical (viz. When he commented upon the Physicks of *Aristotle*) according to Opinion (that is the Mind of *Aristotle* and his Interpreters) but that he writes these things according to the Truth, that is to say, agreeable to the History of the Creation in holy Scripture, seeing before he could have no certainty concerning the Principles of Natural things before he knew them by reading the holy Scripture, to the reading whereof he had consecrated his old Age. And I have been long of the mind, That he who not knowing, or neglecting the Creation of the World, shal undertake a Dispute of the things of Nature, he shal err in many things; yea, and that many upon that occasion have fallen into most grievous Errors.

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world

Now *Moses* hath described the History of the Creation in the first Chapter of *Genesis*; the Interpretation whereof to set down in this place, I count not worth the while; since there are many large Commentaries extant thereupon, and amongst the rest that of *Franciscus Vallesius*, which though it be short is none of the worst. Only I shal advise you of one thing; That there are many who affix a wrong Interpretation upon the Text of *Moses*, whiles they endeavor to expound *Moses*, not by *Moses*, but from the Writings of Heathen, an unhappy and intollerable desiga. For it is certain amongst al Christians, that al things delivered in the holy Scriptures are true, and those delivered by *Moses* (being plainly Historical) are to be understood according to the proper and genuine sense of the words, as they are commonly understood in the Holy Scriptures; and not to be explained according to pre-conceived Opinions sucked in by reading Heathenish Authors: nor is the holy Scripture to be wrested to such Opinions. And therefore *Augustine* gives a good warning in the beginning of his second Book upon *Genesis*, that we take heed lest we contend, not for the sense of the holy Scripture, but for our own Opinion, so that we would make that to be the Opinion of the Scripture which is our Opinion; whereas we should rather be willing to make that our Opinion which is found to be the sense of the Scripture. The History (truly) of

of the Creation is not repugnant to Nature, but it is many times opposite to the false Conceptions which Men have of Nature; concerning which the same *Augustine* in his seventh Epistle to *Marcellus* thus writes: If a reason be given contrary to the Authority of the holy Scriptures, be it never so acute, yet does it deceive by an appearance or similitude of Truth. For it cannot be true. Again, if a man does oppose the Authority (as it were) of the holy Scriptures against most manifest and certain Reason, he that does so understands not himself, and he does not object the sense of those Scriptures which he cannot dive into, but his own sense against the Truth; nor does he oppose what is in them, but what he finds in himself in their stead as it were. And therefore although it seems hard to many to abandon some Hypotheses of Natural Philosophers, because they agree not with the History of the Creation of the World: yet is it altogether necessary so to do, seeing there are some things in *Aristotle* contrary to the History of the Creation of the World. For as *Benedictus Pererius* (an excellent Aristotelean) hath ingenuously written, *de Com. Rerum Nat. princip. Lib. 5 cap. 7.* nothing can be found out or imagined which is more contrary to the Doctrine of *Aristotle*, and which does more vehemently break all his Joynts and Nerves, than the Creation of the World. And a little before; When the Peripateticks perceived that a Creation being allowed, most grievous inconveniences would follow against their matter, they could by no means be induced to grant the same. And he who wil examine some Tenets of *Aristotle* shal easily perceive that *Pererius* was not mistaken when he so thought and wrote. And he shal see the same (not to speak now of the Eternity of Motion, and of the World) who wil but consider the Doctrine of *Aristotle* concerning the Principles of things Natural. But it is not my purpose to produce all the Tenets of *Aristotle* which may be called into question, nor is it my design to subvert the Natural Philosophy of *Aristotle*, but rather to shew which way the same may be perfected. And therefore I shal only hint a few things concerning the same.

### Chap. 2. Whether the Principles of Natural things are contrary.

**A**ristotle in the first of his *Physicks*, chap. 6. presupposes this as a thing granted by all Men, That the Principles of Natural things ought to be contraries. Now he was periwaded to hold this Opinion, either because he beleved that the generation of all Natural things was performed by the action of Contraries, and that when one contrary overcomes another, this thing perishes, and another is generated; or because he would insist in that Method by him pointed out in *Lib. 1. Physicor.* and proceed from things most known to us, to search out the Natures of things. But some Expositors of *Aristotle* have long since told us that this proposition is not universal, nor hath place in all Physical things. For since the World hath two sorts of Parts, some that have remained incorruptible and unchangable to this very day, viz. The Heaven and the Stars; some corruptible, whose Individuals are generated and corrupted, yet the kind is preserved by a continual succession of the said Individuals; it easily appears, how those principles belong to the Heaven and Stars. As for Matter, it belongs indeed to the Heaven, but not by a definite contrariety, but only affording Magnitude. For (which *Aristotle* wil not deny) the end of matter is to be the Receptacle of Forms, both substantial and accidental; and therefore in *2. Phys. cap. 8. text. 81.* he terms the Form the End of the Matter; and the same Matter gives corpulency and an indeterminate magnitude to things, and hath an aptitude to receive Forms, and a determinate figure, and of it self is no waies the Cause of Generation and corruption, but receives those effects from some Agent, or as *Scaliger* writes in *Exercitat. 61. Sect. 1.* Matter was not given primarily and of it self, for to cause a transmutation to generation; so that where ever it is, there also Generation should be; but to be the subject of the form of Corporeity in a substance, and to receive Quantity and Figure: Quantity in regard of change of place; Figure, because every body must and ought to be finite. And a little after, For these Causes Matter (by a primary Council of God) was created; but secondarily, and as to a less noble end, for Generation. And therefore although Matter belongs to all Natural things; yet, that the Principles of Natural things should be contrary does not belong to all; since in the Heavens and Stars (according to the Opinion of *Aristotle* himself) there is no Generation, and no contrariety, which might be the cause of Generation and Corruption. And therefore Principles with a definite and determinate Contrariety are not the most general, but do belong only to bodies subject to Generation and Corruption.

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Moreover, they do not belong to al corruptible and mutable things neither, but to such alone as are made by the action of contraries, and not to such as are made of seed. And touching this very Contrariety of Principles, and concerning them how they are contrary, the Peripateticks themselves are at great variance; of which see their Commentaries. Howbeit, the most of them do not place a true Contrariety in the first Principles, but such an opposition as is between the Habit and Privation, as *Zabarella* writes in his first Book *de materia prima, cap. 2.* and thus of an Egg which is no Chick, a Chick; and of Wood which is no Statue, a Statue; and of Potters Clay a Pot they say is made, and that Generation is a passage from a Privative to a Positive Essence.

But in good deed, thus going to work they have not sufficiently explained the Doctrine of the Generation of things; nor have they sufficiently laid down the Causes of Generation. For in the first place those examples which they bring of Artificial things, as when a stool or statue is made of Wood, a Pot of Potters Clay, a Globe of Wax, and such like, are all to be rejected: seeing they are not produced by operation Natural, but are the works of Art. Moreover, although we should admit a Contrariety in things Natural, in regard of their forms, by which many actions and Sympathies and Antipathies are caused, as Water is contrary to Fire, and Plants are killed by the Cold; yet from that very Contrariety a Cause of the Generation of all things cannot be rendred, nor is that Generation which is primarily intended, accomplished by the Action of Contraries; and therefore it cannot be granted that contrary Principles must be constituted for every Generation. For that a Sheep produces a Sheep, a Plum produces a Plum, does not proceed from the Action of Contraries.

And therefore although the Expositors of *Aristotle* having canvassed the matter to and fro concerning the Contrariety of Principles, do at last conclude, That one Contrary is not made of another, as of the term from whence, but that one Contrary is made after another; as for example, Cold after Hot; yet that term infers no causality, and affords nothing to the production of the thing, and therefore cannot be called a contrary Principle.

### Chap. 3. Of the Form.

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the princi-  
pal Cause  
of Gene-  
ration.*

AND therefore besides the Matter, our great Care must be to find out a Principle which is the efficient Cause and principal Agent in the Generation of all things. Verily (that I may not seem injurious to *Aristotle*) I must needs confess, that he in *Lib. 4. de Ort. & Interit. cap. 9. text. 53. &c.* as also in the end of the 4. of *Meteors*, reprehends the Ancients, because they did teach the Generation of things to be caused by the first Qualities, too instrumentally, omitting the Cause taken from the Form; and doing just as if a man should attribute to the Saw, Hatcher, and such like Instruments, the things made by them. But I could wish that in the beginning of his *Physicks* he had made larger mention of that Cause, or at least that his Expositors had from other places of his Works explained what *Aristotle* taught in his *Acroamaticks* concerning the Principles of Natural things. For so doubtless they would have enquired thereinto, and would not have been so content with the action of contrary Principles, and taught that the Generations of things were so instrumentally performed by them. Yea, and it were to be wished that *Aristotle* himself had been more solicitous about that Cause, or had more largely explained the same, and not extended too far the action of the first Qualities. At the end indeed of the 4. of his *Meteors* he plainly laies open his mind; where he attributes the Generation of similar parts in Animals to the action of the first Qualities, but the Generation of the dissimilar parts alone he attributes to a superior Agent, while he thus writes: Such parts happen to be made by Heat and Cold and their motions; being compacted by the power of Heat and Cold. Now I mean those parts which are similar, as Flesh, Bones, Hairs, Nerves, and all that are like to these. For they are all distinguished by those differences which we mentioned before, viz. Tension, Drawing, Comminution, Hardness, Softness, and others of the same kind. For such parts I say are made by heat and cold and mixt motions. But no man can imagine that the dissimilar parts, as the Head, or Hand, or Foot, are constituted of them: but as the motion of Cold and Heat is the Cause why Brass or Silver are made, but not of the making of a Saw, Glass-bottle, or Box; but of these Art, of the other Nature, or some other Cause: and so it will be thought to be the cause that those things are made. But whether this Doctrine of *Aristotle* be perfectly currant, I leave to the Reader to judge. *Galen* (truly) and other Physicians,



rians ascribe not only the Formation of the dissimilar parts to the Soul; but also they attribute thereto a blood-making, flesh-making, bone-making, nerve-making Faculty; and doubtless they are therein in the right. And who can believe that Gold, Silver, Iron, are generated principally and solely by Heat and Cold; and that the efficiency of the Form is not added. Moreover, neither hath he sufficiently declared what that specifick cause is in the Generation of things, but neglecting the same he often runs to the Universal Cause. For in his Book *de Generat. & Corrup. cap. 10.* and the following Chapters, he makes no mention thereof, but after he hath rejected the Opinions of the Ancients, and would produce his own, he flies to the Motion of the Heaven; and after he hath taught that the Motion of Heaven is perpetual, thence he concludes by way of Consequence, That rather that which is should be the Cause of that which is not, than that which is not the Cause of that which is; and that that which alwaies is, should make and produce that which is not and is generated. But at the beginning of the World, neither did the motion of Heaven make things Sublunary, nor now being only an universal Cause does it produce the sorts of things. For God in the first Creation gave to things their Forms, by which the Order of Generation is continued and perfected; and these Forms are justly held to be the Agent Principle, and as the Expositors of Aristotle themselves do hold, have a power to multiply themselves; and at the Generation of Natural things depends upon the multiplication and propagation of Souls, by reason of the Faculty which by the Almighty power of God was put into them at the first Creation, when God said, *Gen. 1. 11. Let the Earth bring forth Grass, the Herb yielding seed, and the Fruit-tree yielding Fruit after his kind, whose seed is in it self upon the Earth: and it was so. And the Earth brought forth Grass, and the Herb yielding seed after his kind, and the Tree yielding Fruit, whose seed was in it self, after its kind. And in verse 22. he said to the Fishes and Birds; Encrease and multiply, and fill the Waters in the Seas, and let Fowl multiply in the Earth. And God made the Beast of the Earth after his kind, and every thing that creepeth on the Earth after his kind: and God saw that it was good. And to Man-kind he said, verse 28. Encrease and multiply, and fill the Earth. And in verse 29. Behold I have given you every Herb bearing seed, which is upon the face of all the Earth, and every Tree in which is the fruit of a Tree yielding seed.* But as to the manner of Generation; The generation of Plants and Animals does sufficiently declare, that their Generation is not caused by the action of contraries one upon another, but by the communication of Souls, or by Seed which perfects the Fabrick of its own body, not primarily by the action of contraries, but by attraction of things friendly and of kin, and the expulsion of things having Enmity. For, that the body of some Plant or Animal is made, does not come to pass by the only concurrence and fighting of the Elements. For except, as *J. Casar Scaliger, in Exercit. 307. Sect. 20.* rightly teaches, *Those four Elements have a Governor, they will both toss and be tossed rashly without manner or measure. For what is that which mixes just so much Earth, and so much of the other Elements? But there ought to be in every motion one first mover. For they cannot move themselves to the Production of any work; but in Compounds they are moved by the more excellent Form to Generation, and in imperfect mixt Bodies by an external Principle they are moved to a mutual connexion.* For instance, when the Seeds of Plants are cast into the ground, the Elements do not then begin to fight that they may make the Body of a Plant, but each particular seed draws out of the Earth such nourishment as is to its own Nature agreeable, some that which is harsh, others that which is bitter, sweet, salt, as Hippocrates writes in his Book *de Natura Humana*: whence the whol Plant is formed, nourished, and attains to its growth.

Yea, and even Aristotle himself when he treats of Generation, cannot rest in the first Qualities, but is compelled to ad an higher Agent, viz. The Soul, even in the Generation of the similar parts, whiles in *2. de Generat. Animal. cap. 1.* he writes: *Even as we do not say that an Hatchet or other Instrument is made by the fire alone: So neither the Foot nor the Hand, no nor so much as the Flesh. For it also hath some office. Hardness therefore and softness, clamminess, stiffness, and whatever other dispositions are in the parts animated, may be produced by heat and coldness: but that whereby it is Flesh or a Bone cannot: but it is so made by a motion proceeding from the Generator, which is actually that thing, which the thing whereof Generation is made is potentially or by way of aptitude; as we see it is also in things Artificial. For Iron is made hard or soft by cold or heat; but a Sword is made by the motion of Artificial Instruments, which motion hath in it the Nature of the Art. For Art is the Principle and Form of that which is effected, but in another. But the motion of Nature is in it self, proceeding from another Nature,*

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The first  
Original  
of Forms.

The first  
Qualities  
are only an  
instrumental  
Agent  
in Generation.

which

which hath the Form actually. And as was said but even now, in 2. de Generat. & Corrupt. cap. 9. text. 53, 54, 55. he reckons Heat, Cold, and such like Qualities for Instruments, and saies they generate after a very Instrumental manner; and he writes that such as attribute Generation to them, do just as if a man should make a Saw, Ax, or any other Instrument the Cause of all those things made thereby.

whence the Elements have their forms.

And just so it is with the Elements. For when God first created the Heaven and the Earth, he first separated the Elements, and distinguished the Earth from the Water, and so gave the Elements their forms. That therefore is false which Zabarella endeavors to teach out of Aristotle Lib. 1. de Element. cap. 8. 9. (where he pitifully beats his Brains and vexes himself, and yet cannot make it appear how the first Qualities which flow from their forms can be before them; nor doth he seek after Truth in the thing it self, but how he may find such an Opinion as the words of Aristotle can bear) that this Elementary world hath nothing of it self but Aptitude or Potentiality; and whatever it hath of act, it receives from the Heavens; and that the whol matter of this inferior world is potentially Hot, Cold, Moist, Dry; but is actually made such by Immobility the motion and of the Heavens; growing hot by the motion of Heaven, and cold by the want of that motion; and that after the first Qualities (which are the preparations for the eduction of Forms) the forms of the Elements do follow, and that so the Elements are made and continue such (according to the Opinion of Aristotle) from Eternity. The holy Scriptures, as hath been said, do teach us better that the Elements were created at the Beginning, and that all things have their matter and forms whereby they differ one from another, and whereby they are able to operate, from the first Creation, and preserve the same to this very day, by the good wil and pleasure of the good and great God.

whether Forms are drawn out of the aptitude of the Matter?

From all which it appears, that God in the first Creation gave to all natural Bodies their matter and Form. To which if some would afford their Consideration, they would think otherwise than they do concerning the original of Forms. For it is an opinion sufficiently common, for which some plead as if their Life and Salvation lay on it, that forms are drawn out of the power or aptitude of the Matter, which is nevertheless built upon no sure Reasons, as I have shewed in my Epitomy of Natural Philosophy, Book 1. Chap. 3. and as I shal shew hereafter in my Fourth Discourse touching the Original of living things, chap. 4. Here I shal add nothing, but that this Opinion had its original from the Ignorance of the Creation of the world. For since they knew not whence all natural things should receive their forms, and that they had by command of the Creator a power to multiply themselves; they invented this original of them. Most indeed do give this out for an Aristotelick tenet, but with Bon-Amicus and others, Dr. Casper Hofmannus, a man excellently vers'd in Aristotle, saies it is a tenet of Averrhoes, in Traët. de Origine Form. near the end. Yet the said Hofmannus in the same place doth produce some texts out of Averrhoes, wherein he holds the efficient cause of Generation to be the form contained in the Seed: so that the fore-said Tenet seems rather to have had its original from the Schoolmen. Aristotle is verily of another mind in this point, who though he admits the Heaven as an universal Cause, yet he adds an immediate Cause, when he writes, that the Sun and Man generate a man. And in 2. Phys. cap. 3. text 31. he hath these words expressly concerning Seed: *The Seed and the Physitian, and the Consulter, and whatever, is Efficient, all these are the Causes whence the Beginning of Mutation, of Rest and Motion doth proceed.* And Scaliger produces more such Places in Exercit. 6. sect. 2. of which also mention is made hereafter, where we shal speak of the Generation of Living things.

whence that Opinion arose, of drawing Forms out of the aptitude of the Matter.

Now two things chiefly brought the School-men into this Opinion: the first it that they beleaved, as was said before from Zabarella, Lib. 1. de Element. Qualitat. cap. 9. and as they indeed suppose, according to the mind of Aristotle, Lib. 1. Meteor. cap. 4. that this Elementary world hath nothing of it self but aptitude or potentiality; and that whatever it hath of act, it receives from Heaven; and if at any time all the Elements were at first generated, and began to be what they are, they were generated by the Heavens; and because according to Aristotle Generation never began, that they are perpetually made and preserved such by the Heavens.

The other is because they endeavored to prove their natural Principles by examples drawn from the production of things natural (which kind of Examples though Aristotle hath used in his Physicks and Metaphysicks, yet we must think he intends thereby only to illustrate, not to prove that Doctrine:) for when they saw a Statue or Image made by the Carvers paring somwhat off, and adding if need were somwhat, and that when the Artificer had done his work at last, the very moment he leaves off the Form results from

all

al that hath been done : they thought after the same manner, that by the action of some external Agent (yet what that Agent should be they have not clearly enough explained, lurking under the general term of Nature, whereas a specific cause ought to be rendered of every specific Effect) some disposition was brought into the matter, upon the final perfection whereof the form sprung up in a moment : and they said that it was drawn out of the power or aptitude of the matter. But they were herein in a very great Error : For when of Wood a Bench is made, or a Statue ; or a Jug is made of Earth, a Globe of Wax, there is nothing induced but a certain Accident, Quality or Shape, and there is then no power of the matter save obediential. But here the Question is concerning the original of a Substance. Yet the Production of even artificial things might have brought them to the knowledge of the generation of natural things if they would have weighed the matter more accurately. For as artificial things are produced by an actual Agent, according to a determinate Idea in the mind of the Artificer, and so every thing is not made by every Artist, but a Carver makes one kind of work, a Box-maker makes another kind : a Carpenter makes another : so also to the generation of every natural thing a determinate and specific Agent is requisite, and one that is an Agent actually which according to the Power given it by its Creator (as the Artist works according to the Idea or Pattern in his mind) makes a work like it self. Herein only is the difference, that the Artist in the artificial generation is without the matter : but in things natural, the Artist is in the matter, and diffused through the matter as Galen speaks, *de Causis procat. & Causis pulsuum*. Nor can any external thing, whatever they shall feign, be admitted for a determinate cause, since none is like unto and (as they say) univocal to the thing generated, or hath at least that similitude to the thing generated which the Pattern in the mind of the Artist hath to his work, be it Statue, Pot, Bench, or what ever. For indeed Nature is an intrinsic Art ; Art an extrinsic Nature. Now Nature hath this Art from God, the foot-steps and Prints of whose wisdom appear every where, in Men, in Bees, in Pulmires, in the leaves and flowers of Trees, and all natural things whatsoever upon which the Creator hath imprinted his Image when he gave them Forms. For every Form is a participation and Image (after its manner) of the Power, and Wisdom, and Goodness, and Love of God : and every Being or thing, by its form, hath a desire to be, a Knowledge how to be, and a Power to be. And all things natural have by their forms whatever they have, and from the form proceeds the whole Fabrick of the Body, and the ornament of Accidents ; and many Qualities which are vulgarly ill attributed to the mixture of the Elements and the temper of tangible Qualities do flow from the Form, and all the furniture of the Body proceeds from the Form, as I shall hereafter shew more at large in the 4. and 6. Discourses of this work.

And although in the Forms of things we meet with many Particulars worthy of admiration : yet forms have chiefly three Proprieties which are diligently to be observed : The first is, that the Form of it self hath no Quantity, nor can it be divided ; and the same can be essentially entire and compleat in a small Quantity, as in a great Bulk ; and in the smallest Atome or indivisible Particle of Fire, or Water, is as perfect as in a great Quantity of either ; and in a small Seed of Poppy or Tobacco, as in a great Plant of either ; or to avoid all occasion of cavilling, in a little Sprig sprouting from an Acorn set in the Ground, the form of an Oak is as perfect and compleat as in the tall and hard Oak afterwards : nor is the Soul which is in a small Seed or Shoot, lesser than that which is afterwards in a tall Tree : nor is that in an high Tree greater than that in a small Seed or Branch.

Secondly, Yet is the form extended according to the extension of the Matter, or rather the form fills its whole Matter : For whereas, that I may demonstrate this by the Example of Plants, the whole Body of the Plant lives, is nourished, grows ; the soul which was at first in a small Twig, diffuses it self (its nature becoming no bigger) into the nourishment newly adjoynd ; and where ever the Body is which lives, there the Soul is rightly said to be ; and the plenitude (if I may so speak) or Replency of the Soul is just so great as the living body, and the dimensions thereof. For since no act is performed without some primary Agent ; where ever there is nutrition, there of necessity the Soul must be. And because Augmentation is made, when the pre-existent Soul communicates it self to the affluent Aliment, whose Bulk reaches further than the Body which is nourished, and diffuses or sheds it self abroad thereinto ; of necessity it must be present in every part of the whole Body. After the same manner the case stands in Animals. For since they are nourished, increased, and endued with the gift of feeling ; the soul which is but one, must of necessity be in all parts of the Body.

The difference between Artificial and natural Effects.

The Proprieties of Forms.

Thirdly, But although every form be of it self incapable of being divided or parted, yet because it is coextended or stretched out together with a corporeal body, which hath Quantity, by the division thereof it becomes capable of number, and is multiplied into many Individuals, and every form hath the Power of self-multiplication. Howbeit the manner of that multiplication is not one and the same. In some Plants in which the seminal matter is dispersed through their whole Bodies, the soul though of it self not subject to Quantity, is divided after a manner peculiar to it self according to the division of the Matter, and being actually but one in number is manifold potentially, that it hath in it a fitness, power, or aptitude to become many and becomes actually manifold, when its Body is divided into many parts; of one Vine many Vines, and of one Willow or Withy many may be made. But in others this same Multiplication is caused by Seed: of which we shall speak more at large in our Discourse of the Generation of living Things.

#### Chap. 4. Of Privation.

*Privation.* I must here also ad somewhat concerning Privation, which is reckoned amongst the Principles of natural things. Since the original of the form is such, as hath been explained just now, and shall be hereafter explained more at large; Privation unless the nature thereof be rightly opened, is in vain reckoned amongst the Principles of things natural. The very Expositors (truly) of Aristotle themselves do grant, that Privation is not a Principle, otherwise than by accident, if you regard the thing it self constituted: but if you consider the Generation thereof, it is of it self a Principle, viz. because it is as a Term from which, (since it is the absence of the form in the immediate Matter) which hath an aptitude to receive the same: Which opinions if they are to be allowed, they do stand altogether in need of a convenient explication. For that which is wont commonly to be said, that Privation though it belong not of it self to the Essence of things to be generated, yet it concurs of it self to natural Mutations, and from it all natural Generation proceeds, so that the form doth (as it were) arise thereout; that is false. The absence of the form helps nothing to the Generation; but besides the matter a disposition to receive the form is necessary. For every Form and Soul, since from the divine Benediction it hath a faculty to multiply it self, it requires a matter wherein to be propagated, and it disposes and fits the same for it self. Plants (for example sake) produce Seeds or bulbous roots, and Egg-engendering Creatures produce Eggs, other living Creatures produce seed, by which they are able to multiply themselves and to communicate somewhat of their Essence. If they please to term this disposition Privation, they shall have my consent. But they do not clearly enough explain how the Form follows Privation, and whence it proceeds. The Conimbricentian Collegiates do say indeed, *Lib. 1. Phys. cap. 9. Quest. 9. art. 2.* that the matter then only attains an immediate and compleat aptitude, when it is arrived to the Term and Fulness of all the Accidents wherewith it is disposed and fitted by the Agent, which term betides only in the very moment it self of Generation. And very true (indeed) it is, that disposition of the matter whereby it is fit for the multiplication of the form is made in time, and at last perfected in a moment, nor can the Seed of a Pear or an Apple be termed properly a Seed, til the accomplishment of the accidents is present. But the Form is not absent while these previous dispositions are made, so as to result upon their accomplishment; but it is already present, and it self according to the nature of the Body whereof it is a form, fits the matter wherein it may multiply it self, and elaborates the same, and in this elaboration some space of time is spent, more or less according to the Nobleness or Baseness of the Forms: but when it hath introduced the utmost perfection and accomplishment into the matter, just then the Form which before had a power to multiply it self, doth multiply it self actually; as for example sake, in a Poppy look how many seeds are generated, so many times doth the form of the Poppy multiply it self, and so new Plants of Poppy are generated. The soul in an unripe seed is not different from that in the same seed when it is ripe; but herein lies the difference, that the seed unripe lives only with the soul of the Plant; and being separated from the Plant wherein it was bred it cannot exist of it self: but a perfect and ripe seed is so disposed, that though it may be separated from the Plant wherein it is produced, yet it hath the same soul in it self, and lives now by its own soul, so that it can exist by it self. Of which matter *J. Cas. Scaliger* saies rightly, *Exercit. 6. sect. 10.* *A Tree (saith he) engenders, when it produces seed. But the Tree is not then generated when it sprouts out of the seed; but then that which was formerly ingendred*

*dred and imperfect, is perfected.* But if any man wil thus explain the vulgar Doctrine of Privation, and say that after the matter hath received al its accomplishment of Accidents, then there is a Privation, and that then afterwards in a moment the Form is introduced by an external Agent, that man is very much out, as shal hereafter be largely declared in its place; and it is sufficiently proved by *Julius Caesar Scaliger, Exercit. 6. Sect. 5.*

To be brief: In the first place, Privation (however it be explained) does not belong to al Natural things, but to such alone in which there is Generation, and therefore it cannot be numbred amongst the most general Principles of Natural things. For in the Heavens there is no Privation properly so called. For since it supposes a subject having aptitude to another Form, there is no such aptitude in Heaven.

*The Nature of Privation explained.*

Secondly, Privation (which also the Expositors of *Aristotle* themselves do reach, as may be seen in *Tolet. Lib. 1. Phys. cap. 9. Quest. 21.*) is not a Principle of Constitution, or which enters the thing generated, to help make it up, but of Generation.

Thirdly, Though it should be admitted for a Principle of Generation; yet they who maintain the Doctrine of the Eduction of Forms out of the aptitude of the matter, cannot conveniently shew what Privation is. But if we hold the multiplication and propagation of Forms, Privation may (not unfitly) be explained two manner of waies.

First of all, Since Forms are propagated not without Matter, but with it, and every Form requires a peculiar matter; that same last disposition to the reception and propagation of the Form may (not altogether unfitly) be called Privation: and it may be thus defined. Privation is the absence of a Form in a Matter which is immediately fitted to receive the same. To explain the thing by Examples: In a Stone there is no aptitude to receive the form of an Apple, or of a Dog; and therefore we do not say there is the Privation of the form of an Apple or a Dog. So neither is the Soul of a Dog propagated with his Blood, nor the form of an Apple with the pulp or meat thereof, but with the seed. And seeing the seed is not generated in a moment; for examples sake: The seed in an Apple is first white, and then it becomes black and ripe, and apt to receive the Soul of an Apple into it, and also to retain the same, being separated from the Tree: in the seed already ripe, and which hath already in it the soul of an Apple, Privation is not said to be because the Soul is already therein; but in that same seed which is just ready to ripen and is immediately fitted to receive the Soul, and to retain it, though it be separated from the Tree, Privation is said to be; and then Privation is that same ultimate disposition of the seed whereby it is fitted to receive and propagate the form of an Apple.

Secondly, Because nevertheless in that same ripe seed the Soul is present, at least in its first act, and because it wants Organs is not vulgarly called an Apple-tree, as an Egg is not called an Hen for the same Reason: If any man by reason of the absence of those Organs necessary to perform the actions of an Apple-tree or an Hen, shal cal that disposition which is in the animated seed and Egg, to receive the Organs, and exercise the actions by a second act Privation; and hold that in the Egg there is the Privation of an Hen, because there is therein an immediate aptitude to become an Hen, consisting of a Soul and perfect Body, I wil not quarrel or contend with that man; provided he grant, that in such a Seed and Egg there is not simply a privation of the Soul, since it is there not the first act, but the Privation of a Soul furnished with bodily Organs necessary to perform its actions.

And truly, I see the most learned *Aristoteleans* when they perceive the Tenet of *Aristotle* cannot be otherwise explained or defended, they can find in their hearts to embrace this Opinion. It is one and the same thing they say, which *Aristotle* names Privation, and which also he names the Form, whose absence, after its manner, is Privation, viz. In a divers respect. *Scaliger, Exercit. 6. Sect. 5.* There is in the Seed the forming Soul, going before the Soul for which it prepares that House; or as *Zabarella*, in his *B. de facult. anim. cap. 11.* speaks, the animated seed is a certain Matter cut off by the Animal it self which ingenders, retaining an active power able to generate a like Animal. For the seed of a Man hath an implanted force in it, whereby (as *Aristotle* saies, 2. *Phys.*) the Humane Nature is not as it were a Form, but as an Artificer, or immediate Agent. And therefore (in the former respect) it is an internal Principle of the thing to be formed; and although it do not inform that compound which yet is not; yet it informs the Seed so as to give it the name of a Mans seed, a Dogs seed, an Horses seed, &c. And therefore *Aristotle* calls Privation the Form as it were 2. *Phys. cap. 1. t. 15.* in respect of the form considered after the latter manner, viz. of the Compound. Inasmuch therefore as it disposes the Matter, and is the Architect of the parts to be formed out of the seed, so far it is termed Privation. And it is in reality a substance, and it is only termed a *Non Ers*, or a Non-being, in respect of the Form which shal animate the

the parts generated out of the seed. For it hath not yet the Office of a form. So that passage in *Lib. 2. de Generat. animal. cap. 1.* is to be understood with a grain of Salt, where Aristotle tells us, that the Soul is potentially in the seed. For as the parts of the Body are not actually in the seed: so neither is the Soul in the Seed as a Form, so as to give Essence to the parts of the compound, which are to be framed out of the Seed. Mean while it is actually in the Seed, as a principle of acting, that the living thing may be generated, as Aristotle professedly discourses in the foresaid place. To which purpose also *Julius Caesar Scaliger* in *Exercitat. 6. Sect. 5.* thus writes. Concerning this matter we are thus to think: That the Form is in the seed of a Dog, in the aptitude whereof it is said to be; because the Seed is able to give that Form which it hath in it self. Now it is reduced out of that remote aptitude which is the first act, to a neer aptitude which is the second act, viz. That the Form may be in the same Matter after such a manner as to need no helps to enjoy its end for which the whol Compound is ordained. It must therefore be declared after what manner it is brought forth by preparation; in case the Form it self be author of that preparation. For the Form does both alter the whol, and order the parts for its own accommodation. The Form therefore should draw it self forth. Therefore they said not well; That when it shal attain the greatest perfection of preparation, then also it shal arrive to the substantial Form. For the Form it self exists before that: therefore it does not arrive to it, but to the act thereof, whereby it may afterward enjoy the use and benefit thereof. After which manner it any man wil explain Privation, I willingly shal allow thereof. Yet this is certain, That the vulgar Doctrine of Education of Forms cannot stand with this Opinion.

### Chap. 5. Of the Consent and Dissent of things Natural.

**N**OW as the Forms are the first Cause of al Actions; so in regard of their Forms there is a Consent and Dissent of al Natural Things, and some things have a friendly appetite one to another, and unite themselves; others are averse one to another, and fly one from another. For things like do exceedingly covet Union. For that which is not one is not at all. So, that which is separated from its like seems also to defraud the same, and that it is defrauded thereby of the compleatness (as it were) of its Essence; for I do not say they are two fires, but one divided: As *Scaliger* writes, *Exercit. 310. Sect. 2.* Seeing therefore every thing requires its own Conservation; it attains the same by shunning things contrary, by moving to things like, and by drawing like things unto it self. Hence Fire unites to Fire, but flies from Water; and Water unites to Water, but flies Fire. Hence Water sprinkled in the Air or on dust gathers it self into round drops like balls to defend it self from the Earth and Air. Hence a smal flame is most swiftly drawn to a greater, or a little flame does move it self to a greater. The same is done in the Air. Hence those Bubbles which are made on the Water do move one to another, and so much the faster by how much they are neerer. So (as *Pliny* writes, *Lib. 2. cap. 105.*) *Naphtha* is of great kin to Fire, and the Fire leaps to it if it come neer the same. So they report *Medea* burnt her Rival, her Garland taking Fire as she came to the Altar to Sacrifice. Hence we see that if Water be sprinkled into boyling Oyl or Tallow, or melted Lead or Antimony, the fire flies from the water as an Enemy, raises a flame and mounts aloft; so that sometimes water poured into boyling Oyl or Tallow, hath been the occasion of setting Houses on fire. And here *Hieronymus Fracastorius* is of a different mind, who in his Book *de Sympath. & Antipath. cap. 5.* denies that one thing is moved to another by reason of similitude, so that it may be united hereto and preserved; because the part separated can neither by knowledg, nor by Nature, be moved to its like part. And that it knows not, he thinks it a cleer case. But without Reason. For as there is a certain Natural Appetite which they commonly call Instinct Natural: so there is a certain natural knowledg distinct from sense and understanding. For nothing can seek after any thing as pleasing, or flee it as displeasing, unless it have some natural knowledg of the gratefulness & fitness of the one, and the ungratefulness & unfitnes of the other. For nothing is desired that is not first known. By this kind of knowledg Plants do know such Nutriment as is fit for them, desire and draw the same to them; and what is inconvenient for them they let alone; and that which they have drawn, they turn some of it into Bark, other some into Fruit, other some into other parts. Of which *Hippocrates, de Nat. humana, text. 31.* Such things as grow and are sown, when they come into the Earth, every one draws that which in the Earth is most familiar thereto, as there is bitter, sweet, sower,

There is  
a Consent  
& Dissent  
of Natural  
things.

A Natural  
appetite,  
& a Natu-  
ral Know-  
ledg.

*sour, and all kinds.* So in the Crisis of Diseases, by a Natural Knowledg Nature knows and expels a vicious humor, and retains the good and profitable. By this Natural Knowledg Nature many times seeks strange and hidden waies to expel humors. And amongst the principles of the Nature of things Galen reckons this also from Hippocrates, 1. de facult. nat. cap. 12. That Nature performs all things artificially and justly, as being furnished with Faculties whereby all the smal particles do draw convenient juyce to themselves, and when it is drawn they make it grow and stick to every part, and at last assimilate the same; and what in the mean while they have not been able to vanquish, and that which will receive no alteration, nor become any waies like the thing which is to be nourished; that they reject by another faculty, viz. the separative. And in the same place, Lib. 3. cap. 13. he writes: That all the particles of the whol Body have a power to draw to themselves that which is agreeable and friendly to them, and to force back that which is burdensom and biting. And therefore Fracastorius labors in vain to shew how by a certain violence such things as are separated one from another may be again joynd together. Now although this Natural Consent and Dissent of things does spring primarily from their forms: yet because the Forms do act by Qualities; some things also consent or dissent by manifest Qualities, as Water and Fire, and others by occult or secret Qualities, of which we shall speak hereafter.

And from this Consent and Dissent of things Natural a reason may be given of many things which happen in Chymistry and Physick, and every where in the world. Salt things are mixed with salt, and dissolved by salt things; Oyls mingled with Oyl, Fat, and Sulphureous things. For examples sake, *Aqua fortis* dissolves Metals, yee can it not dissolve Brimstone: contrarywise, Brimstone is dissolved in Oyl which cannot dissolve Metals. So Gums and Sulphureous fatty Tears of Plants are dissolved by Oyl; but such things as are of a watry substance are dissolved by Wine and Water, not by Oyls. 'Tis a common Practice for a man that hath fouled his Hands with Pitch not to wash them in Water, but in Oyl or Grease, which wil dissolve the Pitch. And every where in the composition of Medicaments such things occur, especially in the making Plaisters, which if the Apothecary be ignorant of, he wil lose both his labor and materials. Also precipitations so called do afford a rare document hereof; when Gold, Silver, Corals, Pearls, Crabs-Eyes, and such like, are dissolved and precipitated. To speak only of Corals and Pearls; for examples sake (for the same reason holds in all) these Bodies are dissolved by the Salt of distilled Vinegar, or the like sharp Liquor, whereunto that same Body in regard of affinity is so joynd and united by the most lubtile Atomes, that it may be strained through a brown paper. To this Liquor (containing in it the Body of Corals and Pearls) if you drop in Oyl of Tartar made by *deliquium*, or Oyl of Vitriol, the Salt of Solvent Liquor unites it self to the Oyl of Tartar or Vitriol by reason of affinity, and leaves the dissolved Body; which being so left unto it self descends to the bottom by its Natural heaviness, which they cal precipitating. Also how great the force of Gunpowder is there is no man ignorant; and that proceeds only from the antipathy that is betwixt Brimstone and Salt-peeter. From the same proceed Lightnings, Thunders, and Thunder-bolts. For if in the Globe of the Earth Sulphureous, Nitrous, and watry Vapors are at once raised aloft, in the lowermost Region (truly) of the Air; where it compasses us about, being dispersed into very smal atomes, they fight not together; but when in the Clouds the fiery atomes or particles are joynd with fiery, the sulphureous with sulphureous, the watry with watry, at last resuming Courage on both sides they fight furiously, and both fly from, and chase away their Enemy. Hence the Fire shunning the Water Lighens out of the Clouds. From this Fight rumblings and Thunder-cracks are raised, and that same Fiery and Sulphureous Spirit breaking out of the Clouds melts, burns, or throws down whatever it meets with. Also there is a vulgar example hereof in Quick-lime, upon which if Water be poured, the fiery atomes which lay hid therein flying the water as their Enemy do break forth. Whereupon being collected they have raised so great heat, that they have been known to set on fire some wood that was at hand. Also if you put Spirit of Nitre to Butter of Antimony, or Oyl of Vitriol to the filings of Steel or Iron, there arises a boyling and a noise; yea; and a flame too: Where nevertheless it is to be noted, That it is credible that this same boyling is not caused only by the fight of Contraries, but also by the sudden motion of like parts to like. Also from this Consent and Dissent of Natural things many Questions in Physick may be answered, and Controversies composed. That Burns are cured by burning things, viz. by holding ones burnt hand against the fire, or by smearing the burned parts with Linseed Oyl, or an Oyntment made of Onions; and parts nummed with cold, by rubbing them with Snow, or dipping them in cold water;

Examples  
of the Consent  
and  
Dissent of  
things.

Precipitation.

The cure  
of persons  
burnt, and  
such as are  
frozen  
and with cold.

and that Apples or Eggs being frozen, are cured by putting them in cold Water: all these effects happen because hot things draw hot things to themselves, and cold things draw cold things. Also Physicians dispute about the temper of Camphire, while the Ancients say 'tis cold, and most late Writers hold that it is hot. Howbeit the taste and its aptness to burn do so manifestly convince it to be hot, that I wonder any man can doubt thereof. The only thing which perswaded others that it was cold, is because it does cool. But this it does, not of it self, but by accident, viz. Whiles it draws the fiery and sulphureous atomes, out of the Body unto it self, by reason of similitude: which the flowers and water of Elder do in the Rose or fiery Inflammation so called, as also Oyl mixed with Lye.

The temper of Camphire.

### Chap. 6. Of the Matter of Natural Things.

Now, as God created all the Forms, so he gave unto them Matter, such as was fitting for every Form; and that there might be an interchangable course of things, and alwaies fit matter for sundry Forms, God created the Heaven and the Elements. The Heavens, that by their Influence they might cherish and govern the Generations of inferior Bodies; and the Elements as simple Bodies, which by their actions might further the interchangable course of Generations and Corruptions, also might afford matter to living Bodies.

whether there is any other matter of Bodies besides the Elements?

But whether there are yet other simple Bodies besides the Elements, which may afford matter to living things, is made a Question, not without cause. With the Peripateticks indeed it is out of question, that there are in this sublunary World no simple Bodies but the Elements; and that of them all others are compounded. Howbeit, many have doubted hereof, and that not without cause. *Johan. Francisc. Picus Mirandulanus*, in his Book of Elements, chap. 3. writes: *If there be any that will not content themselves with the Opinion and Authority of the Philosophers, and will maintain that there are yet some other Elements mixed with those vulgarly known, which by a secret power of Nature concur to the constitution of sublunary things, they can hardly be substantially refuted.* And *Jacobus Schegkius*, in his Book of the Power and Efficacy of Heat, chap. 4. writes, That every Body is either an Element, or compounded of Elements, or hath some proportion and similitude with the Bodies Coelestial. And that he had out of *Aristotle*, who in 2. *de Generat. Animal. cap. 3.* writes, That the heat in living things is neither fire, nor hath its Original from fire, but is of analogy to the Heavenly Matter. But what that Body is, and whence it had its Original, cannot be explained without the Creation of the World. But from the Creation of the World all these things are clear. For God did not at first command the Elements to fight together, to make up mixt Bodies, of which afterwards Plants and living things were to be made; but as he gave to Plants and Animals their Forms and Souls, so he gave unto each of them their peculiar Bodies. Which although (for I wil not now dispute that point) they may be constituted of the Elements as to their matter: yet that there should be nothing in them but Elements, and that the forms of these Bodies are Elementary, and that the Souls of Living Creatures are received in a Body simply constituted of the Elements; and that so the Elements considered either as simples, or as mixt Bodies, should be the immediate subject of Souls, there is no firm demonstration to prove; nor is it yet proved, That that which *Aristotle* saies holds proportion to the Element of the Stars is a meer compound of the four Elements so called. For since more noble Forms do require a more noble Matter (as *Aristotle* also teaches) the Creator gave to every Form a convenient Body, each of which receives its nobility and activity from the Form, which (as *Scaliger* speaks, *Exercitat. 307. Sect. 20.*) is a fifth Nature, far differing from the four Elements. And in very deed, that Spirit which is inbred in Animals and Plants is a wonderful thing, which first is in a smal quantity of seed, and afterwards by means of the Blood flowing in at the first formation of the yong one, and then by the Aliments taken in it is increased to a great bulk, and goes al over the whol body of an huge Animal, and warms and enlivens the same so long as the Creature lives. And although this Spirit be of its own Nature hot, yet, and heat it self, though the admixture of other things with it makes that it is not discerned, yet is it really in them; and it may be separated from them, as appears in Spirits made out of Plants. Where this is also to be noted, That as nothing is nourished but what hath life, as *Aristotle* teaches, 2. *de animal. cap. 4. text. 46.* so nothing can properly nourish, unless it be a part, fruit, or effect of a thing animated or endued with a Soul; and therefore in all aliments there ought to be some of that Spirit which they vulgarly cal *Calidum innatum*, or inbred heat; and there



their food does not only restore the moisture, but the heat also.

Nor do other Bodies which seem to be only mixed and not animated arise from the mutual fight of the Elements. It is a point of small discretion to believe that Wine, Oyl, Honey, Sugar, do arise from the mutual fight of the Elements. The truth is, God did not create those things at the Beginning. For there is no Wine before Vintage, nor Oyl til the Olives are gathered, bruised, and pressed; nor Honey before the Bees make it, nor Milk before living Creatures that bring forth live yong ones become with yong. But God created such things in their Principles, that is to say, he gave a power to the Vine to make such a Liquor as Wine out of the nutriment it draws out of the Earth, the Olive tree such a juyce as the Oyl, a Reed to breed such a juyce as we cal Sugar; and to the Bees he gave power to gather juyce out of Flowers, and thereof to make Honey; to the Dugs a faculty to make Milk.

And here the Chymists bring in their Principles, concerning which I have spoken largely in my Treatise of the Consent and Dissent of the Chymists with the Galenists and Aristoteleans. That I may say a little of them in this place; first of al, those who do not simply allow them as Elements, do grant them to be the first mixt bodies. About which I wil contend with no man, if I may but obtain thus much, that in such a Sence they may be called Principles, because in the resolution or separation of mixt bodies Art can hardly proceed any further, yea, and perhaps Nature goes no further, which when she makes a mixt body does not immediately constitute the same of the last Principles, but rather of these first mixt bodies: whereof I shal speak more hereafter in my Third Discourse concerning Mixture. And this is most of al manifest in the Nourishment of Living Creatures. For neither is the Chylis made immediately of the Elements, but of Bread, Flesh, Fish, &c. Nor is Blood made of the Elements immediately, but of Chyle, as we shal shew more at large when we come to speak of Mixture.

Moreover, this also is worthy our Consideration, Whether those first mixt bodies do consist of the Elements only? or whether they received from God in the first Creation a Form different from the Forms of the Elements, since God created not the first matter only, but also the second, and gave every Form its proper matter and subject, by which they preserve themselves, and remain entire in the sundry Vicissitudes of Generations, and being variously mixt do afford matter to other natural things. Truly as the Expositors of Aristotle are too long in their Disputations of *Materia prima* or the first matter, so are they over-sparing in the Consideration of the second Matter, whereas every Form does nevertheless require its peculiar matter or subject. For neither can every body be the proper matter and subject of every form, especially of Souls, but in living Creatures it must be so disposed of necessity as that it have an immediate aptitude to receive a Soul, and to be converted into the substance of a living body, and to be nourished by the nutritive faculty. Which disposition proceeds from the peculiar Forms. Now that there are in Plants and in living Creatures forms distinct from the Soul, which belong to the proper Constitution of the Subject of Souls, is also sufficiently manifested by the wonderful operations of dead Plants, and the parts of dead Creatures in Physick. For since every action flows primarily from the form, and these actions are more noble than that they can proceed from the forms of the Elements, either simple or mixed; of necessity there are other forms besides the forms of the Elements, from which these actions proceed; and I see no cause why I may not cal them with Scaliger, a fifth Essence, and the Body wherein they are, with Aristotle and Schegkius, a thing answering to the Element of the Stars; And some of Aristotle's Interpreters (among whom Zimara especially) do hold, That not only Souls are super-added to the Forms of the Elements, but also that the form of mission is a fifth form really distinct from the forms of the four Elements, and super-added to them.

There are  
Forms su-  
per-added  
to the  
forms of  
mixt Bo-  
dies.

Hence, Whereas they say, That some bodies are simple, others compound, and that some are more, others less compound; that does not come to pass by reason of the first matter and Elements, but in respect of the Forms. For since al mixt Bodies consist of the four Elements, in that respect one is not more compound than another. But because some forms do presuppose other some, and cannot perform their operations save in a subject after a certain manner disposed by other forms: such Bodies which contain divers forms besides the Elements are termed Compounds, such as are the Bodies of al living things. Hence that form is most perfect which hath most other forms under its Command.



## THE SECOND DISCOURSE.

*Concerning the occult and hidden Qualities.*

### Chap. 1. *What hidden Qualities are.*

**S**INCE to Know is to understand a thing by its Cause, we must labor with all our might, that in the things of Nature also we may render the true and proper Causes of all operations and effects. That there are indeed in nature four Elements, and that they work by their first qualities (so called) which are obvious to the Sense is a thing out of Question. But there are very many Effects in Nature which can no waies be referred to those Qualities. And therefore the most acute *Juhus Casar Scaliger* in *Exercit. 218. sect. 8.* ingeniously and freely writes, that to reduce all Effects in nature to the first qualities is extream Impudence. And those who endeavor to do so, it happens to them as *Galen* writes of *Epicurus* and *Asclepiades*, in *Lib. 1. de natural. facultat. cap. 14.* that either they alleadg foolish and ridiculous reasons, or deny those things which are confirmed even by Experience, and as *Thomas Erastus de occultis medica. proprietat.* writes, they get nothing but to be derided by all that are studious of the truth and knowing in the things of Nature. And therefore *Galen Lib. 11. de simp. med. facultat.* when he treats of the vertue of the ashes of River Crabs against the biting of mad Dogs, acknowledges their said faculty proceeds altogether from their whol substance, and reprehends his Master *Pelops* because he boasted very ambitiously, that he knew the Causes of all such things; and promises that he would at one time or another write a Book concerning such things as act by the propriety of their whol substance. And if there were nothing else to perswade us how vainly and rashly many have endeavored to reduce all things to the first qualicites, Poysons at least and their remedies might teach us so much, as the same *Scaliger* tels us in the place fore-alleadged. I for my part do freely and boldly pronounce, that there is hardly any more pernicious opinion, and which hath more wearied even the best wits and worn them out with vain and fruitless labor, than that of those men who endeavor to assign causes of all things which happen in nature from the four Elements and natural Qualities. For whether you consider them as simples, or however mixed and remixed, and however you may suppose their Qualities to be tempered, nothing can proceed from them but what is Elementary. And it is al one whether more or fewer come to sup without money, for they must all fast. But this error hath been hitherto sufficiently common, nor hath it kept it self within the bounds of natural Philosophy, but hath also crept into Physick, whiles many men have vainly endeavored to fetch the differences of all Diseases, their Causes and Symptoms, with the virtues of medicaments, from the first Qualities.

But in very deed, certain most experienced Physicians have long since acknowledged this Error and warned others thereof, amongst the rest *Johannes Fernelius*, a most excellent Physician, who in two Books *de Abditis rerum Causis*, hath most learnedly demonstrated, that many things are, and are performed in Physick, whose causes 'tis vain to draw from the temper of the first Qualities. For which excellent pains nevertheless of his he hath gained nothing from some but reproach and back-biting. And no wonder; for the world is governed by opinions: and many think it not very honorable, yea and a foul disgrace too, to lay

*Fernelius  
defends  
occult  
Qualities.*

lay down the Errors they have unwarily drunk in, and to admit and acknowledg the truth, though it dazle their Eyes with its most cleer brightness; and therefore whatever they are ignorant of they esteem as new and false. Mean while all more learned Philosophers and Physitians have undertook to defend the truth, and have constantly taught, that the Causes of many things in natutal Philosophy and Physick do depend upon hidden Qualities, and that we are glad oftentimes to fly to the saving Sanctuary (as *Scaliger Exercit. 218. sect. 8.* names it) of an occult Propriety: which whiles it is called ignorance by some, they rather accuse the weakness of our understandings to dive into the secrets of Nature, then blame these hidden Qualities. For if the true Original of these qualities be sought into, (whereof few have taken care) the knowledg thereof wil produce as certain science as that of the first Qualities. For the natural Philosopher knows no more of Heat, but that it Heats, and that it flows from and depends upon the form of Fire: which form is to man as unknown as those forms from whence the hidden qualities arise. For as *Scaliger Exercit. 307. sect. 29.* laies, The Form is a divine thing, the perfect knowledg whereof is hidden from us, and therefore to search further is the part of an unquiet and over-busie mind. And therefore those who traduce these Qualities, by calling them the Sanctuary of Ignorance are long since worthily refuted by *Avicenna, Lib. de virib. Cordis, tract. 1. cap. 10.* when he thus writes: As he that knows fire warms by reason of the heat therein, truly knows and is not Ignorant: so he that knows the Load-stone draws Iron because it hath a virtue in it whose nature is to draw Iron, without doubt is knowing, and not Ignorant. And afterwards: The Ignorance of the Causes of this Virtue in the Load-stone is no whit stranger than the Ignorance of the Causes disposing things be to red or yellow, or the Body to the Soul. But admiration ceases in things we are used to, and our mind neglects to enquire concerning them. But that which happens seldom stirs us up to admiration, and moves us to enquire and contemplate the causes thereof. And a little after: If that Fire were a thing hard to come by, and brought from far Countries, People would more admire the properties thereof than the properties of other Bodies, and more enquire into the Causes of its proprieties than into the Causes of other Proprieties, because its proprieties are very wonderful. For the presence thereof brings the sight from aptitude to act, and it will not suffer it self to be touched; also it mounts upwards, and makes such things as it can master to ascend with it, and of a smal quantity thereof in the space of an hour a great quantity is bred; and it corrupts every thing it meets with, and changes it into its own substance; nor is it lessened though you take some from it. And these things are in truth more wonderful than the drawing of Iron by the Load-stone, or than other Proprieties. But because these are usual, and daily seen, we cease to admire them, nor are careful to enquire into their Causes. But the action of the Loadstone, because it is rare and unusual, induces to admiration, and provokes men to enquire after its causes. And indeed if we enquire into the original of these hidden qualities, there may be had of them as certain knowledg as of those that are manifest. For in this darkness of humane understanding the form of the Fire is to us as unknown as that of the Loadstone, and as the Poet sings.

*Nature's wont to hide many things with a Sacred cover:  
Nor is it fit that mortal men should come to the knowledg  
Of all things, since that many are more fit for a wonder.  
And so far the truth of things is set from our Eye sight,  
That we may hardly be said to know the things we do handle.*

Now these Qualities are called Occult, Hidden, Abstruse, to difference them from the manifest qualities which are discernable by the external Senses, especially the Feeling; whereas contrariwise these are not perceivable by the Sense, although their operations are. So we see the attraction which is made by the Load-stone; but we perceive not the qualities which causeth that motion of the Iron. So we perceive with our senses the evacuation caused by purgative medicaments; but we do not perceive that quality by which the purging medicaments do work that effect. After the same manner, we perceive with our Senses the symptoms which Poysons do stir up in our Bodies; but the qualities whereby they cause the said symptoms we perceive not by the sense. By our Senses (for example sake) we perceive Heat in the Fire, by means whereof it heats: but it is not so in those operations which are performed by occult qualities. We perceive the Actions but not the qualities whereby they are affected. Hence these qualities are termed hidden and specificall proprieties, faculties proper to substance; and such Agents are by *Galen* called things acted by their whol substance, or by a propriety and familiarity of their whol substance, 6. *Epidem. Com. 6. text. 5. 11. de simpl. med. facult.* and elsewhere.

Chap. 2. Whether there are occult Qualities, and things that act by their whol Substance.

*'Tis proved that there are occult qualities.* NOW that there are occult Qualities and actions proceeding from occult Qualities, is from two things chiefly apparent. The first is, That there are many actions in Nature which totally differ from the actions of the Elements; The second is, That the way and manner of the actings of such things as work by occult Qualities, is far different from that of the Elements.

*The actions of occult qualities differ from those of the manifest ones.* As to the first, What the actions of the Elements are, is known, viz. To heat, to cool, to moisten, and to dry, and such as follow them, to rarefie, make compact, &c. But there are actions in Nature far different from these. The Load-stone draws Iron; a Cat (though thus up in a chest) does so work upon some people that they are ready to fall into a swoon; a little Quantity of Opium stupifies a man and brings him into a dead sleep; what mischief the biting of an Asp, a Viper, a mad Dog works in our Bodies, almen know; what strange symptoms does the biting of the Spider *Tarantula* cause; of which I have spoken in the first Book of my Practice, part. 2. cap. 17. And how great the force is of a little pestilential Infection, many know to their sorrow. And these Venoms are not cured by heaters, moisteners, coolers, dryers, but only by such things as work by occult Qualities. And as was before wel said from *Scaliger*, If nothing else could perswade how vainly and rashly many endeavor to reduce al effects to the first qualities; at least Poysons and their Remedies might convince us. And a thousand such actions are every where met with in the course of Nature. Since therefore such actions are of a quite different kind from the actions of Elementary Qualities, and surpass their faculties, we do therefore justly distinguish these Qualities from those which are manifest to the Sense, and term them occult. *Galen* knew this, who writes in his 6. *Epidemic. Com.* 6. text. 5. and 3. *de temperament. cap.* 4. expressly, that poysons do not at al act after the self-same manner as fire and water, but by a contrariety of their whol Nature. And *Lib. 5. de simplic. medicam. facult. cap.* 1. 18, 19. he writes, That there are some things contrary to us by their whol substance.

*Also the manner of acting is different.* Again, The Elements have a much different manner of acting from that of those things which work by occult Qualities. For the Elements (to exercise their Faculties) require a sufficient bulk of Body, nor can they exercise their forces in a very smal quantity. For though fire be extreemly hot, and Snow extreemly cold; yet as *Galen* wel writes in his 1. *de Temperamentis, cap.* 4. a very smal quantity of either of these works no effect in our Bodies; yea, bodies so qualified do not kil a man though taken in a good quantity, whether hot or cold; as Snow, Pepper, cold Water. Again, they do not work such sudden mutations in the Body. But some Poysons kil a man in the smallest quantity imaginable, or stir up most grievous Symptoms, and that in a moment. Of which *Galen, Lib. 1. de Semine, cap.* 16. thus writes, *The smallest portion of a deadly poyson being entred into a man or other Creature, does change it totally in a moment of time, and qualifie the same with a disposition like it self.* Again in his 3. *de locis affectis, cap.* 7. he saies, *Who would beleieve that from the stinging of a Scorpion, or of the Philangium (a Spider so called) the whol body should be so exceedingly and unusually changed, unless he had often seen the same with his Eyes, especially considering the sting of those Creatures is a very smal thing.* And a little after: *The sting of a Sea Turtle, as also of a Land Scorpion, does end with an exceeding smal point; where there is no hole through which the poyson might be cast in: yet we must needs suppose that there is some substance in the Nature of a spirit, or of a Liquor, which though very smal in bulk, yet is very great in activity.* And *Ælian* in his 9. *B. de Animal. cap.* 7. relates, that the prints of the biting of an Asp are so exceeding smal that they can hardly be discerned by a sharp sight. And *Ful. Cas. Scalig.* in *Exercit.* 153. *Sect.* 11. and *Mercurialis* in his Book *de Venenis. cap.* 16. do write, that in *Nubia*, which is a part of *Æthiopia* beneath *Egypt*, there is poyson, the tenth part of a grain whereof wil kil a man, or one grain ten men, within a quarter of an hour: or if one man take one grain it kil him presently.

*Occult qualities known & asserted by learned Men.* By which Reasons most learned men being moved, have acknowledged and taught, that there are very many Qualities in Nature, besides the Elementary. *Galen* (as we said before in the beginning of our first chapter of this Discourse) in his 11. *de simpl. med. facult. cap.* 14. where he treats of the vertue of the Ashes of River Crabs against the biting of a mad Dog, reprehends his Master *Pelops* that he vain-gloriously boasted that he knew the causes of al such things:

things: and in his first *de nat. facult. cap. 14.* concerning *Epicurus* and *Asclepiades* he writes, That those who endeavor to bring manifest causes for al Diseases, it commonly falls out, that either they bring foolish and ridiculous reasons, or deny those things which even experience it self confirms. And in the third B. of the faculties of simple Medicaments, chap. 3. he writes; And truly it is by us in other Treatises demonstrated, that there are in all things certain Agreements and Repugnancies of Qualities, and that which is familiar is readily assimilated, but that which is contrary kills both Plants and Animals; also that these familiarities proceed from the propriety of the whol substance. And in B. 5. *de simpl. med. facult. cap. 2.* we have shewed (saies he) that Medicaments have a faculty to alter, either by one quality, viz. By heating or cooling, moistening or drying, or by some of the said qualities joynd together, or by their whol substance; as most deadly poysons, many Antidotes or amulets, and al Purgers. Which also he repeats in the same Book; chap. 17, 18, 19, 23. The same he teaches in the 6. 8. & 9. *de simp. med. fac.* the 1. *de compos. med. secundum genera, cap. 16.* the 8. *de compos. med. secundum loca, cap. 8.* the 13. *de Methodo medendi, cap. 6.* *Alexander Aphrodisæus* writes in his Prooeme to the Problems, that there are infinite things in Nature, which can be known only by experience, and are therefore by Physicians termed Hidden Properties; and he reproves those who endeavor to render the Causes of such things from the qualities of the Elements, and that they scurvily botch up certain solutions which are altogether unprofitable and improbable: whom *Mesues* and other Arabians do follow. But in the Age last past, *Johannes Fernelius* that most learned Physician does largely and learnedly maintain these Qualities in his 2. Books *de Abditis Rerum causis*; who in the Preface to his second Book thus writes. Many indeed laugh at the Atomes of *Democritus*; but *Democritus* if he were to rise from the dead would much more (after his manner) laugh at these Elements we talk of, inasmuch as some endeavor to draw the causes of al things in Nature from them. The most acute *Jul. Cesar Scaliger*, in his 218. *Exercit. Sect. 8.* writes, That it is a point of extream Impudence to refer al things to manifest Qualities; and in *Exercit. 101. Sect. 14.* thus he bespeaks *Cardan*: What evil Alexandrian spirit hath so belotted thee that thou shouldest pitifully beleve it possible that the Load-stone should draw Iron to it only by the mixture of the Elements? And in his first Book of Plants, treating of Tasts, he hath this passage: But if any man shall say, That Tast is made by a conspiracy of the four first Qualities, let him tel me, Whether in any Element as an Element there is any Tast? There is truly none at al. But as neither life proceeds from the Elements, nor laughter, nor sense, nor understanding, nor voluntary motion, but from other forms besides the Elementary; even so does Tast also. And though there were no other thing to perswade us that there are other occult Qualities besides the Elementary; we might be satisfied only by the consideration of Poysons. The same *Scaliger* in *Exercit. 218. Sect. 8.* saies: Many of them have Proprieties different from the Elementary Qualities, which are concealed from temperate minds, and delude the curious. And *Thomas Erastus* in his 4. chap. of the Hidden properties of Medicaments (which place I alleadged in the first Chapter) saies, That they who would reduce al effects to manifest Qualities do gain nothing, but to be justly derided by al that are studious of the Truth, and skillful in the things of Nature. Also *Johan. Francisc. Ulmus* hath defended, explained, and by many examples proved the said occult Qualities, in *Lib. 4. de occultis in re medic. proprietat.*

That which *Galen* saies happened to them that reduced al things to first Qualities, that either they brought foolish and ridiculous Reasons, or denied such things as were evident, that also happened to *Sanctorius*, who in his *Lib. 8. Methodi Vitand. in Medicin. Error.* endeavors to reduce hidden and occult properties to manifest qualities: Whose Discourse of that Subject I think fit briefly to propound and examine.

But at first, in *cap. 3.* by way of a Ground-work he premises that Question, Whether the Faculties of the Soul do essentially differ from the substance of the Soul? or Whether they are in the same predicament therewith, viz. in the Predicament of substance; and he conceives the Fountain of that error concerning occult qualities to be, that those who hold there are qualities of the whol substance, do conceive that they belong to the predicament of substance. For suppose indeed that some there were who conceived the Faculties of the Soul differed not from the Essence thereof; yet they held an Error. And herein we willingly assent to *Sanctorius* when he holds the powers of the Soul are not substances; but that they differ from substances and are qualities. But if such things are sometimes by Authors attributed to Faculties which are proper to substances, there is an equivocation in the word *Potentia*, power or Faculty, which sometimes (and that properly) is taken for a quality, but sometimes

*Sanctorius his Discourse of Hidden Qualities examined.*

sometimes (though improperly) for a substance, having a power or faculty to act. And such substances are not only Souls, but also other forms, as that of the Load-stone. For all forms are substances which have their powers of exercising certain actions, all which they do not perform by manifest, but some by Hidden Qualities. He labors therefore in vain chap. 6. while both by Authorities out of *Galen*, by reasons and experiments, he endeavors to prove, That hidden Qualities proceed not from the substance, but from the manifest Qualities. For in the first place, that which he brings out of *Galen*, 12. *Method. Medend.* and other places, that occult qualities have their contraries, but substances have no contrary, is of no moment: for the occult Qualities are not substances, but qualities flowing from their forms. And if there be any other such arguments, they touch not our Opinion, but that of *Fernelius*, who holds Diseases of the Form. Moreover, that which he brings out of *Galen*, *Lib. de Constit. Artis*, cap. 8. and 4. *de simpl. med. cap. 15.* and 2. *de locis affectis*, cap. 8. deducing unutterable proprieties from sundry alterations, all that we grant. But if only the first qualities be mixed, no occult qualities can arise from thence, but only a temperament of the first qualities; though the degree of the temper or mixture cannot alwaies be sufficiently explained. So, when he saies, that of bitterness, sweetness, harshness, and acrimony mingled there arises a quality, which because it cannot be expressed by one name, may be termed ineffable or unutterable, al that we grant; but yet no occult quality, such as is in the Load-stone, Poysons, and such like, does thence arise, but only a tast, being only a manifest quality perceivable by the Tongue. Of the same moment is that which he alleadges as an experiment, that out of divers colors mixed peculiar colors arise. For whatever colors are mixed, nothing arises therefrom but color; but no occult Quality. And although of an hundred other altered qualities the determinate degree cannot be known: yet the power of drawing Iron which is in the Load-stone cannot be made thereof as he falsely conceives. Out of the first Qualities only temperaments of tangible Qualities are made, though the determinate degree is not alwaies known; out of colors colors, out of Tasts Tasts are made. But never out of the first qualities, or tasts, or colors, can be made the power of drawing Iron, or of purging, or of stupifying like Opium, or such as is in the Venom of the Pestilence. From al which it is manifest that *Sanctorius* hath not rightly formed the state of the Question, but dallied with the equivocation of the words Ineffable and Occult Quality, and was ignorant what that Occult Quality meant which is intended in the Question.

Sanctorius his arguments examined.

Of the differences of occult qualities. But whereas in the seventh chap. he labors to find out the differences of Occult Qualities, therein he does well in that he labors to fetch them from the Subject; since the condition of al qualities depends upon the first Subjects. But when he endeavors to deduce them from the first manifest Qualities, and second, as Heat, Cold, Moisture, Driness, Rarity, Density, he makes himself a laughing stock. For whereas in the first place he conceives the proper subjects whereby the Qualities may be defined may be taken from a substance considered as corporeal; he is exceedingly out. For from a Substance as Corporeal nothing proceeds but quantity and dimensions. But on Bodies not considered as Bodies, but as furnished with certain Forms, the occult qualities and all others depend. Moreover, whereas he makes the Principle of al Passion to be Density and Rarity, and deduces the qualities both first and second, hot, cold, moist, dry, hard, soft, stiff, crumbly, rough, smooth, thick, thin, from Rarity and Density, that therein he is in an error is so clear that it needs no proof. And let it be granted (truly) that those Qualities proceed from Density and Rarity: yet all these qualities are not occult, concerning which our question is, but tangible qualities. And that is yet more absurd, that he endeavors to bring al from Scituation, and saies that Scituation is the general kind of al: For from the Scituation of the parts of a Body proceeds Rarity and Density, and from Rarity and Density hot and cold, moist and dry, also hard and soft, with the passions, and passive qualities.

Of the Antipathy betwixt a Man and a Cat. And he becomes perfectly ridiculous when he writes chap. 10. That he saw in *Hungaria* an Italian Gentleman, who when he was near a Cat (though he saw it not) he presently swooned, and unless the Cat had been driven away would have been choaked; and he supposes the cause hereof was Compactness and straitness. For that the Gentleman was narrow chested, and apt to a Tiffick, and in the Cat there were three destructive things for those in the Tiffick, viz. Its Brain, Breath, and Hair. Therefore he conceives it is no marvel if of these a new stopping quality was bred which might by the exhalation of the Cat be communicated to a man, and by condensing choak him. But one absurdity being granted, a thousand follow. For I my self (and many others) have known such as could not endure the Presence of a Cat, yet are they not troubled with the Tiffick. Moreover, if the destructive Faculty be

in the Brain, Breath, and Hairs, it is not Density. Thirdly, If Cats do this by their thickning breath, why do Cats shut up in a Chest work the same effect? Fourthly, Those that are troubled in this kind do not complain of the *Asthma* and shortness of breath, but only of fainting fits.

But the best thing in this Discourse of his is that which he hath in chap. 10. where being convinced by the Truth it self, he proves by many reasons and experiments, that there are Hidden qualities which do not arise from the first qualities, whereof I shal ad only some, viz. Those which directly prove that occult qualities do not flow from the first qualities.

*That there are Occult Qualities which arise not from the first, proved by certain Experiments.*

The first Experiment is of the Load-stone, which is notoriously known to draw Iron, which Faculty nevertheless cannot be reduced to any first quality.

Secondly, If *Doronicum* did kill Dogs by vertue of Heat or Cold, it could not cure Men.

Thirdly, If Scorpions did kil by Heat, the drinking of pure unmixt Wine would not cure their poyson.

If a dram of *Opium* kills by its coldness, why wil not an ounce of Ice (which is colder) do as much?

But the rest of the Experiments which he brings do not prove that occult qualities flow not from the first; yet against those who endeavor to derive al qualities from the first, they prove there are qualities which flow not from the first. For since alteration and the action proceeding from the first qualities is not effected in a moment, but gradually and in time; and that there are many mutations of qualities which happen in a moment, thence it appears that there are qualities which are not made by mutation of the first qualities. For if a red Glass be put before a blue Glass there arises therefrom in a moment a Violet color; if a blue Glass be put upon a yellowish Glass, there arises therefrom a green color; Water wherein Galls have boyled is clear, but if Water be poured thereinto wherein Vitriol hath been boyled, which is also clear, there arises a black color in a moment; and there are many such mixtures which produce a new quality in a moment.

Finally, Whereas in cap. 11. he writes, That the maintainers of occult qualities have been too credulous to beleve the most vain reports; I confess indeed that many fabulous and superstitious tales go up and down; but in the mean time, al things are not fabulous which are spoken of the effects of occult qualities. Doubtless those reports of the Load-stones Faculty to draw Iron, of the stupefactive faculty of *Opium*, of the Faculties of Poysons and Antidotes, of the Antipathy betwixt some people and Cats, are al most true, and any one may dayly experiment the same. And whereas he accounts for fabulous al that is said of sundry things hung about the Neck, or tied to the Body, he does it without cause; since those things which are reported of *Peony Root*, the *Elks Claw*, the *Nephritick Stone*, and such like things, are known by Experience to be really true. So also, those things which are written of the *Echeneis* he can by no other reason confute save that it cannot produce such an effect by heating, or cooling, or rarefying, or rendring compact, or the like qualities. Others there are who account the Narration concerning the *Echeneis* to be fabulous; but *Pliny, Lib. 32 cap. 1.* confirms it by Histories, thus writing: *The Fish Echeneis or Remora, held the Prætorian Ship of Antony in the Adriatick Sea. And a little after he saies: It stopped also in our Memory the Ship or Galley of Prince Caius as he was sailing from Astura to Antium. Nor was there long wondring at that stay, for presently the cause being known, when of the whol Fleet that Galley only did not stir, some leapt out into the water to seek the cause, and they found the said Fish sticking to the Rudder, and shewed it to Caius, who stormed that so small a thing should stop his course, and frustrate the endeavors of four hundred Rowers.*

*All things are not vain which are reported of Occult Qualities.*

*A Story of the Echeneis, Remora, or Stop fish*

Therefore *Franciscus Vallesius, Controvers. Med. & Philos. Lib 8. cap. 5.* saies, That it is a ridiculous thing to deny that which is manifest by Experience, because we cannot tel the reason thereof. As if it were impossible any thing might happen in Nature of whose cause we are ignorant. We are ignorant of most things. And therefore they that would in Natural Philosophy find out the Truth, and not fall into wild and sophistical Opinions, they must begin with things known to the Sense, and so proceed to the Causes, and having found them rejoyce in the Works of Nature; and not finding them, confess their own ignorance; but by no means deny things that are manifest. For it is less shameful having found out the effect to be ignorant of the Cause, which is frequently hid from the most expert Philosophers, than together with the cause to be ignorant of the effect, which when you deny, the common people wil laugh at you, and prove it by experience.

*'Tis ridiculous to deny a manifest effect because the cause is unknown.*

## Chap. 3. Of the Original of Occult Qualities.

Now to find out the Original of Occult Qualities is a very hard thing, nor are all men of the same Opinion concerning their Rise. For in the first place, some there are who being moved with the evidence of the thing it self, dare not deny occult Qualities: but when they come to search out their Original, they fall back to the Elements and their Qualities, and endeavor vainly to derive the occult Qualities from their mixture and temperament: and conceive the hidden proprieties of things do proceed from a peculiar temper of the first Qualities, which therefore they term *Idiosyncrasia*. It is not (truly) sufficiently apparent what *Galen* thought in this point, since that Book which in *Lib. 11. de simp. med. fac.* he promised to write of things which operate by their whol substance, and which he cites in the *6. Epidem. comm. 6. text. 5.* is lost through the injury of time; yet he seems to encline to this Opinion, and to rest much in the first Qualities. For in the *1. de Element. cap. 7.* he writes, That our Bodies are altered only by being heated, cooled, dried, moistened; for that these Qualities only do totally change through their whol substance. And when in *Lib. 3. de Temper. cap. 3.* he had said that the four Faculties of the Body, Attractive, Retentive, Concoctive, and Expulsive, were in every Body effects of the whol substance; he adds, that the said whol substance consists of Heat, Cold, Moist and Dry, mingled together. And in *Chap. 4.* he teaches us to observe for a Principle, that every body hath a certain propriety of Temper, which is convenient to this Nature, disagreeing to that. And hence he gives the reason why several things are Food or Physick for several Creatures; as for instance, Hemlock is Food for the Starling, and Hellebore for the Quail, which are Medicaments for men; because the temper of the Starling and Quail can assimilate the Hemlock and the Hellebore, which Mans Temper cannot do. Most late Writers have been of the same Opinion, not being able to raise their Minds beyond the Elements.

The mixture of the first Qualities cannot produce the occult Qualities.

But in very deed the Occult Qualities which act beyond the power of Elementary Qualities cannot proceed from the Elements: however mixed, nor from their Qualities however tempered. Nor can a hidden way of Mixture bring in new abilities, but which way soever the Elements be mixed and remixed, and however their qualities be tempered, nothing arises therefrom but what is Elementary. And the Proportion of manifest Qualities being unknown does not of manifest make them occult, but only breeds a temper wherein the proportion of the first Qualities is unknown to us. The Elementary Qualities are; and remain even under the unknown measure of a Temperament; and as in the Temper the Qualities do not change their Essence, so neither can they perform an action transcending their Vertue and activity. For that is a Rule infallibly true, That nothing acts beyond the powers of its own kind. And that Argument which *Jul. Cas. Scaliger, Exercit. 307. Sect. 20.* uses to prove, That the Soul does not arise from the Elements, is doubtless general and of use here. That (saies he) is in the powers of the Soul which was never in the power of any Element. But there is nothing in any thing which was not actually in its Principles. For the Principles are the acts of those things whereof they are Principles. Now in the Soul there is a Faculty to move forward, backward, to the right hand, and to the left, which is not in any Element. There are also other more illustrious powers of the Soul, which are not in the Elements. For what *Scaliger* saies of the Faculties of the Soul, the same may we say of the Faculties of the Load-stone, of purging Medicaments, of Poysons, and other things. For nothing acts beyond the vertue of its own kind; and nothing can work as a Cause beyond its own adequate Act; since it fills the vertue of the Power. And though other vertues be in a mixture than are to be found in the simples singly considered: yet those Vertues are no other than Elementary, and which the several Elements joyned together have in them; and they are the first Qualities broken and allayed by their Contraries. For as I said before, if four or more come to sup together without every man his shor, they must of necessity all fast. For examples sake, If four colors be mixed, a color indeed different from each of the four arises, but nothing else save a color; not such a faculty as is in Scammony, Opium, and the like. After the same manner, if you mix the first Qualities, and mix them again, other qualities indeed or temperaments wil arise different from simple Heat, Cold, Moisture, Driness; but no other Quality wil arise from thence, save an Elementary Quality or Temperament.

Nor let any man think to scape by saying, That the manifest Qualities and their Temperament do not indeed of themselves perform such noble actions, but as they are guided by a more



more noble specifick Form. For no Instrument acts beyond the vertue of its kind, though it be directed by a superior Agent. And therefore as an Artist uses sundry Tools, as the Carver his Compass, Saw, Chizel, Scraper, every of which performs its use: so every Form uses its Qualities to sundry actions. And as a Saw when the Carpenter uses it does saw asunder, but does not hew or pare; even so Hotness where-ever it is does nothing but heat. Nor does the Load-stone draw Iron, nor Rhubarb purge by heat, but by an hidden Quality, peculiar to themselves.

Nor is it credible (since the Forms of the Elements have their Qualities) that those more noble Forms are barren, and produce no qualities, so as to stand in need of borrowing the service of the Elementary Qualities. In a word, as things differ in their Forms, so do they in their Operations and Instruments.

Nor do they bring any thing better or righter, who hold, That in every Mixture a new Form is drawn forth, and that there are alwaies new ones made, the degrees of the former remaining, and that with these there spring forth new Qualities, and that Nature first brings forth the Universal Forms, and by their help the particular ones, until at last she come to the forms of Individuals; and that from this contemperation of Qualities arising from divers Forms and mixture of Bodies, which saving their forms do put on the Nature of matter (as it were) or aptitude, there arises (they say) an unexpressible propriety of temper, which may rightly in some sort be termed an occult Quality. For, to pass over other Errors touching drawings out of Forms, degrees of Forms, and such like; these Men also favor nothing but Elements, and that which they had before rightly determined, viz. That an occult manner of mixture does introduce no new faculties, they themselves afterwards destroy. For suppose that many mixtures are made, and that with these alwaies new Qualities arise: yet because the first mixture is only of Elements, and no other temper arises from thence but of the first Qualities, though you remix things mixed before an hundred, yea, a thousand times, nothing but what is Elementary, and no Qualities but Elementary Qualities can arise therefrom, and therefore nobler actions than those of the first Qualities cannot be by them produced. And if Natural things should be generated after this manner, and by the mediation of Forms (their degrees still remaining) a progress should be made unto particular Forms, and at last to such as are individual; the forms of all things living, as well living things as Plants, should be drawn out of the Elements. Indeed that same Innovator, who dares vent the Dreams hatched in his own Brain to day or yesterday for the Tenets of reverend Antiquity, accounts it no absurdity; who holds that the Souls of living things, Plants, and Animals (excepting that of a Man only) are made of the matter of the Elements, and that Plants and Animals (both as to Matter and Form) were both at first produced out of the Elements, and at this day have no other Nature, and remain through all Generations Elementary Bodies in respect both of Matter and Form. But this gross and most absurd Opinion can neither be by any reasons proved, nor can the invincible reasons of *Julius Caesar Scaliger* against the same be answered. Which when he perceived, and that he could not find any probable reason for his Opinion, no not to make a flourish with, he flies to the holy Scriptures mis-understood, and endeavors to set *Moses* against *Scaliger*, as if he had said, That all living and lifeless things were so produced out of the Elements as to consist of Elementary Materials, both in Matter and Form, and to arise therefrom at this day; because God said, Let the Earth bring forth, let the Water bring forth the living Creature; also, Encrease and multiply. But although God said, let the Earth produce, let the Water produce; yet by force of those words it no waies follows, That Plants and Brutes were made of the Elements both Body and Soul, and are generated of them at this day; since God then created perfect Plants and Animals in the Earth and Water, which as *Fr. Junius* writes upon this place, came out of the Earth and Water wherein they were created, as Children out of the Womb. Nor does the Hebrew word *Hotzi* signifie to give matter, but to make and suffer to go out; as in *Gen. 14. ver. 18. Exod. 8. ver. 18. chap. 20. ver. 2. Numb. 17. 8. Psalm 68. 8. Psalm 104. 14.* and very many more places of Scripture, appears. Nor did God say so the Earth and Water, Encrease and multiply, but to living Creatures made by him, and having their seed in themselves; whereof we shall also speak hereafter in our Fourth Discourse, Chap. 4. *Julius Caesar Scaliger* saies much better in *Exercit. 307. Sect. 20. Yea, and I tell them withal, That the form of every perfectly mixt Body, although it be no Soul (as that of the Diamond for instance) is a fifth Nature, far differing from the four Elements.* And in *Exercit. 307. Sect. 12. If (saies he) as these Tormentors or Hangmen of Souls contend, the Souls were made of the Forms of Elements, the Forms themselves corrupted could do more than they could when they were in their Integrity. But in*

Occult Qualities are not drawn out of the power of the Matter.

Whether the forms of Plants and Brutes spring from the Elements?

case they will have them remain entire in the Compound, of necessity they must be by another power different from themselves both mixed to certain ends and limited in certain bounds. For of them actually existing there cannot be made a thing simply one, save by a superior power, which Aristotle calls the Beginning of Living things. And all the Reasons which prove it, are most firm. For who is it that considers how in Plants, the Roots, Trunks, Leaves, Flowers, Boughs, are so wonderfully and variously shaped, according to the variety of sorts, in respect of magnitude, figure, Situation, color, and with so much Art and constant Symmetry, as that no Geometrician or Painter can express all that Art, will believe that all these things are wrought by the Elementary matter? who will believe that the most noble Fabrick, not only of Men, but of Brutes, is produced by an Elementary Nature? Who will derive the Sagacity of Dogs, the Prudence (that I may so speak) of Elephants, the Craft of the Fox, the Magnanimity of the Lion, the wonderful works of Bees, Pismires, and other Creatures, from the Elementary Nature? And therefore from hence (as was said) Scaliger frames an invincible argument, *Exercit. 307. Sect. 20. That is in the power of the Soul which was never in the power of any Element. But nothing is in any thing which was not actually in its Principles. For the Principles are the acts of those things whereof they are Principles.* In the answering of which Argument, the foresaid Innovator takes pains to no purpose. For first, he doth seek to elude that same Axiome, That Principles are the Acts of those things whereof they are Principles, by saying that Matter also is a Principle, and yet is not the act of a thing. But who sees not that Scaliger speaks of the formal principle, the Cause of actions; and that the form is often termed the Principle by way of Eminence. Nor yet is it absurd to say, that even matter also in its way hath an act. Indeed it is not the act of the Compound which the Form affords, yet is it in the mean while a substance by it self; and as Scaliger in *Exercit. 5.* speaks, it is that which it is by an Essence proper to it self. And *Exercit. 17.* The Matter hath its quiddity whereby it is somewhat, and differs from other things. And the Matter gives Quantity to all things. But against that other Axiome, That there is nothing in any thing which was not actually in its Principles, he can bring no reason. Verily that which one hath not he cannot give to another Man, and unless the Earth were heavy, the Fire hot, no mixt Body would be heavy or hot. And doubtless, no affection can be in a Compound which may not be referred either to the Matter or the Form. Yet he endeavors to evade the same by some instances. And in the first place he objects the Heaven, how that it is all things in respect of its working power. But (which himself confesses) the Question is not concerning external efficient causes, but essential internal Principles; and the enquiry is, Whether there be any thing in the Compound which does not depend upon the internal essential Principles. Also the Heaven it self is an universal, and not a particular Cause. Moreover he objects life which is from the Soul, but not in the Soul. But he ought to have observed what very many of Aristotle's Expositors do note upon the 2. *de Anima, cap. 1.* that Life is taken two manner of waies: First for substantial Life, from which as a Fountain Vital actions proceed, which is in the Soul, which is the Root of all vital Powers and Actions, in which sense Aristotle himself takes Life, 2. *de Anima, text. 37.* when he writes, To live is the Essence of living things. Secondly, it is taken for the Vital Operation, or at least for the power of exercising those vital actions, whereof the foresaid substantial Life is the Principle; which being an accident, is by many called *Vita accidentaria*, accidentary Life. And therefore unless the Soul had life actually it could not communicate the same to living Creatures. Here indeed the Paradox-monger seeks an evasion to avoid this distinction by attributing this essential Life only to the Rational Soul, and the other accidentary to Brute Beasts. But he brings no reason of this difference. Contrariwise, all the Expositors of Aristotle do attribute Life in both Sences to all Living things. And after the same manner, as there is in Man an Essential Life, from whence proceeds an accidental (for a Man hath not one Soul to make him a Man, and another to make him a Living thing) even so in Brutes also and Plants from the essential Life it self proceeds that accidentary Life. Yet there is this difference, That in Man by Death the accidental Life is abolished, the essential remaining; but in Beasts, both essential and accidental Life do perish. Which things were necessary to be said in this place for defence of the Truth.

Moreover, If Occult Qualities did flow from the Elements, there should be no other simple qualities in Nature besides those first of the Elements, but all should be tempers of the first, and so compounded, which is false. For the occult Qualities are perfectly simple, and arise from their simple forms; since those last forms are not barren and idle, but produce certain peculiar Qualities. For as from the simple form of Fire flows heat; so from the form of

whether  
there be  
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Principles.

Life, how  
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of the Load-stone flows the Faculty of drawing Iron, which is a simple Quality; from the Form in Rhubarb flows the Quality and Power of Purging Choler, which is a simple quality; and the same holds in al other Occult qualities. For the most good and great God hath not drawn al Forms out of the power of the Matter, but created al things, and gave them their Forms; and those not idle and ineffectual, and void of Forces, but endued with their peculiar Qualities, Proprieties, and Activities.

Some also there are who conceive these Qualities are infused from the Heavens. But since they cannot deny, That al Qualities and Proprieties do flow from their Forms, they are forced to grant that these Qualities also though they come from Heaven, yet it is not without the assistance of their Forms. But we have elsewhere proved, that the Forms come not from Heaven. whether the occult Qualities flow from Heaven?

Al which Conceits therefore being false, it is most rightly determined and held, That as al other Faculties and Proprieties, so these also do flow from their Forms. But what those Forms are we must now enquire. Which that we may do more readily and Easily, we must first shew the differences of these Qualities according to their Subjects, or of the substances to which they belong, whereby it wil appear that they have not al one Original. Bodies are some Living, others Lifeless; and of the Lifeless some have had life, as Rhubarb, Worm-wood; others neither have it, nor ever had. All which if they be distributed into their Ranks as they ought, six differences there will arise of Occult Qualities, in reference to their Original. The true Original of Occult qualities. The differences of Occult qualities.

For in the first place there are certain hidden and wonderful Properties, which alwaies are found in some sorts of living Creatures. An example of these we have in the Echeneis, Remora or Stop-ship, a Fish so called, whose strange force (as others, so) Pliny admires in lib. 32. cap. 1. *Let winds blow (saies he) and the storms rage, a very little Fish masters their fury, and bridles all their strength, forcing the Ships to stand still in the Sea; which no Cables could do, no massive Anchors. It curbs the violence, and tames the rage of the wind without any pains to it self, not by holding the Ship, nor by any other way than sticking to the same. This little Creature is so powerful against all the strength of wind and Tide, as to stop the Ships in their way. But Armed Fleets have Towers built upon them that they might fight in the Sea as from a City wall. Alas for the vanity of Man-kind! when a little Fish half a foot long can arrest and hold in bondage their Men of War armed for the Fight with Brass and Iron. So far Pliny. And this is performed by the said Fish only when it is alive. Also 'tis wel known what force the Torpedo hath, viz. How it does not only benum those that touch it, but it stupefies the hands of Fisher-men through the Net it self. And some relate when it swims away alive, if a man stir the Water with his hand it numbs his hand. And yet being dead the said Fish is Food for some People. How admirable the forces of a live Basilisk are may be teen in our Epitomy of Natural Philosophy, Book 7. Chap. 10. yet being dead it may be handled without danger. Such Qualities are rightly derived from the Forms of Animals, concerning the Original whereof we have spoken elsewhere more largely, viz. how at the first Creation they were all created with Plants and Animals, and are now multiplied in the generation of Plants and living things, and have their Faculties implanted by the Creator. Occult qualities in certain sorts of living things.*

Secondly, There are some individual Proprieties in living Creatures. So some persons cannot abide Cheese, this or that Fish, or other meat or drink; and Authors every where observe sundry sympathies and Antipathies of sundry Creatures individual. These Properties (since they are not common to the whol kind, but proper to some Individuals) do not arise from the specifical form, nor do they belong to the Essential faculties which flow immediately from the Form, and like the Form it self are immutable and incapable of degrees; such as is in Man the Faculty of Reasoning, Laughing, Seeing, Hearing, &c. But to Natural Powers and Impotencies they are to be referred, which flow from a peculiar disposition of the Body, or its parts. Which disposition since it is not essential to a Man, but variously mutable, a Natural Power, and a Natural Impotency, may be changed one into another: for examples sake, It is the Property of a Man among other things, to desire, digest, and be able to turn meats good for his Body into nourishment. But in that some cannot away with Cheese, others with a Pike-fish, others with Wine, that springs from a Natural Impotency arising from a peculiar disposition of the stomach in this or that man: which being not alwaies perpetual (but sometimes in progress of years, or for other causes it is changed) it many times falls out that he who in his Child-hood could not abide Cheese, nor to drink Wine, afterwards being grown up to mans estate he can away with both Wine and Cheese. Now whereas to Natural Impotencies do belong al those things which belong to any sickly constitution; Individual Proprieties

tution; those occult Qualities depend not upon distemper, or any Organick Disease, or of Solution of Unity, but upon an hidden an unexplicable disposition. Indeed for a Man not to be able to desire to eat, nor to concoct his meat, may proceed from a manifest distemper of the stomach: but that he who can eat and digest all other meats, only should not endure Cheese, or Bread, or this or that sort of Flesh or Fish; this comes merely from an Occult Quality. Now these dispositions are sometimes born with the party, and sometimes they happen afterwards. Of those which are born with the Party, some are Hereditary, which being before in the Parents, are derived into the Child with the Principles themselves of Generation: but others, though they were not in the Parents, yet are they imprinted on the Child by the imagination of the Mother; whence it comes to pass that Children cannot endure such meats as either their Mothers loathed when they were with Child, or which they longed for, and could not obtain. After Birth they are sometimes caused by loathing of some meat too often and too plentifully eaten. In which case the power of the Imagination commonly bears the greatest sway, of which I have treated in my Book of the *Consent and Dissent of the Chymists and Galenists, &c. chap. 14.*

*Of the Occult Qualities of Jewels, Stones, & Metals.* The third kind of Occult Qualities is of things which do not live, but have nevertheless their specifick Forms, differing from the Forms of the Elements. So, by Reason of its specifick Form the Load-stone draws Iron. And the several precious Stones, as also Metals and Minerals, have their Occult Properties and Faculties, which flow from their specifick Forms; which specifick Forms nevertheless (as all others) do lie concealed from the knowledge of Man.

*Occult Qualities of dead things.* Fourthly, There are Occult Proprieties in Natural things which have formerly lived but now do not live any more. Such as are every where to be seen in Plants and Animals, which we use instead of Physick. For we use not ordinarily living Plants or Animals, but only such as are dead. So we use dried Toads to draw out Poyson: the ashes of River-crabs or Cray-fish cures the biting of a mad Dog: the Horns and Hoof of an Elk are good against the Falling-sickness: Harts-horn and the Bone taken out of an Harts Heart, are used against Poysons: Mans Skul cures the Falling-sickness: Rhubarb, Agarick, Mechoacan, white and black Hellebore, and other Plants, have a purging faculty: Peony Roots are good against the Falling-sickness: Scordium is good against Poyson: and there are very many more rare Vertues of Plants. And to this Tribe in a word belong the Vertues and Hidden Properties which are sought for in Plants and Animals after they are dead.

*whence they proceed.* Now certain it is, That these Occult Properties do not flow immediately from the Soul and specifick Form of Animals or Plants; since the Soul is no longer in those Medicaments. Nor can they proceed from the Mixture of the Elements simply, and the temper of the first Qualities; since their actions are of a quite different kind from them, and above their activities, nor are they directed by the Soul, as being no longer present. And since every Quality pre-supposes a Form, these Qualities must also of necessity flow from, and depend on some Form. Now that can be no other than that which was before the subject of the more noble perfect and specifick Form, after its manner, and as far as belonged thereto. I say, after its manner, lest any should have occasion to quarrel. For that Form with its matter does not quite make up the ultimate subject, which is corrupted with the Form it self, or at least does not constitute a perfect Organ; since in Animals there is also required an influent Heat, and in Plants somewhat which holds proportion thereto. For seeing the more noble Form requires the more noble Matter, and as Forms differ in nobility or baseness, so also those matters differ, and are proper to several sorts and forms of things: the difference and diversity of those matters cannot come but from different Forms which constitute the proper subject of every specifick Form. Which Forms (truly) considered by themselves are also true Forms, which do inform their Matters; but in respect of the Soul and specifick Form they have the Nature of an immediate matter; and so one thing does not subsist by two substantial acts, but each hath one specifick Form. Now when the specifick Form goes away, these Forms remain a while after, and perform the Office of Forms, and are the Authors of those Faculties which are found in many things after they are dead, but such as 'tis impossible they should proceed from the Qualities or Forms of the Elements.

*whence the subordinate Forms proceed.* Now what the Original of these Forms should be, is a Question hard enough, and few have enquired thereinto. And because I have spoke largely thereof in my *Institutions of Physick, Book 5. part 1. Sect. 1. ch. 2.* I wil but briefly touch the same in this place. The most wise Creator, as he gave in the first Creation to all things their specifick Forms, so also he gave them different matters, to each a proper one, and in that matter also certain Forms proper

proper to every Species; and that for two intents: First that the specifick Forms might have subjects wherein to be, subsist, and perform their actions. Secondly; That when the Soul or specifick Form is gone, they might be useful to Man as Food or Physick. And as those specifick Forms are multiplied and propagated; so also these subordinate Forms are propagated. Or at least (which I see is the Opinion of some others) the Souls of living things have an ability to produce such Forms as are necessary to constitute their subject place or Mansion-house, which also may remain when they are gone.

*The end of those Forms.*

And forasmuch as every Form requires its Subject and adequate Matter with which it is, and perishes therewith, it is worth our Labor to enquire of the Subject of these Forms. Now this in Plants and Animals seems to be no other than that same implanted Spirit and Radical Moisture which joyntly are called commonly Native Heat, and by late Writers (especially Chymists) Natural Balsam. For Experience it self teaches, That Plants and the parts of Animals, so long as they retain that Balsamick Substance, do preserve their vertues entire: but as soon as they lose the same, and become rotten or putrefied, they lose also their vertues, so that the remaining Body becomes unprofitable. Which the Operations of Chymists and Apothecaries do shew. For if by boiling or steeping that part of the substance be separated and extracted, wherein is the Purgative Faculty, an useful Medicament is made; and the remaining Body becomes quite ineffectual.

*The subject of these forms.*

Fifthly, There are occult or hidden Qualities in such things as are Naturally bred in Plants and Animals; such as are the Poyson of a Scorpion, an Asp, an Adder, the Spider *Tarantula*, and other venomous Beasts; Bezoar stone, Musk, Civer, Castoreum, and whatever other things there are of like kind Naturally bred in Animals. Hither are to be referred the juyces of Plants, their Tears and Gums, as Aloes, Scammony, Elaterium, Euphorbium, *Gambugia*, Opium, juyce of Hemlock, and many more of this kind. All which though they are to Men in place of Medicament or Poyson, yet are they Natural and kindly to their respective Plants and Animals. Now all such Qualities and their effects do not proceed immediately from the Soul or specifick Form of those living things, but from their own proper Form; since being separated from the living things, they have nevertheless their effects and operations. Now whence these Forms proceed, though it is not very easie to declare; yet it seems most safe to hold, That those things receive the said Forms from their own Souls, and that those Forms are some way included in the Souls, or at least proceed from them. For as the soul hath a power to make Chyle, to make bones, and to make skin; even so other Juyces are produced in other living things, as Oyl in the Olive Tree, Wine in the Vine; and after the same manner those Medicinal and venomous juyces aforesaid are produced by the Soul proper to their respective kind. And as Wine though no longer animated with the Soul of the Vine, yet retains many yeers that same form which it received from the Vine as a Body Natural; so the juyces lately mentioned do long retain their Forms and Vertues entire; yea, and they have some affinity to, and correspondence (as it were) with the forms of that kind, and perform motions answerable to their motions. Whence it is that Wine in the Hogshead is wont to work when the Vines do blossom. For the reason of all such things lies concealed in the seed; because (as *Aristotle*, 5. de *Gen. anim. cap. 7.* saies) Principles of things though smal in Bulk, yet are exceeding great in faculty and power, which is especially true of the seed; and what *Seneca* said excellently, *Lib. 3. quest. nat. cap. 29.* concerning Man, is true of all other living things. In the seed (saies he) is contained all the Nature of the future man; the Infant not born hath in it the Principles of a beard, and of Gray Hairs.

*Occult qualities in things which are naturally bred in Plants & Animals.*

In the sixth place, are malignant Humors and Poysons, which are preternaturally bred in the bodies of Animals, and do all operate by hidden Qualities. Such are those Humors whence the Falling-sickness, Mother-fits, Malignant Dysenteries, Malignant and pestilential Feavers, yea, the Plague it self, the Scurvy, the Leprosie, are generated; also the poyson of a Mad Dog. Of the Generation whereof we have treated in our *sixt Book of Practice, part the second.*

*Occult qualities of things preternaturally bred in the Bodies of Animals.*

#### Chap. 4. Of the Difference of Occult Qualities.

Now Occult Qualities are not of one kind, and the first difference appears from what hath been said in the foregoing Chapter, by which it is manifest that there are six kinds of them in reference to their Original, touching which 'tis needless to add any more.

*The differences of occult qualities.*

In the second place, There is another difference drawn from the manner of inhering. Vulgarly, as also it appears from *Scaliger, Exercit. 71.* they say some Qualities are real, others

others

others intentional. The greenness on the Tree they say is a real Quality, the greenness cast by the Tree upon a wall, or on a mans cloaths, is an intentional Quality: the color of a Glass of Claret is a real Quality, the redness thereby caused upon the Table-cloth is an intentional quality, the light shining through the Glass of Wine. Where the thing it self is truly declared, but the names are not convenient. For since that is properly termed intentional which depends upon the operation of our mind, and is nothing without the same: after this manner these Occult Qualities cannot be termed intentional, nor are rightly opposed to real Qualities, since they themselves are also real, and are found in Nature when we think not of them, and have real effects. I conceive the color in the Tree, and the Wine in the Glass should be more rightly called material qualities, seeing they are not separated from the Matter; but the other Spiritual Species or representations. And there is no small difference betwixt those material qualities, and these Spiritual Species. For the former are in their Subject, and are moved with it, and according to its motion, nor are separable therefrom, and are successively received in their Subject, nor are they divers differing in number in the same Subject, not confused but distinct. But those Spiritual Species are diffused from the Body whence they arise round about in a right line like Raies, nor are moved with the air wherein they are; in the same Subject they are many in number, not confused, as appears by the sundry shadows made by several Candles; also many of them pass through solid Bodies, as appears by sounds, and the vertue of the Load-stone. Nor are they ineffectual, but have in them the vertues of those things from which they flow; as Shine represents the Light; the Load-stone draws Iron, the shadow of the Eugh-tree is hurtful. And although these Species are commonly reckoned only amongst Sensible Species; yet doubtless there are many more of them than are discerned by Humane Sentes. And by means of them many Sympathies and Antipathies of things do happen, and wonderful actions and operations, which are by some termed Magnetical. Which very thing *Jul. Cas. Scaliger* acknowledgeth, who in *Exercit. 344. Sect. 5.* where he speaks of Sympathy, at last concludes, That such things are done by Species, and that those Species are like a continual Ray promoted, which is propagated through and beyond the Body of the Glass.

*Material Qualities and spiritual species, how they differ.*

But what these Spiritual Species are is not easie to say. They are commonly called Qualities; but this term likes not *Fracastorius, Lib. de Sympath. & Antip. cap. 5.* who holds that they are Substances, and of the same nature with those Forms whose Species they are, not differing from them save in their manner of subsisting. For so far he saies they are Material, because they are in the matter by a certain gross existence, and require certain limits. And since it is the innate property of al Forms to propagate themselves, and these material Forms cannot propagate themselves after their own manner of existence, they produce a thin and Superficial part or degree of themselves, which they term *Epipole*, which by reason of its tenuity both hath no contrary, and is bred and propagated in a moment, as a kind of Brood. But hardly wil any man say, That the Light and Shine of the Sun are of the same Essence one with another, much less that they are of the same Nature with the Suns Form; or the color in a thing with that in its Image in a Looking-glass. But how (in case they are Qualities) they should be generated in a moment and propagated, not moved with the Air through which they are diffused, and that divers in number of the same sort should be in the same Air unconfounded or jumbled together, there is hardly any man can well tell.

*What spiritual species are.*

For the same obscurity we meet with in the sensible Species of Nature, we find also in all other her Spiritual Species, which are many more than can be discerned by our Sentes, or is commonly believed.

*Occult material Qualities.*

According to this Difference of Qualities Occult Qualities also differ. For first there are Occult Qualities which may be termed Material because they are alwaies propagated with the Matter and Subject wherein they are generated, and do not diffuse themselves without the same. And though they may seem to diffuse themselves into other bodies, and afar off; yet that is done by Atomes and their smallest Corporeal Particles, which differ from the Bodies from whence they flow only in Magnitude, and have the same Essence, Qualities, and Faculties with them. Such are al those Occult Qualities by which contagious Diseases are conveyed into other persons, as is seen in the Venereal Disease, the Leprosie, Pestilential and Contagious Feavers, and the Plague it self. For in al such Diseases certain very small particles flow from the sick body, which being received by other bodies they raise in them the same Disease; as I have shewed at large in the *Second of my Institutions, part 2. cap. 12.* and my *Fourth Book of Feavers, Chap. 3.* and my *Sixt Book of Practice, p. 3. cap. 3.*

cap. 3. For these are not Species carried right on as a Ray, but little Particles or small Bodies which are themselves disorderly moved by the motion of the Air: nor is any man infected either with the Plague, Venereal Pox, or Leprosie, unless he receive into his Body some of those foresaid Particles or small Bodies.

Again, There are Occult Qualities which are justly termed spiritual Species, because they pass from their Body like a Ray continually thrust forward, being circularly diffused, and have a certain Sphere of their activity, and some of them do also pierce through other Bodies. So a Load-stone draws Iron though a Board be betwixt them: a Cat shut up in a chest can affect a Man that hath an Antipathy against Cats; the Dog through the shut door by vertue of these Qualities knows his Master to be there; the *Torpedo* benums the Fishermans hand through the staff of an Eel-spear. And *Avicenna* and the Conciliator in *Lib. 1. de Venen. cap. 1.* speak of a Serpent who infected and killed a Soldier through a Spear, with the end whereof he touched it. So the Basilisk or Cockatrice kills a Man by looking on him. Which things the foresaid Qualities adhering in the matter cannot do. Nor can a Man sick of a contagious Disease infect another through the door (being shut) since those small bodies cannot pierce the boards.

Thirdly, There is yet another Difference of Occult Qualities observed as yet by very few, viz. There are some Spiritual Qualities which flow from other things, are received in some Bodies, and being received in them they have the same Faculty as the others. Such a like thing is observed in the Load-stone. For the Vertue thereof is received by Iron, whereupon the Iron also gains the faculty of drawing Iron, and moving to the Poles. Nor is this only done by rubbing upon the Load-stone, and the communication of certain Atomes; seeing Iron shut up and covered wil receive vertue from the Load-stone, which I my self have observed. For having once an Ivory-cover'd Sun-Dial made with a touched Needle; in the same case or box with a greater Load-stone, the Needle of the Sun-dial quite changed its faculty of turning to the Poles, and was moved with a new kind of motion. So Dogs follow their Masters; and they hunt the Beasts by the track of their feet; such species being doubtless printed upon the Earth and Grass which they perceive by their smelling faculty. For it must needs be some real thing that works upon their Smel, and yet not a material quality, which with its small bodies hath no fixed mansion, but is inordinately moved with the motion of the Air. And I am confirmed in my Opinion by *Nicolas Cabens*, in *Lib. 3. of his Magnetick Philosophy, cap. 21.* where he informs us, That Iron attains its verticity or a faculty of turning towards the Poles, not only by touching the Load-stone, but by being near the same also. Take (saies he) a Needle which hath never touched a Load-stone; and hang it up by a thred; then hold it towards the Load-stone, but so that it may move towards the Load-stone, but not touch the same, nay; that it may be a pretty distance therefrom; I say, it will so come to pass, that the Needle shal receive vertue from the Load-stone not only by touching it, but also by approaching the same without touching: yea, it would derive into it self the vertue of the Load-stone, although some other Body were interposed betwixt the Needle and the Load-stone, as Wood, Stone, or any other. This appears first by experience. For if (as I said) the Needle be hung up so far off, that it aspires indeed to touch the Load-stone, but cannot do it, either because it is held afar off; or because some other Body is interposed betwixt it and the Load-stone; If afterward you take away the Load-stone the hanging Needle wil shew al the magnetical Effects most clearly, which before it did not shew, even as if it had touched the Load-stone. For ballanced it will turn to the Poles, its point looking alwaies to the North, according to the magnetick Laws; and it wil draw filed Iron; so that try it which way you will, it wil continually most clearly evidence its magnetick Vertue, which did not appear before it had so made its approaches to the Load-stone. Therefore the Load-stone conveighs its Verticity and Vertue into the Iron not only by touching the same, but by its presence alone if it come but near the same. Moreover, this is also apparent by Reason. For the Loadstone hath not only in it self a Magnetical Vertue, and consequently a Faculty in it self to produce the same in Bodies having affinity thereto, but it also sheds forth round about the said Vertue, and forms to it self a Sphere of activity. And many other such like Species there are (doubtless) which pierce as easily through the most solid Bodies, as through the thinnest Air. So far *Cabens*.

Now such Qualities are received in any Body agreeable thereto. So the magnetick Quality is received in the most pure Iron. Also the same *Cabens* writes, it is received in those Bricks which through vehement burning have gained the color of Iron, and are therefore either from their color or hardness called Iron Bricks. *Lib. 2. Philosoph. Magnet.*

Magnet. Cap. 8. and if you take a bit of such a Brick, and touch it artificially upon a strong Load-stone, it receives (he saies) the Quality of turning to the two Poles of the World.

*The fourth Difference.* Fourthly, Occult Qualities are also distinguished in respect to their effects, in regard some cause Sympathy, others Antipathy, examples whereof are every where to be seen in Nature, and they are collected by *Fracastorius* in his Book *de Sympathia & Antip.* *Marcellus Donatus, de Histor. Med. mirabil.* *Johan. Francisc. Ulmus, de Occult. in art. med. proprietat.* *Andreas Libavius, part 2. singul. tr. 4.* *Johannes Schenckius, Lib. 7. Observ. in sine.* which I think needless to repeat in this place.

*The first difference.* Fifthly, There is a certain difference which *Galen* reckons up, 6. *Epidem. com. 6. text. 6.* where he divides things which work by Propriety of their whol substance into four kinds; Aliments, Medicaments, Poysons, and Antidotes, wherein are comprehended al things in Nature, Minerals, Stones, Plants, Living things. And as to Aliments or Foods, of necessity some likeness there must be and sympathy between the Food and that which is nourished thereby; which consists not only in the first Qualities, and their Temperament, but also in the whol substance and occult qualities; which even hereby appears, in that there is not one Aliment of al living things, but sundry Aliments. For several Plants growing in the same Field do each draw its own proper Aliment, and as *Hippocrates* writes, *Things that grow and are sown, when they come into the ground each draws that which it finds in the Earth suitable to its Nature. Now that is sown, and bitter, and sweet, and salt, and all kinds of Juices.* And the same holds in Animals. For such things as are poyson to a Man are food to some Creatures; as Hellebore to the Quail, Hemlock to the Starling, Frogs, Snakes, Toads to the Storks. Yea, and some men delight in some kinds of Meats, and abhor other some.

*The quality of occult Medicaments.* Now it is a thing not to be doubted that most of the Vertues of Medicaments proceed from occult Qualities. Purgatives exercise their Operations by occult Qualities. And so do specificall Medicaments, and those which are proper to several parts of the Body; also Amulets, and al things that help or hurt the Body, externally applied. Hitherto pertain Smels, Fumigations, and those hidden steams which work upon Man and Beast; as it is very wel known how Dogs follow their Masters and wild beasts footing by the scent; and some cannot endure a Cat in the room though they see it not, as was said before: not to speak now of such things as mutually work one upon another by seeing and hearing. Of al which *Johannes Francisc. Ulmus* brings many examples in his whol Third Book *de Occult. in arte Medica Proprietat.*

*The occult qualities of Venoms.* And touching Poysons, it is so manifest that they act by occult Qualities, that *Julius Caesar Scaliger* writes wel in *Exercit. 218. Sect. 8.* If nothing else could perswade us how vainly and rashly many endeavor to reduce al things to manifest Qualities, at least poysons and their Remedies might teach us so much.

*Of Antidotes.* And the same may be said of Antidotes, seeing they are opposed to Poysons, and therefore as Poysons are hurtful to our body, not by manifest, but by Hidden Qualities; so are these also contrary to Poysons, not by manifest, but by Hidden Qualities.

And whoever shal observe what hath been here said in general of Occult Qualities, he may with little difficulty understand such things as he shal meet with in the Writings of Natural Philosophers and Physitians concerning the said Qualities.





# THE THIRD DISCOURSE:

## *Of Atomes and Mixture.*

### Chap. I. *Of Atomes.*



NOT only Words (like Money) are current by use, but also Opinions; and those Opinions of Philosophers which were in request in daies of old, have been by the springing up of other Opinions banished with the Writings of the said Philosophers. There were anciently (by the Testimony of al Antiquity) most wise men, *Pythagoras, Empedocles, Democritus, Socrates, Anaxagoras, Parmenides*, and very many more, whose Opinions nevertheless are either altogether unknown, or such are attributed to them as seem more like old Wives Fables, than Opinions becoming a wise man, as *Fr.*

*Titelmannus* speaks, *Lib. 5. Philos. nat. cap. 15.* which if they were by us rightly understood, peradventure we should think them not altogether to be rejected; which nevertheless now at the first appearance, when they are not understood, are laughed at as absurdities, and rejected as unworthy of Philosophers. Truly *Aristotle* in his Works, every where recounts the Opinions of the Ancients, and sharply opposes the same; but *Pererius* ingenuously confesses in *Lib. Comment. de rer. natur. princip. cap. 16.* That he cannot deny but that *Aristotle* in making Inquisition into, and judgment upon the Opinions of the Ancients, was too hard and severe a Judge and Arbitrator. And in the same place he relates the Opinion of *Simplicius*, who conceived that those ancient Philosophers were accustomed to hide their Opinions under ænigmatical and allegorical obscurities: and therefore *Plato* and *Aristotle*, fearing lest rude persons as were too dul-headed to understand their abstruse sense, understanding them according to the first appearance should fall into Error, did so handle their Opinions as that they might seem to common Readers to dislike and reprove the same. Not to speak of others, *Democritus* who lived when *Hippocrates* lived, as appears <sup>The praise</sup> not only by the Epistles of *Hippocrates*, but also out of *Diogenes Laertius*, and *Pliny*, <sup>of Democritus.</sup> *Lib. 30. cap. 1.* was a man most studious of Philosophy, and diligently weighed the Opinions, not only of *Anaxagoras* (whose junior he was by forty yeers, as is reported) but also of the Outlandish Philosophers, and many years together (to attain Wiidom) he travelled strange Countries, *Chaldea, India, Persia, Æthiopia, Egypt*, and heard and consulted with the great and wise men of those places, as it is to be teen in *Ælian, de varia Historia, Lib. 4. cap. 20.* *Diogenes Laertius* in his *Life*, *Clemens Alexandrinus, Lib. 1. Stromat.* and *Eusebius, de preparat. Evangel. Lib. 10. cap. 2.* *Pliny, Lib. 30. cap. 1.* And during the long time of his Life (for he died in the hundred and ninth year of his age) he diligently examined al things, and did so excel in Philosophy that he was called commonly *Pentathlos*, the Champion at five Games, viz, Because he was eminent in Natural, Moral, Mathematical, and other Disciplines; termed by *Hippocrates* in his Epistle to *Damagetus*, the *Wiseest of Men, the most Wise Man*, and in his Epistle to *Democritus*, *The most excellent Interpreter of Nature and the World*; and by *Aristotle* himself in *1. de generat. & corrupt. cap. 2. text. 5.* he is preferred before al other ancient Philosophers in the Science of Nature. And by the Senate and People of *Abdera* he was so highly esteemed, that

they write in their Epistle to Hippocrates, That they feared if Democritus should be sick the City of Abdera would become quite desolate; and in the same Epistle he is termed the Body of Wisdom. Yea, they called him Philosophy it self, as Ælian relates in the place fore-alleadged. And this alone argues his great care in the study of Nature, that Pliny writes Lib. 14. cap. 2. Whereas there are innumerable and almost infinite sorts of Vines, and almost as many as there are Fields, yet Democritus was the only man that conceived their kinds might be numbred, professing he knew al that grew in Greece. It is not therefore credible that so sagacious a Philosopher, a most wise man (as Hippocrates called him) one so useful to Humane Life (as Pliny calls him, Lib. 28. cap. 8.) should entertain such absurd Opinions as are at this day fathered upon him; nor is it (indeed) likely (to use the words of Pererius, Lib. 4 Phys. cap. 4.) that so discreet and wise a man, so many waies commended by Aristotle, should beleve and teach things so evidently false and absurd, nor only secretly contrary to Reason, but likewise openly against the very Verdict of the Senses.

The Do-  
ctrine of  
Atomes a  
most anci-  
ent Do-  
ctrine.

Now amongst other Opinions ascribed to Democritus, Empedocles, and other most noble ancient Philosophers, is this; That they held Atomes or individual Bodikies to be the Principles of Natural things, from the various mixture whereof other Bodies have their Original. And this Opinion was a most ancient Opinion, and is now attributed to one Mochus a Phœnician, who is reputed to have flourished before the destruction of Troy; yea, and that it was the common Opinion of Philosophers before Aristotle, is apparent from the beginning of his Second Book de Generat. & Corrupt. Aristotle was the first that relinquished this Opinion, and held that those Atomes or smallest Bodikies were not only united in mixture, but also by mutual action and passion one upon another so altered and wrought upon that they ceased to be what they were before their mixture, and were changed into a Body so similar, that every smallest part imaginable could be no longer called Fire, Water, Air, or Earth, but a mixt Body. Of which we shal speak more largely when we come to speak of Mixture. And although the Doctrine of Atomes and Indivisible Bodikies be commonly set out after an odious manner; yet if rightly explained it seems not absurd. Yea, the Reasons brought for this Opinion are not light or foolish, but strong and urging, and which can hardly be answered, as Aristotle himself confesses, Lib. 1. de Generat. & Corrupt. cap. 2. text. 6. and which he cannot certainly promise to answer, but he would try what he could do. And doubtless he knew he could not tollidly refute this Opinion, and therefore he used not proper and Physical Reasons as he ought to have done, but Mathematical and extravagant ones.

'Tis found  
ded on  
Reason.

The Do-  
ctrine of  
Atomes  
explained.

Now I conceive the Doctrine of Atomes may be thus explained. In Natural things subject to Generation and Corruption, because there is a perpetual Interchange of Generating and corrupting, there must needs be certain simple bodies, each of a nature by it self, out of which the Compounds may be generated, and into which Compounds are again resolved. For Democritus seeing that Bodies Natural were neither made of nothing, nor made of Points, he was forced to hold they were made of the smallest Bodikies. Where it is to be noted, That Democritus did not enquire, Whether there were an individual Mathematical Magnitude; but whether there were Natural Bodikies of an indivisible smallness, out of a multitude of which gathered together a certain sort of natural Body does arise. These Bodikies are therefore termed the smallest particles in Nature, Atomes, *Atoma corpuscula*, indivisible Bodikies; because in the resolution of Natural Bodies there is no further progress to be made beyond these into any thing smaller; and contrariwise Natural Bodies have their original from these. Which Bodikies are indeed really in Nature, but are so smal as they cannot be discerned by the Sentes. Of them Plato in his *Timæus* thus writes: Touching these so smal Bodikies we are thus to think, That if you take only one single one of a kind, there is none of them can be seen by us in regard of its smallness; but if many are collected together, their bulk and magnitude is discernable. For neither are those little Bodikies we see floating up and down in the Sun-beams such Atomes as we speak of, but compounded Bodies. Al the Learnedest Philosophers have acknowledged that there are such Atomes, not to speak of Empedocles, Democritus, Epicurus, whose Doctrine is suspected, perhaps because it is not understood. And Galen makes mention of them 1. de Element. cap. 9. And indeed every where amongst Philotophers and Physicians both Ancient and Modern, mention is made of these little Bodikies or Atomes, that I wonder the Doctrine of Atomes should be traduced as a Novelty. That I may not speak of others besides those whom I have already praised, who may be suspected as Contemners of the Ancient Philosophy, and delirous of Novelties; Franciscus Aquilonius, Lib. 5. *Optica desin.* 5. thus writes: Amongst

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Elementary

Elementary Qualities, the two which are termed passive are exceeding far from the Nature of Light. For neither does Humidity signifie a Quality, nor Humectation an alteration. For humidity in the substance of Water is the same thing that fattiness is in the substance of Oyl; and as fat makes Greasse by being smeared upon a thing, so moisture moistens only by sticking to a thing. Again driness is only the defect of moisture, and exsiccation the consumption of Humor. And among the active Qualities Cold sends forth no coldness out of it self: which though it may to some seem strange, yet is it agreeable to reason, and experience manifestly demonstrates the same. For the coldest body that is (to feel to) as Ice, does send forth no sense of coldness to ones hand that is near it; but all cold things are perceived to be so only by handling them. Which (to such as denied the same) I have often made appear by a pleasant experiment: for their eyes being blinded and their hand held forth, I would ask them if they felt the coldness of the Ice near their hand. For sometimes they would say they felt somewhat when there was nothing near them; and otherwhiles they would say they felt nothing when the Ice was so near their hand as it did almost touch the same. And a while after he saies; Heat seems to diffuse it self abroad like Light. Moreover, I account it (truly) most likely that from the kindled fuel a kindled vapor does flie abroad, which being secretly conveyed through the Air does heat every thing it touches, and also burns the same if it have any thickness. Hence it comes to pass that things set near a blazing fire are burned though they do not touch the visible fire it self, which is often seen in Paper and Tow; but much more apparently in Naphtha, Asphaltum, Amber, and such like, which draw the flame to them from a far. Hence also it comes to pass that the fire heats more strongly and fiercely aloft than beneath or on the sides, viz. Because the inflamed vapor attenuated by Heat endeavors to mount upwards. Which truly does not properly agree to a quality, but to a substance. Nor can you rightly say Heat is Light, but that which is hot. For that being by the force of heat rarefied becomes lighter; as that is heavier which by condensation of the matter is brought into a narrower compass. Hence also the true cause may be rendered, why in the Winter flames do blaze more lustily: for the surrounding cold hinders the heat from spreading it self abroad in the Air. And in the same Book, *Proposit. 2.* We must call to mind what was said, *definit. 5.* of this Book, how that the Heat of the Fire is not carried along by a continual action, but is secretly conveyed through the Air, just as smells which breath out of odoriferous Bodies, and being received in the thin Air, and founded in a secret exhalation, are carried this way and that way by *habnabi*. So (I say) the fiery heat being carried in a certain kindled Spirit is thrust strait along, as much as the power of the fire is able; very speedily upwards; but the more slowly by how much the more downwards. But being set at liberty it wanders more freely through the Air, and is driven any way by the lightest motion, and by its sticking to them things never grow warm, as those which are placed by odoriferous bodies do smell sweet only by exhalations sticking to them. Soldiers in their Camps find this by experience, when having cut down a great deal of Wood they pile it up and set it on fire in the middle of a field, and stand round about the same. For they that have the wind on their backs do feel hardly any Heat although they stand close by the fire, the fiery spirits being thereby carried unto the opposite side; which the wind could not do if only a quality were carried through the Air; for that being no body would give the wind a free passage through the Air. Thus far *Aquilonius*.

But what need we Authorities when the matter is plain enough of it self? For if we consult with Experience, which *Aristotle* so commended in *Democritus*, we shall find both the Generations and Corruptions of things to be made by Atomes, and that there are every where in Nature examples of the uniting and separating of Atomes. And since there is not only one kind of Atomes, but that they are various according to the variety of Bodies, I conceive it will be best to consider them both in respect to the Elements so called, and in respect to bodies compound.

For in the first place, The Elements themselves are resolved into such Bodies, and the said Bodies joyning again do make up not only Compounds, but also the bulk it self of the Elements. Now these Atomes or indivisible Bodikies of the Elements do arise both out of the resolution and corruption of Compounds, and likewise out of the Terrene Globe (wherein are all Elements) and are carried up into the Air; whence proceed sundry mutations of the Air, and Generations and Corruptions, which variously affect both Man and Beasts, and Plants. For it is very true of the first Atomes or indivisible Bodikies, that if we take but one Atome of a kind there are none of them visible: but if many of them be gathered together their magnitude and bulk is discernable, which (as hath been said) *Plato* also teaches us in his *Timæus*. Since therefore these Bodies are most small and subtle,

they do both easily pierce into other Bodies, and afford matter also to others.

**Fiery Atomes or Bodikies.**

To run through all kinds of Natural Bodies, and first as to Elements; Fire insinuates it self into Iron and Water. The same being insensibly in the Summer mixt with the Air makes fouldry hot weather; yea, and (as Experience shews) hath burnt up Woods sometimes. It is variously mingled also with other things, and according to its various commixture makes sundry sorts of things. Fire indeed of it self (as *Jul. Cas. Scal.* teaches) neither shines nor burns; but that it shines and burns it comes to pass by the admixture of another Body, and the propinquity of the parts, by whose co-action in a smaller space the substance is greater, and therefore the force is greater. But being rarefied it burns not, nor does it shine. That smoak which ascends hath much fire in it. Not yet hath it any burning Faculty, nor shines it at all with any light: and such things as are roasted on Spits are not touched by that fire which we see; yet are they so touched by fire, as that they are sometimes burnt to a Coal. Yet is not that fire visible which burns them. And the same *Scaliger, Exercit. 325. Sect. 7.* Fire is much more transparent than the Air, because it is thinner. The Fire which we use is yellow because of mixture. For there is fire in a vapor, in smoak, in burning coals, in a flame; and *Aristotle* calls a flame burning smoak, and that not amiss. For the flame seems to be no other thing than the meeting together and union of the particles of fire, the heterogeneal substances being separated. For whereas by reason of distance and commixture of Contraries the smal bodies of fire could not joyn together, the obstacle being taken away they begin to be united. Hence it happens that if the chamber where fire is kept be close shut the fire wil not flame, but as soon as the Air is let in, and those heterogeneal bodies are distuffed, the flame breaks forth. Not yet is flame absolutely pure, but contains in it self some heterogeneal Matter, which the color alone does shew. But that fire which is above the flame is purer; and therefore is not seen. For by reason of the different concourse of the Atomes divers bodies seem to arise which yet are of one Nature. The Fire is but one thing, yet undergoes divers names, according to the different concourse of its smal bodikies. The Concourse of many homogeneal bodikies of fire is requisite to make fire in such a condition as to shine and burn; which two things though fire does not, yet is it fire stil.

**Aerial Atomes.**

Now Air is in all bodies almost. For since most Natural Bodies are porous, Air fills those empty spaces naturally. Not to speak of other things, some Metals are sounding, others not. And those which sound have Air in their pores, which is the subject of sound. So Woods are apt to admit sound, which happens only by means of the Air contained in them. And this is most frequent in dried Woods; because the watry moisture being consumed, which was unfit to receive sounds, Air comes into its place by its quality more fit to receive and advance sounds. And if a man touch a stick at one end, and put the other end to his ear, he shal hear a sound. Which comes to pass by means of the Air which is contained in them, seem they never so solid. And Soldiers are wont to try whether their Enemies are coming by clapping their Ears close to the Earth.

**Watry Atomes or Bodikies.**

Water or moist Air (which is nothing but Air full of the vapors of water) does so insinuate it self into wooden things that they wil even be thereby swollen in bulk. And therefore folding doors many times when the Air is moist, wil neither open nor shut. And tubs that leak being laid in water come to hold again, because the boards which were contracted and made chinks, are by the water distended.

**Earthy Atomes or Bodikies.**

Finally, The Earth though it be thick, yet it insinuates it self by its smal bodikies into other things, and is mixed with them. So we see in Baths, Icesickles, and stoney substances grow to the Channels, so that a man might wel wonder how such a body could lie so long concealed in clear and transparent Water. If therefore Air and Water can so insinuate themselves into solid Bodies, and Earth can be so mingled in transparent Water as not to be discerned by the sight, why therefore may not fire do the same which is much more subtile? So that there is now no need to dispute how red hot Iron burns, since really it contains in it the Atomes or smal bodies of fire, which vanishing away it returns to its Natural actual coldness. For the same cause also Metals are melted, and afterwards growing cold become hard again. Of which we shal speak anon.

**Alteration what it is. what heating is.**

Which if a man diligently consider, he shal observe, That alterations commonly so called are not mutations only in Qualities, but the participation of another Body: that the heating of water is its participation of fiery Atomes, by means of which also it hath the power to burn, which vanishing the water returns to its ancient coldness. Which also may be known even by Experience; for hot water shut up in Peuter Pots wil retain its heat ten hours and longer in the Winter time; by which means Beds are warmed in the Winter, and Gentle-

women travelling by Coach defend their feet from the Winters cold. For if the water had contracted only heat from the fire, that imprinted quality in a cold place, in a Vessel made of Metal, and in the cold air, could not continue so long a time. There are therefore (doubtless) fiery particles, which being shut up in a thick Metalline Vessel do for some time abide therein, before they can all leisurely creep out through the pores of a compact Body. So in the Summer time we are taught by this following Experiment, That Wine and Beer do not only contract a hot quality in the heated Air, but that they also receive into themselves fiery particles, viz. If two Vessels be filled at the same time with Wine or Beer, and both be plunged a good way into cold water, and then one be stopped, the other open, that Wine or Beer in the open mouthed Vessel is sooner cooled than that in the stopt vessel; which therefore happens because the fiery Atomes which did heat the Liquor being compelled by the force of contrary coldness do sooner exhale when they have a free passage than when by stopping the vessels mouth they are restrained. Yea, and it is not absurd to say the Air in our stoves is not only altered, but receives into it some of the substance of the fire. Nor is it impossible that the fire should pierce through the furnace, since air (not so subtile as fire) pierces both into Iron and stone Jugs. Yea, and the thing it self testifies thus much; for we see paper, cloaths, and other combustible things being held near the hot stove do ofentimes take flame. And if those supposed alterations are meerly such, how can heat and cold be in the same part of the water; and seeing no accident operates but by vertue of its form whence it flows, how can that heat springing from the fire act both upon the cold and upon other Bodies, the fire whence it came being now absent and quenched. Now whether is more absurd to hold that in water there is also fire, from whence as its proper subject heat flows? or to hold heat to be both in its own proper, and in a strange subject? And that this is true many most learned men have acknowledged, and amongst the rest *Averrhoes*, who in his *B. de Anima*, text. 15. writes: We must not think that water is heated remaining pure and meer water, nor that Air is cooled remaining meer and pure Air; but this happens by reason of hot or cold bodies being mixed with them. Also this is manifest in the cold air, which nips Plants less being stirred with winds than if it be still and quiet. For the cold Atomes mixt with the air and sticking to the Plants do more hurt than when they are stirred. *Julius Casar Scaliger* grants as much, when in *Exercit. 12. Sect. 3.* he saies that Brass becomes hot by the parts of the fire entering into the pores thereof. The same *Scaliger*, *Exercitat. 14.* teaches us, That boiling water is fiery, or hath in it fire and driness; and he writes that the fire exhales out of hot water: *There is (saies he) fire and driness in hot Water, which in the steam ascending we perceive by our understanding, and by our sense also; for it burns. The heat which is in water is fire mingled with its contrary.* Yea, and *Galen* taught this long ago, who in his 1. Book *de Element. cap. 6.* saies, *I say that he who in the time of frost is warmed with the fire, does receive fire into his Body.* And that the substance of fire and air does penetrate into other bodies, this also argues that the digestions which are performed in dung or hot water can never be exactly accomplished in the Embers, whatever degree of heat you shal use; and because in an hot and dry subject a thing is easily burned, but not in an hot and moist. Also the Cure of burns, and of parts nummed with cold, as also other things congealed with cold do shew, that alterations hitherto so esteemed are not meer alterations, but the mixture of a certain kind of Atomes. For if a man shal put frozen Eggs or Apples into hot water (which should be done were it a meer alteration) they wil be spoiled: but if he plunge them in extream cold Water, the frost is drawn, and sticks like Ice upon the out side, and they are preserved. So those that travel in the Winter, as is well known to the Inhabitants of *Norway* and other Northern Countries (nor is it altogether unknown to our people) and have their Members frozen as it were; if they come presently to the fire or into an hot room, they are very much hurt and exceedingly pained, and many times the part becomes gangrenated, the cold parts (I do not say the coldness, but the cold parts or atomes) piercing inward, and extinguishing the natural heat. But if their Members are first rubbed with Snow, or are plunged into cold water, the water or Snow do draw unto themselves by reason of similitude those atomes and petty cold bodies which had gotten into the part. Contrariwise, when any Member is any waies burnt, if it be plunged into cold water (which the Law of alteration requires) it is most certainly endangered. Contrarily 'twil be cured if it be put, not into cold but hot water, which may by similitude draw to it self those hot bodikies: and if the burning be not great, the Member may be held to the fire, or hot embers may be applied thereto. Of which *Fernelius*, 6. *de Method. Medendi, cap. 20.* As the fire, if a part which is burned be held near the same, becomes a cure of the evil it self caused, and by drawing back the fire eases it of its pain; so

Some things externally applied do by their heat draw out the heat of the fire, and so by ceasing the Inflammation they cure burnings. For fire and hot things do by similitude draw out the fiery Atomes. And for this very cause (as *Aristotle* writes in the 13. Probleme of the 24. Section) hot things are faster cooled in the Sun than in the shade, because the beams of the Sun draw out the fiery Atomes.

*The Fire is no Accident.* But that same Opinion of *Thomas Fienus* is altogether absurd, who in his Apology against *Santacruz*, Page 50. saies, that this Fire of ours which we use (he calls it artificial and earthly, unfitly; since it is most natural and of the same substance with that Fire which is in other parts of the world, although it be in a thicker matter) is an Accident; and he conceives that those things which are said to be Fired, or those substances which men are wont to call Fire, as Iron, Coals, Flame, are indeed Substances: but that which is in them more than their own substance, by reason of which they are called Fire, or are said to burn, he denies to be a substance, and thinks that the fieriness adds nothing to the burning Iron, Wood, or Furnace, but an Accident, viz. a most intense Heat, and that he endeavors thus to prove.

First, He saies, a substance is not capable of more or less. That same fieriness in the Iron, Wood, Furnace, admits of more and less. Ergo it is no substance.

Secondly, When the Iron is red hot or the smoak flames, the whole Iron is fired, and the fire is in all the parts thereof. If therefore the fire were a substance, in all the parts of the burning Iron there would be another substance, and consequently one substance should be in another, and so there would be a penetration of dimensions; which is absurd.

Thirdly, He saies: When the Iron becomes red hot, either the substance of the fire comes into the Iron from without, or it is generated in the pores thereof. He conceives neither of these can be: Not the first, because neither the Coal of the fire because it is thick, and stirs not, but lies still, nor the flame of the fire, because of its extreme thinness and lightness, can enter into the hard substance of the Iron. Moreover, if the fire entered into the Substance of the Iron, when the Iron cools, the flame that went in should come out again: but no man (he saies) did ever see fire fly or go out of a cooling Iron. Also (he saies) the latter is impossible, because the substance of the Iron should be turned into the substance of the Fire; which is false, because the Iron remains Iron still.

Fourthly, If the Iron became fire, it should lose its Heaviness, Hardness, and Consistency.

Fifthly, A Substance is a Being subsisting by it self, not existing in another thing, nor inhering in any thing as its subject. But the fire by it self no where subsists, but is always in some other thing, as in its subject, after the manner of accidents; and its subject taken away, wherein it sticks, there is no such thing as Fire. Ergo it is an Accident.

Sixthly, Every Body of it self hath Quantity: for Quantity springs from matter, and the determination thereof from the form: But Fire hath neither it self any Quantity, nor hath it any determinate figure, but it hath only the Figure and Quantity of the subject wherein it inheres, as other accidents. Therefore it is no Body.

But this Error *Julius Caesar Scaliger* long since observed and refuted in *Cardan, Exercit. 10.* For nothing is accidentally in any thing, which is not essentially, primarily, and of it self in some other; since every accident flows from a certain substance. And therefore since Heat is accidentally in the Iron, of necessity there must be a substance wherein it is primarily, and by which the Iron becomes hot: But such there can be none but the Fire. And if fire be a Quality, its first and proper subject must be some substance. But those reasons whereby *Fienus* was brought into that opinion are so slight, that I wonder so learned a man should thereby be moved so to hold.

For, in the first place, we deny that the fieriness in the Wood, Iron, Furnace, Smoak, receives more and less. But that the fire sometimes burnes more, sometimes less, happens by reason of the application thereof to the Patient. For Virtue united is stronger, and therefore Fire in a compact substance, as Iron, burnes more than in a thin substance, as Stubble or Straw.

To the second I answer: That Smiths can tell that Iron is porous; and therefore the fire can easily insinuate it self thereinto. And whereas *Fienus* denies the Iron to have pores; that is contrary to sense: for Smiths know how to distinguish the sorts of Iron, and discern Iron from Steel by the variety of the pores. Nor is that of any moment which he further objects, that if the fire were only in the pores of the Iron, the solid parts thereof should not burn, nor would the Iron be light all over, many parts thereof would be dark. For indeed

*Fienus*

*Plinius* was ignorant of the nature of the small individual Bodikies or Atomes, nor did he consider what dayly happens in Nature. For if Water can so penetrate into all the smallest parts of Wood, that there shall be no part thereof which is not moistened; Why may not the moist subtil fire much more pierce the Iron? And therefore to his third Argument we Answer, That the substance of the Fire doth certainly enter the Iron from without. For although the Coal it self stir not, and enter not into the Iron; yet the fire which is in the coal exhales in smal Atomes, and insinuates it self into the Iron. And the thinness of the flame does not hinder the same, but rather help it to enter the hard substance of the Iron. And when the Iron cools again, then the fire exhales out of it; which though it be not discerned by our bodily eyes (for who can see the pure Elements of Fire and Air?) yet Philosophers discern it sufficiently by the effect.

To the fourth I answer, the Iron is not made Fire, but it receives the same. Which while it does, it loses indeed its hardness and consistency, so that it may be bent and beaten by the Hammer, yea, and it may be melted.

To the fifth I say; It is false that Fire no where exists by it self, but is alwaies in some other thing as a subject; which the sense teaches. And although fire be in the Iron; yet is it not there as an accident in its subject; just as when water is in a Vessel, it is not there as in a Subject.

To the sixth I answer; That the Elements of themselves have no determinate figure nor quantity, but they are determined and receive figure from the things which compass them about.

Contrariwise, Cold Atomes having no hot body mixed with them, being abundant in the Air in the Winter time, they cause extream cold, and congeal al bodies whereinto they insinuate themselves.

Nor did the Ancients only teach, That these first Atomes of the Elements did variously spread themselves up and down, and penetrate into other bodies; but that of them also mixt Bodies were made; and they held them to be nevertheless immutable, and to retain their own Nature how ever they were mixed, and being separated from the things where-with they were mixed they held their Nature entire as before. For thus *Lucretius* writes in his Second Book.

*What came from Earth goes back to Earth again,  
And Heavenly parts do fly to Heav'n amain.  
Nor does grim Death consume our Bodies so  
As to destroy the Matter, but unsew  
The joynd Parts.*

Most Meteors (truly) are no other than a mass of Elementary Atomes variously congregated. For Exhalations and Vapors are not continued bodies, as is commonly thought, but crowds of infinite Atomes; which is manifest from the vapors arising from water which heats over the fire. For these though far off they seem to be a continued body, yet he which is neer at hand, or who walks on a Mountain top when the Air is misty, may even discern with his eyes that these vapors are not continued Bodies, but a throng of Atomes. A Cloud is nothing else but an infinite multitude of Atomes. For as when we see a smoak ascend from burning Pitch or any other thing, we think afar off that it is a continued united body; but if we come neerer and diligently look upon the smoak, we see that it is no continued, no nor contiguous body neither; and so it is with Clouds, which until the smal bodies are again joynd together (which happens in Rain and Snow) they are no continued bodies, but many millions of millions of petty Atomes or smallest bodies. And Clouds as they are of divers kinds, so when they grow together again divers things are bred of them, as Rain, Snow, Hail, Winds, Lightnings, and other Meteors so called. Sometimes nevertheless the Atomes of Bodies perfectly mixed are mingled amongst the Meteors.

For there are (in the second place) Atomes of another kind besides the Elementary (which if any man wil term first mixt bodies, he may do as he please) into which as similar parts other compound bodies are resolved. And indeed in the mixture of Natural things, or that which happens in lifeless things, these bodies of which the mixt things consist are so broken and divided into smal particles, as that none of them can be discerned and known by it self. Also in al fermentations and digestions and coctions, which are made by Nature or Art, nothing is done but to reduce things into their smallest parts, and unite them as neerly as may be. Contrariwise, the Resolution of Natural Bodies, both that which is done by Nature, and that performed by Art, is nothing but the resolving of them into their smallest parts or Atomes.

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*A Cloud.*

*The se-  
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But

Chymical  
Operations  
prove At-  
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But Chymical Resolutions do in a special manner discover that there are Atomes, and teach sufficiently what little bodies there are. So Spirit of Wine pierces through writing paper four times double into the Alembick; and in Distillations and Sublimations such Atomes are raised from Plants and Minerals into the Alembick or Recipient, many millions whereof nevertheless when they joyn together again do sometimes hardly make one drop or sensible quantity of Liquor. Nor let any man here perswade himself when he sees a vapor rise out of water or Spirit of wine, or a Smoak arise out of Pitch, Sulphur, or burning wood, that these bodies are changed into Air; but the water, spirit of wine, and other bodies, are resolved into the smallest Atomes, which when they joyn together again, they turn to water, spirit of wine, or some other body again; which the Alembicks of Chymists and their Recipients do teach. Also whiles spirit of Vitriol and other Spirits are distilled, the Recipient Vessel is often full of such small, but not yet smallest bodies for two or three daies together, and every moment some millions of such bodies are present and follow one another. Yet a small quantity of Liquor comes of them when they meet and are condensed; so that those Atomes which are present at the same moment, of which nevertheless there are some millions, do hardly constitute one drop. We see the same in other Resolutions. If a man set on fire a little bit of Pitch, and suppress the flame, an huge space of Air is filled with the smoak thereof, which is no one continued body, but a multitude of little Atomes or small bodies. And what difference there is betwixt a body compact and resolved into Atomes, we may learn only by the putting out of a Candle. For if one blow out a burning Candle, the smoaking Snuff, which is hardly so big as a Pease, does presently send forth so great a quantity of Atomes that a great part of the Air is filled therewith. So flower of Brimstone melts into Brimstone; Mercury precipitate, or sublimate, or however resolved, does return again to living and running Quick-silver. So the water wherein Metal is dissolved, although it seem clear water, and is so exactly mixed that it will pass through a paper: yet the Metal preserves its own nature therein entire, and is easily precipitated to the bottom in form of a most very fine powder, which is afterwards melted into a Metal again. So also if one Mass be made of Gold and Silver melted together, and they be so mingled in their smallest Atomes that no man would think them but one simple body; yet in the mean while in those smallest Atomes each Metal preserves its form and nature, and may be separated by *Aqua fortis*, and reduced into its former Nature. Hence the cause of many Chymical Operations and things done in Chymistry may be rendered. If to Lead any way calcined you pour distilled Vinegar, the Lead is indeed dissolved in the Vinegar, but the salt of the Vinegar unites its self to the Lead, so that if it be drawn off by distilling, it comes away quite without taste, the salt of the Vinegar remaining with the Lead, whence comes that same sweet mixt body which they call *Saccharum Saturni*, or Sugar of Lead. So if Crabs-eyes, Corals, Pearls, be dissolved by Vinegar or other acid Liquors, and be reduced to powder, so that they may be also strained through a paper, and the salt of those acid Liquors by reason of the similitude joyns it self with the bodies dissolved (so that if it be distilled it cannot be separated without much ado) yet if into the solution you drop Oyl of Tartar made by *Deliquium*, the salt of Tartar does by similitude unite it self to the salt of Vinegar, and the dissolved Pearl or Coral is precipitated to the Bottom. So if to Quick-silver you pour Oyl of Vitriol or Sulphur, the Quick-silver is dissolved in them, but the salt which is in those Spirits is united to the Quick-silver, whence arises Mercury precipitate, which hath therefore such a corrosive faculty. Of Quick-silver, Vitriol, Salt, is made *Mercurius sublimatus*. Of Mercury and Sulphur sublimed together, is made *Cinnabaris*. Thus Metals are reduced into powder when being dissolved in corrosive Liquors they are precipitated to the bottom. Yet they return and are reduced into their former Nature, that Body or Salt being taken away which they borrowed from the Solvent, which Operation is called Reduction. Which may be performed divers waies. Mercury precipitate if it be rubbed in a Mortar with Oyl of Tartar or Salt of Tartar dissolved *par deliquium*, the Salt which cleaves to the Mercury is united to the Salt of Tartar, and forsakes the Mercury, whereupon it turns to Quick silver again. So, if Mercury sublimate be mixed with Quicklime, and put into a Retort, the Salt of Vitriol, and the common Salt which is in the sublimate, sticks to the live or unslak'd Lime, and so the Mercury returns to its former Nature, and becomes Quick-silver again. The Calces or Pouders of Metals are turned into molten Metals when the Salt mixed therewith is dissipated by a strong fire, yet it is done sooner if some of those Pouders they call melting Pouders be mixed therewith. For the Salts of which those melting Pouders are made do draw to them the Salt which adheres to the calcined Metal; from which when they are freed, the Atomes of the Metal by reason of similitude unite themselves, and so return into their ancient Body

Precipitation.

Reduction.

Body



Body and shape. And indeed, how many external forms Bodies natural being mixed with others may put on (their substantial form remaining safe and sound) even Mercury alone may teach us, which puts on so many external forms, that it may be well called Many-shap'd Mercury. 'Tis changed into a clear water, into a Liquor like Butter; 'tis sublimated, precipitated, reduced into powder, into Glasse, the likenels of Lead, Gold, Silver, so that it may be wrought into Plates, and I know not how many forms besides; at which nevertheless it laies down, if that which is mingled with it be therefrom separated.

This Doctrine also of Atomes is manifestly confirmed by anointings with Mercury and Fumigations made thereof; wherein the Quick-silver being reduced into smal Atomes penetrates the whol Body to the very jaws and mouth where it may be received by pieces of Gold held in the same. Yea, and it hath been found that after nointings with Mercury, Quick-silver hath been collected in the Cavities of the Veins and Bones.

Yea, There are Atomes not only of inanimate Bodies, but also of some animate bodies: and the Soul it self may sometimes lurk and preserve it self in such smal bodies; as we shal hereafter shew when we treat of the Spontaneous Original of living things; and upon this Doctrine of Atomes the most learned *Fortunius Licetus* hath built in a manner at his Treatise of the Spontaneous Original of live things. Of which we shal speak in its place.

Plants (truly) do manifestly declare that there are Atomes. For who would beleve that in cleer and transparent Wine there were a stony substance, unless it appeared by separation, whiles the Tartar separated from the Wine sticks to the sides of the Vessels? And matter unfit to nourish the body being thrust into the joynts stirs up athritick pains, and there at length it grows into a kind of stoney substance. The Generation also of other diseases shews the same: For seeing many superfluous things unfit to nourish are taken in with our meat, they though they are bitter, and sour, and salt, and otherwise pomaint, strong and different; yet (as *Hippocrates* saies, *de Prisca Medicina*) being mixed and mutually tempered together they are neither perceived, nor do they hurt a man: but when any of them is separated and by it self, then it becomes apparent, and troubles a Man.

Also the Atomes of Purging Medicaments do make the Milk purging, as also *Hippocrates* saies in 6. *Epidem. com. 5. text. 33.* If a woman or a shee Goat eat Elaterium or the wild Cucumer, their yong ones are purged. For although as we have also said in our *tr. de Diffens. chymicor. cum Aristotelic. & Galen.* a purging Plant eaten by a shee Goat is digested in her stomach, and mingled with the Chyle, that Chyle is turned to Blood, that Blood in the Goats Dugs becomes Milk, this Milk is drunk by the Nurse, and there are so many mutations: yet in all these the Atomes of the purging Plants remain intire, and keep their Vertues.

Milk also it self, though it seem but one body, yet the Whey, Butter, and Cheese do shew being separated, that there were divers smal Bodies mingled together therein. So the Blood of Animals, although it seems to be one homogeneal Body, there are nevertheless therein not only divers parts which afford nourishment to different Members; but also if it be distilled, Volatile Salt which before did not shew it self sticks in great quantity to the Receiver. Which also happens if the Horns and Bones of Animals be distilled.

Yea, and the consideration of whol entire Animals may bring us to the knowledg of Atomes. *Aristotle* in the 5. *Histor. Animal. cap. 3.* writes that in old Wax and in Wood a certain Animal is bred (which is the least of al living things) called *Acari*. There are also a sort of Lice called *Sirones*, so smal that they cannot be seen but by a sharp sight, and in an augmenting Glasse. Yet these are Animals, ergo they have an animal, motive, nutritive, and sensitive faculty in an Organical Body made up of very many Organs. They draw, concoct, assimilate their nourishment, and are moved. They have therefore animal Spirits, and natural, which are themselves also bodies; they have Organs wherein they are generated, and wherein they are contained. And al these again if we divide them into their first and smallest Atomes or bodies, how many thousand parts wil they make? and if the little Creature *Acari*, or a smal Louse, be divided into so many thousand parts, how very exceeding little must those parts be?

And although those Atomes be so exceeding smal; yet the essential forms of things remain in them entire, as was lately said, and experience it self does witness. For if Gold and Silver be melted together, the Atomes of the Gold and Silver are so mingled in their smallest parts, that no sense can discern the one from the other. Yet both of them do retain their forms entire. Which appears hereby in that if you put *Aqua fortis* upon the said

Masse

Many-shap'd Mercury.

Atomes of Animate Bodies.

The Atomes of Plants.

The Atomes of purgatives.

Atomes retain the forms of things.

Mafs, the Silver melts and turns into the Liquor, but the Gold remains in form of a Poudre. If the dissolved Silver be precipitate it settles to the bottom in form of a most delicate fine Poudre. Each of these Pouders molten by themselves do return into their former shapes of Gold and Silver. So if Quick-silver be sublimed, precipitated, turned to water, and undergo other changes, according to the various mixture of the Atomes whereinto it is resolved with other things; yet it alwaies retains its own essential form, is easily separated from the Bodies wherewith it is mixed, and returns into its old shape of running Quick-silver. Nor does this betide in Metals only, but also in Vegetables or Plants. For when distilled Waters and Spirits are made by Chymists, insensible Atomes arise out of the Plants, so that in the *Cucurbita* they cannot any waies be discerned; but when they joyn together in the Alembick, and turn to Liquor, they again shew themselves in their likeness, whiles one is Spirit of Wine, another of Juniper, &c. And if a Goat be nourished with certain purgative Herbs, and a Nurse drink the Milk of the Goat, it wil purge the Infant which sucks that Nurses Milk; as was said before out of *Hippocrates*, 6. *Epidem. com. 5. text. 33.*

That most learned Peripatetick *Jacobus Schegkius* acknowledged the truth of this thing, when in *Lib. 2. de Occult. Medic. facult. cap. 1.* he thus wrote, *The beating of a thing into a most fine poudre does not necessarily corrupt the substance thereof, seeing it is an accident of an accident for that which is continual to be divided into very smal bodies.* And a little after; *It does not follow that the substance is abolished, if a man shall say that Medicaments beaten into poudre are effectual in our bodies.*

*Atomes are determinate.* Howbeit, Atomes have their Laws from Nature, and doubtless the Atomes of Fire are more subtile than those of Earth, although we cannot discern so much. For so the case stands with Natural things, that the forms consist not save in a certain quantity; and as they diffuse not themselves beyond their Natural bounds; so they cannot be conserved save in a certain quantity. This also *Franciscus Aguilonius* observed, who in the 5. B. of his *Opticks*, Proposit. 8. declared this thing in the example of Light, when he wrote; *Though there is not a smallest in quantity, yet Light hath a smallest in Nature, that is to say, so smal a Light that it cannot be smaller without perishing.* After which manner there are also the smallest among Natural Bodies; which if they be any more divided they lose their form and essence. For as Bodies towards their natural subsistency do require some bulk of quantity, which is nothing but the measure of corporeal substance; even so Qualities also (unless they be in some degree of excellency) they perish of their own accord. And in Propos. 15. We affirm that Light cannot of its own strength and by it self exist solitarily in any degree whatsoever, but that there is a certain limit of smalness, beyond which we cannot proceed by dividing without the destruction thereof, which therefore we may not unfitly call the *minimum naturale* of Light: but if it be joyned to a greater Light, although it be smal, nothing hinders but by help thereof it may be sustained, provided both together do at least attain to the *minimum naturale*, or smallest natural quantity of Light. Moreover, this imbecillity of subsisting is not proper to these Qualities alone, which admit the diversity of greater and lesser, but also common to al Bodies which vary their magnitude. For as these without some bulk, so they without some degree of excellency cannot free themselves from destruction. For being attenuated beyond their strength they fall to nothing and perish, no contrary thing destroying them, but only through defect of that measure, which being an indispensable Law of Nature, is requisite to the proper maintenance of each one. But what he saies of Qualities may be said much more of Forms from which the Qualities flow.

Now those disputes against Atomes concerning the infinite division of that which is continued of indivisible Lines, are disputed not from Natural but Mathematical Principles. For the Question is not here (as was said before) Whether a thing continued be perpetually divisible Mathematically? but, Whether or no Nature in her Generation and resolution of Bodies does not stop at some smallest Bodies, than which there are not, nor can be any smaller.

## Chap. 2. Of Mixture.

Since the Doctrine of Mixture is exceeding necessary rightly to understand the Generation of all Natural Things, and the Foundation well-near of all Natural Philosophy; it is worth our Labor duly to explain the same. Which that we may the better do, we are to know in the first place that the term *Mixture* hath sundry acceptations. For (as *Thomas Erastus*, *Disput. 2. Contra Paracels. part 2. p. 195.* writes) sometimes it signifies an Heap and Mass of things blended together, as of Rye, Wheat, and other such like things which keep their surface and Integrity. Sometimes it signifies the composition of two or three, or more Bodies, so confused together, that though each retain its own Nature, and they may be separated again, yet one Body is made up of all. Such is *Crama*, which is made of Wine and Water mixed; which is not one in Form, but in continuation only. For although neither the Wine nor the Water be separable by their bounds, yet they are both so contained under their Natural Form as Gold is in Silver, which may be separated by *Aqua fortis*. Such a Body is Honey and Wine, Honey and Water, and infinite others compounded by Art. Thirdly, it is taken for a Body compounded of divers things, so that of all one thing is made, of a different Nature from all the Ingredients, and having a form quite different from their forms. And things so mixed are truly said to be mixt bodies. The first manner (since therein no real mixture is made, but dry things are only blended together, which makes no difficulty in our minds) *Julius Caesar Scaliger* omits, and propounds other three, *Exercitat. 101. Sect. 1.* There are (saith he) three Manners, Degrees, or Sorts, of Mixture. The first is of those things which after they are blended may again be separated; as a mixture of water and wine. For *Pliny* reports they are separated with Vessels of Ivy as he had it from *Cato*; and we do it with a cloth. The other manner is as it happens in those bodies natural which we call imperfectly mixed, of which there are two degrees: The other more weak, as of a Cloud, Rain, Wind, Hail, Snow, Dew, Hoar-frost, and such like. For they are exhalations mixt of divers Elements which may easily be dissolved. But they hang together more closely than those of the first sort. The other degree is of a firmer union; as in clods of Earth and stones. For the parts of these are not easily separated one from another. Yet they call them rather mixt Bodies than by any other nobler Appellation, because they seem to them to be things only begun. The third Mixture is of such things as some are pleased after a peculiar manner to term Mixt Bodies. Such are Vegetable and Sensitive things.

Now concerning these three Manners, the Question is, Whether they are in all mixt bodies made after one and the same manner. Which that we may rightly unfold we must know in the first place what Mixture is. Now *Aristotle* defines it to be the Union of things mixable after they are altered. And *Scaliger* in the place fore-alleaded; That it is the motion of Atomes or smallest Particles of Bodies to a mutual Contact, so as they may become one. And he further explains his meaning, and that rightly, how that every thing that is, is one, not only by continuation and privation of pure contiguity, but by act also, by vertue whereof it comes to pass that those parts become one body. Now by Act he means the Form, by which it comes to pass that those parts which by their own nature and aptitude might come together to an Union, are become actually one. And he concludes rightly, That those things which are not one Being formally, but by accident only (as an Heap of Beans and Oats blended is one) are not properly mixt bodies, nor ought so to be called, but things jumbled, as Wine and Water, Silver and Gold; since such things are not formally one, but so many things as there are parts within and without, and only one by accident; which though it be less manifest to the senses, yet is it not hid to the understanding of wise Men; seeing they may easily be separated, as Wine and Water by Ivy Vessels, and by cloaths; and Silver and Gold by *Aqua fortis* so called.

But by all that hath been said the difficulty is not quite removed, nor the Nature of Mixture sufficiently explained; but two knots do remain as yet to be untied, which being rightly unfolded they bring great Light to Natural Philosophy and Physick. For although we must needs grant, that nothing is truly mixed but what is formally one; yet the question still remains: First, Whether it be necessary that the mixable bodies which are united by vertue of one Form, and grow together into one mixed Body, should lose their own Forms? or, Whether in the mixed body they may all under another form retain their own forms still? Secondly, Whether the Elements only are mixable; and every resolution into the smallest particles

particles made in reference to Mixture does alwaies proceed so far as to the Elements? or whether other bodies more noble than the Elements may properly be said to be mixed? Both which Questions must be explained.

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As to the first Question, That the same may be rightly explained, we wil only enquire concerning the Elements. For concerning them there is no doubt but that they are rightly mixed; but as touching other Bodies the matter is questionable. But whatsoever shal be said of the Elements, that hath also undoubtedly place in al other mixable bodies. Now there are chiefly two Opinions concerning Mixture; the one held by well-nigh al the Ancients before *Aristotle*, as *Empedocles*, *Democritus*, *Anaxagoras*, *Hippocrates*, yea, and by very many Philosophers since *Aristotle*, who al held that Generation and Corruption are made by the Conjunction and Separation of Atomes, and that the Bodies mixed do retain their forms entire in the thing made up of them. Which manifestly appears out of *Hippocrates*, *Lib. 1. de Virtus ratione*, where he writes: *What I mean by Generation and Corruption I must explain for the sakes of many, viz. To be mixed and separated. Now thus the matter stands: To be generated, and to be mingled are all one, and to be separated and corrupted are all one.* According to whose mind, as I said before, *Jul. Cesar Scaliger*, *Exercit. 101.* defines Mixtion; That it is the motion of Atomes to the mutual contact one of another, that they may be united. The other is the Definition of *Aristotle*. For he only separated from the Ancients in this point. For thus in the *1. de Gener. & cor. cap. 10.* he writes against *Empedocles*: *We must not say, That such things as are mixed are mingled by their smal parts, which still retain their own nature. For that would be a composition, but not a temperature or mixture, nor would the part be of the same nature with the whol. We say, That if a thing be mixt the parts thereof are one like another, even as every part of water is water. But if mixture be a composition according to the smal parts, none of these things does happen, but that is only a mixture so appearing to the sense, and that which a dim-sighted man will account mixed, a quick sighted man will discern not to be mixed.* He teaches the same in the *2. de generat. & corrupt. cap. 7. pag. 47.* the sense of which place *Toletus* thus propounds: *He reproves this manner of mixture (which Empedocles supposed) because one inconvenience follows, viz. That out of every part of the mixt body the four Elements could not be extracted, and so every part of the mixt body is not mixed: the Consequence is cleared, because as out of every part of a wall cannot be taken stones and bricks, because where the one is, the other is not: so truly it will be in a mixt body, which is made after the same manner of the Elements.* And thus indeed *Aristotle* opposes the Opinion of the Ancients; but he so propounded his own Opinion that hitherto for so many Ages there hath been Civil War amongst his Expositors, what his Opinion was, or how it is to be explained; whiles some (as *Averrhoes*) do hold that as wel the substantial Forms as the Qualities of the Elements do remain actually in the body mixed, only broken, alliaied, and reduced to a mediocrity. Others (as *Scotus*) do teach that the forms and qualities of the Elements do quite perish in the mixture, and that a new form of the mixt body is generated, and a new quality, which is the temperature of the mixt body. Others (as most of the Latins) do conceive, That the forms of the Elements are no waies preserved in the mixt body, neither entire nor broken, yet they hold the Qualities remain in the mixt body, but broken and reduced to a mediocrity. Whose contentions to set down in this place is no part of my business. They may be read in *Zabarella* his Book of Mixture, in *Tolet. Lib. 1. de generat. et corrupt. cap. 10.* and other Expositors of *Aristotle* every where.

The Opin-  
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There have been found in the mean while most learned men of no smal note, who being moved with the evidence of the thing it self, have embraced the Opinion of the Ancients, as *Philoponus*, *Albertus*, *Aureolus*, *Zimara*; and amongst Physicians *Avicenna*, *Fernelius*, and very many more, who so stoutly defend the Opinion of the Ancients that some of them write; *Whoever read their Arguments (if he be not a Mil-stone) wil consent, and those that think otherwise play the Sophisters, abuse the Works of Nature, and destroy and defile the Splendor of the Ancient Discipline.* And especially *Avicenna* comes up directly to the mind of the Ancients, and holds, That the Elements in mixt Bodies do retain their Forms perfect and entire, howbeit divided and cut into very smal parts, so that their particles composed and knit together in a certain order do mutually cohere one with another. *Fernelius* follows *Avicenna*, who *Lib. 2. Physiolog. cap. 6.* calls the Opinion of those that hold the contrary, a childish and vain, nay, a monstrous Opinion; and he judges that those who so think have contemned the Philosophy of the Ancients. And they do indeed al of them wel, in that they adhere firmly to the Opinion of the Ancients, being moved thereto by most firm Reasons: but herein they take pains to no purpose, whiles they would make this

this to have been the Opinion of *Aristotle*; since *Aristotle* in exprefs words relinquishes the Ancients in their Opinion, as appears in that place lately alleadged. Yea, and very many others who differ from the Ancients saw this Truth, and nothing but the Authority of *Aristotle* hindred them from imbracing the same; and if the Authority of *Aristotle* be set aside, and the point debated only by reason, and no vain labor bestowed how to reconcile this Doctrine with *Aristotle's* words, that is, Truth with Falshood, the case is very plain. Yea, *Aristotle* himself comes to this Opinion against his wil, whiles at the end of his 1. Book *de Ortu & Interitu*, he defines Mixture to be the Union of things mixable, being altered. For when he saies the Union of things altered, he intimates that the things mixed do not perish, but remain in the body mixed. For if they are altered and mixed they do not perish. Nor does the word Union oppose this Opinion, as *Zabarella* conceits in *cap. 1. de Mist.* but rather confirms the same. For Union is the Copulation of such things as have a real Being, but not of things that perish. And although of many things one be made: yet neither is it necessary that those simples should perish, nor is it a meer aggregation or blending, but the simples by a superior form are reduced into one body. And this Doctrine of the Ancients, viz. That the Elements and simple Bodies do keep their natures entire in the Compounds, is the key (in a manner) to al Natural Philotophy, and the greatest part of Chymistry and Physick.

Contrariwise, That only Opinion of *Aristotle*, That the Simples do not retain their Natures in mixt Bodies, hath cast the Expositors of *Aristotle* into Labyrinths and inextricable Controversies, and hath been brought into Natural Philosophy to the great dammage of Physick; which being rejected all things become plain and easie.

The ancient Philosophers, and late Authors which follow them, have been induced to imbrace this Opinion by very strong reasons. For first of al, the Nature of Mixture shews as much, since things that perish cannot be said to be mixed: which *Aristotle* himself in the end of *Lib. 1. de Ortu & Interitu* acknowledges. Nor could he do otherwise. For since (as in *Metaph. Lib. 5. text. 3.*) he declares, That Elements are that of which existing things consist; it must needs be that these Elements (if they were Elements) must abide and exist in the mixt Body.

Arguments  
for this  
Opinion.

Moreover, Since Action presupposes Act, and in mixt bodies the actions of the Elements are apparent; of necessity they must be actually in them. Not to speak of others, *Aristotle* himself, *Lib. 1. de Cælo*, writes; That a mixt Body is moved according to the sway of the prevailing Element.

Finally, The Resolution of mixt Bodies into their Elements shews the same. For mixt bodies are resolved into the Elements; and *Aristotle* himself in *1. de generat. & corrup. text. 84.* saies, That the things mixable may be separated again from the mixt body. And if so, then were they actually in the mixed body.

The force of which Argument is such, That those who have labored to answer the same, have shamefully foiled themselves. For the Conimbricentian Collegiates, while they deny that while Woods are burnt they are resolved into the four Elements, and deny that the water which drops out of the said wood, and distilled waters, are true water, they resist not only *Aristotle* himself, and other Peripateticks, but also their very Senses. For suppose that Liquor which drops out of burning Wood, or from an Alembick, is not pure water: yet our Senses, and the separation which is easily made, do witness that the greatest part thereof is water. And after this reckoning there should be no Element of Water in the whol World; since it is no where found pure. But others lest they should go against their own Senses, do indeed grant that mixt bodies are resolved into the Elements, but they foolishly hold, that not the same Elements in number, but only the same sort of Elements come out of the mixt body; which is founded upon no reason, but is only hatched to palliate an absurd Opinion, yea, and it is repugnant to Reason and Experience. For when they hold that Elements return out of the mixt body by reason of the action of a like Element, whereby they recover what they lost in the mixture; how I pray you, in distillations and burnings can Water and Earth be extracted out of the Compound? since Fire by acting upon the mixt body introduces nothing that is watry or earthy, yea, the action of fire is adverse to water and earth, so far is it from augmenting or perfecting the same. The only agent in combustions is fire: and the force thereof equally affects al the parts of the mixt body, and yet nevertheless it brings out some hot, others cold, others moist, others dry, others bitter, others sweet, others other waies differing: which since they cannot proceed from one only action of fire, verily we must believe they were before in the mixt body.

And

And which way soever they turn themselves who hold the contrary Opinion, yet they can no waies dis-intangle themselves. For either the Form remains in the mixt body, or it does not remain. If it remain, it remains either entire, or broken.

He who holds they remain intire, consents with the Ancients. But *Averrhoes* and *Zabarella* hold they remain broken. But what they bring concerning the Refraction or breaking of the Forms, is a meer figment; and their Opinion who hold the forms of the Elements are capable of more or less are sufficiently refuted from the Latins disputing against the Opinion of *Averrhoes*; nor have they ever brought any so much as a probable reason for their Opinion, but have only simply and barely affirmed, that Forms have certain degrees, some of which may be taken away, and the rest remain. For the whol Nature of the Form consists in that which cannot be divided, nor does any Form receive more or less, but where ever it is, either it is totally there, or not at al.

But they which hold the Forms do not remain in the Body mixed, and that nothing remains but the matter, are very absurd and almost ridiculous. For what mixture is there where nothing remains? For since the Elements have no other matter than the first, and the first matter is common to al the Elements, I cannot say that one mixt body hath more fire than air. For whatsoever is, is by its form. And therefore if the Elements are not in the mixt body by their form, they are not there at al. And thus a mixt Body in respect of the Elements should be as simple as the Elements themselves; because although the matter be from the four Elements; yet because the Matter of Fire, Air, Water, Earth, does not differ, and the Form (according to their Opinion) of Fire, Air, Water, Earth, should be no longer present, the mixt body so called must needs be simple.

And that we may also consider what is wont to be objected to the contrary; if any shal ask, What were the Motives which caused *Aristotle* to forsake the Opinion of the Ancients commonly held in his time, we cannot find any of moment, save that which he chiefly propounds, in 1. *de Generat. & Corrupt. cap. 7.* and that is this: That he conceives from the Opinion of the Ancients this absurdity follows, That every part of a mixt body should not be mixed, and that out of every part of a mixt body the four Elements could not be extracted. But the Ancients wil answer, That this ought not to be done, and that this is *Aristotle's* Hypothesis, and that he laies that as a Foundation which is the matter in Controversie. For this Assertion seems contrary to the nature of mixture. For if there be a mixture, those things which are mingled must needs be simples. Nor is it necessary that those Simples should be mixed, but at last in the resolution we must of necessity come to Simples.

Others also do ad other Reasons. *Scaliger, Exercit. 16. Sect. 3.* The Forms remaining (saies he) mixture (according to *Aristotle*) should be but an heap; as it is in dry bodies. For the Natural Quantity of every smal part follows the existence thereof, but not continuation, for so should they be really the Atomes of *Democritus*. But *Scaliger* whiles he regards somtimes truth, other whiles Authority, contradicts himself, and answers this Argument, *Exercit. 101.* while he writes; That these parts retain their forms, but lose the prescription of their bounds, and so they are not a meer heap, but do make a mixt body. For that is false which some object, That things of different sorts cannot be continued. For whiles the Elements are united under the Dominion of one Form, they are really continued. Nor is it absurd (as the same *Scaliger* writes in the same place) to hold that there are many forms in one continued body. For these forms are every one the act of its own Matter. Which matters because they are by Nature ordained to a more labored composition, she hath provided that their forms as wel as themselves should be mixed. But the ultimate and most excellent forms, as of a man, since they are not ordained for any further work, they only are not mixed.

Moreover, Neither is this of any great moment which some object; If the Elements should remain perfect under the dominion of another Form, it would follow that the Form of the mixt Body should be an accident; since what is added to a perfect Being a ctually constituted is an accident. For the answer is manifest from what hath been answered to the former Objection. For as *Scaliger* saies there, those less noble Elements and Mixables are made for the sake of the more noble, and therefore submit themselves to the Rule of the more noble form, which supervening obtains the Office, not of an accident, but of a specific Form. But those things only which are added to those more noble bodies, which are not ordained for any further composition, are accidents.

The principal cause of mixture

Now that many have not been able to attain the truth in this point, and have erred in a matter plain enough, the chief cause is, That they knew not the true and principal Cause of mixture,

mixture, and thought that all sorts of Natural Bodies did proceed only from the mutual fight of the Elements, and their mutual action one upon another; and to use the words of Aristotle himself, *Lib. 2. de Generat. & Corrupt. Cap. 9. text. 54.* they attributed powers and vertues to Bodies (by which they generate most instrumentally) neglecting the cause taken from the Form. But the sole concurrence of Elements makes very few sorts of natural things, and none of those more perfect Bodies: and contrary to the mind of Aristotle, the Expositors father upon him, that he brings the Generation of Natural Bodies only from the Elements. For he expressly holds (as was said before, *2. de generat. & corrupt. text. 40. 53. & sequent.*) that the Qualities of the Elements are only Instruments, and the principal Cause is the specific form of every thing. The same thing Scaliger teaches, *Exercit. 307. Sect. 20.* Unless (saies he) the four Elements have a Governor, they wil vainly toss and be tossed. For what is it that shal mix so much Earth with the rest? And there ought to be in every motion one first Mover. For they cannot move themselves to any work, but in Compounds they are moved to mutual connexion by a more excellent Form, in bodies imperfectly mixed by an external principle. Erastus was forced to acknowledg the same, who although in his Disputations against Paracelsus he writes, *Parte altera, pag. 196.* that there are no qualities in the whol world which can change whol Bodies applied to them, besides heat and cold, moisture and driness (and that therefore these Qualities must necessarily be held the Principle of Mixtures) yet compelled by the evidence of the thing it self he ads by and by: we do not say that they are principles in such a sense, as if we held them to be the principal Causes, but we say they are Instruments without which no form can make a mixture. But being further demanded, What that form is which is the worker of mixtures? he answers, It is the Divine Command whereby in the Creation God commanded the Elements that they should orderly meet together for the Generation of things; and that the Motion of the Heavens gives no smal assistance thereto. But this answer is partly from the purpose, partly false. For the Question is not about the first Cause of things, but the immediate Cause. Nor is it yet proved that God gave this Command to the Elements, but it is the Office of the Form to marshal the Elements in a mixt body. And although God created all things, and these lower Bodies are subject to the motions and influx of the Heavens; yet God hath given Nature, by which all things are generated, which is the form of every thing, and the Soul of things animate. It shapes it self its own body, and for the making thereof draws Elements and other Bodies, disposes, unites and governs them; whence it follows that they are now formally one, and being united under that which is actually one they become themselves actually one which before were many. And therefore the Elements do not concur of themselves, but are drawn by the Forms. Whereof Scaliger writes excellently in *1. de Plantis: The Soul (saies he) is Nature to a living thing. She shapes for her self Hoofs, Teeth, Horns to defend life: and therefore she uses them, and knows how to use them, without any object or any phantasie. He that made the Soul gave certain precepts thereto, partly general, partly special. Those are such as pertain to her preserving her union with the Body: of which there was to be no outward Author. Careful therefore hereof she moves the Heart, concocts in the Stomach, concocts again in the Liver, perfects the nourishment in the Veins, digests in the Members, changes it into the substance of the Body, bears it, unites it, restores it, repairs it. Yea, he speaks Divinely in his 2. de Plantis: That (saies he) which is heavy, also ascends: For that work is performed by the distributing faculty, which also lifts the Earth upwards, and drives or draws the air downwards; being Lady of the Fire and Air, by the first Command of its Creator. For I doubt not but you hold that there was not one Spirit-maker of all things, and another the Preserver of them when made; nor that he which made all things of himself, and cannot be absent from himself, can be absent from the things he hath made. God, God, my good friends, neither idle, nor busied, neither in work nor out of work; but without work, the Head, Beginning, Middle, End, and all of the Work, and that I may in one word dispatch, compass in, and surmount all, He himself, who by his most simple and indivisible Understanding of himself made the World; where y all have attained their End and Order.*

The Opinion of Erastus touching the Cause of Mixture.

Mixture how it is made.

Nature the Handmaid of God.

All things from God.

The Generation of a living and lifeless mixt Body does differ.

But

Zabarella also saw the same Truth in part; but he could not reach the whol, being hindered by a pre-conceived Opinion, whiles in his *1. de mixt. Generat. & Interitu, cap. 2.* he distinguishes betwixt the generation of a mixt animated body and an inanimate, and saies rightly, That a living Creature is not generated by the Elementary Vertue, but by Vital Heat implanted in the seed, so that in the generation of a living thing all the Qualities of the Elements are instead of matter, and the immediate Agent is the Vital Heat implanted in the Seed, being proportionable to the Element of the Stars.

But whereas he saies that a mixt Body as such is generated by Elementary heat tempered by cold as the prime Worker, working upon the two passive Qualities as Matter; that is liable to many difficulties. I say rather, hardly any perfectly mixt body is generated after that manner as *Zabarella* supposes, and that there is no such mixt thing in Nature. For what (as was lately alleadged out of *Scaliger*, *Exercitat.* 307. *Sect.* 20.) should thus collect certain portions of Elements, and what should mingle so much Earth with so much Water? Nor is there any reason to fly to the fire in this case, whereof *Scaliger* speaks in his second *de Plantis*: If the Fire unites the three other Elements as parts, what shall unite it to the three? But most likely it is, that all perfectly mixt things are either parts of an animated Body, or sorts of Natural bodies made in the first Creation, which either yet remain such in the Individuals, or are continued by a new Generation; whereof *Scaliger* most rightly in the same *Exercitat.* saies, That every Form of every perfectly mixt body, although it be not a Soul, as that of an Adamant, is a fifth Essence far different from the four Elements. For this form in Gold, Silver, and other Metals, in Jewels and Stones, aptly disposes the Elements and such matter as is fit for it self. From which it easily appears, that what is by *Zabarella* objected, *de Mistione*, *cap.* 9. is of no moment; where he writes, If in Mixture there were made a resolution into the smallest parts natural, there must alwaies be equal portions of the mixable Ingredients, or they must hold the same proportion one to another. For this is no waies necessary; but the Elements concur in an unequal and most divers proportion, according as the Constitution of the mixt body requires, or as the mixture is directed by the superior Form. For a Gourd and a Cowcumber draw more Water and less Fire; and a Pitch-Tree, a Pine-Tree, and a Fir, draw more Fire and less Water.

whether  
a fight of  
the Ele-  
ments is  
requisite in  
Mixture?

Moreover, This also was no smal Cause (which yet agrees almost with the former) why many erred from the Truth, because they supposed that the Elements did no otherwise concur to Mixture than by their fighting one with another. For seeing mixt bodies consist of contraries, and contraries do mutually fly one another; that they may concur and friendly agree to make up a mixt body, some have thought that this friendship and agreement could not be procured unless by fight foregoing they were reduced to a mediocrity. Which agreement of the Elements how it should be made they are at variance amongst themselves, whiles some hold that it is sufficient that their first qualities be abated, though the forms remain intire; others conceiving that both the forms and the qualities were remitted and broken. But there is simply no need of this fight; it is sufficient if they be reduced into Atomes. For then it is that things contrary do fight together and shun one another, when notable magnitudes and portions of them do concur. But when they are reduced into their smallest Particles or Atomes, there is either none at all, or no considerable Skirmish. Which thing is apparent by many experiments. When water is poured upon burning coals, a noise is raised by the fight of those Contraries; but not when the fiery Atomes are mingled with the Water, while the Water heats and is turned into vapors; where by the confession of all men the Atomes both of Water and Fire are contained in the Vapors, and keep the peace. So also, if water be gently heated, it receives the fiery Atomes without any fighting: but if the water grow exceeding hot, and the fiery Atomes come thronging into the Water, or particles of fire bigger than atomes, there is fighting, and great bubbling and boyling. But when the water is resolved into vapors and smallest atomes, although it be joynd with atomes of fire, yet no fight is observed. Oyl admits no Water, nor is mixed therewith, by reason of the contrariety of its Nature. Yet if Oyl be reduced into Atomes it wil admit Water. For examples sake, distilled Oyls do swim upon Wine and distilled Waters, and mix not therewith; but if those Oyls be first mixed with Sugar, and the Sugar afterwards dissolved in Wine or Water, the Water receives the Oyl being reduced into smal atomes, and thereby a Medicinal Wine or Water is made, having the smel, tast, and vertues of the said Oyl. After the same manner in the dissolving of Pearls, Corals, Metals, first there arises a bubbling and a noise, the bubbles ascend; but when the Connexion of these Bodies is loosened, and they are divided into Atomes, all is quiet, nor do they act any more one upon another, although each of these bodies remains under its own form, as Precipitation and reduction teaches. So also in the preparation of *Tartarum Vitriolatum*, if Spirit of Vitriol be mingled with Oyl or Salt of Tartar, there arises a mighty batle, a noise, heat, and boyling. But when these two Fighters are duly mixed in their smallest parts, all the Quarrel ceases, nor is there any more noise or boyling. Nor let any man object, That those smallest Atomes therefore fight not, because they are by their mutual action one upon another tempered and reduced to moderation. For separation and reduction do shew the contrary,

which



which teach us, that those smallest Atomes do remain and subsist under their own proper Form, and are easily (being joyned together) reduced into their ancient body again. So the Spirit of Vitriol and Salt of Tartar do in their very mixture retain their Forms entire; which even distillation shews, by means whereof the Spirit of Vitriol is again separated from the Salt of Tartar, and being separated it subsists of it self with all its forces entire. Which if it be again poured upon the Salt of Tartar it raises a new combate, until these Combatants (being mingled in their smallest parts) come to a Friendly Agreement.

From all which it appears, That although contrary Principles do concur in the Generation and Nutrition of mixed Bodies; yet for their uniting there is no prime necessity of a fight, but it suffices that they concur in their smallest Atomes. And this is that which Hippocrates writes in *Lib. de Prisca Medicina*: In a Man there are bitter, and salt, and sweet, and sour, and harsh, and tasteless parts, and an hundred other sorts, which being mingled and mutually tempered together are neither discerned, nor do they trouble a man; that is to say, when they are reduced to their smallest Atomes, and so mingled together. But when they exist apart, that is, when many Atomes of the same kind being separated from the rest are joyned together, so that they become a conspicuous coagulated Body, then they exercise their Activity. And hereunto tend all the Digestions and Fermentations of the Chymists, viz. That Bodies which in a greater bulk were contraries may be reduced into their smallest Atomes, and afterward agree friendly together and be united.

Finally, It hath been also no small Cause of Error in many, that same vain Fiction of the Education of Forms, which we have elsewhere rejected. For although herein (as was said before) Zabarella is in the right, when he holds that the Vital Heat is the Agent in the Generation of living things (though it be not the primary Agent which is the form, but its Instrument) yet ever and anon he falls back into the common Opinion, and endeavors to reduce the Generation of living things also unto the Concourse and simple mixture of the Elements. For so (*Lib. 1. de Misti Generat. & Interitu, cap. 3.*) he writes, When five degrees of Heat, and six of Moisture concur, it is a convenient proportion for to educe the form of Oyl. Whereas sure it is, That Oyl is not generated by a simple concourse of Elements, but is produced by the Olive Tree. Now Olives are the Fruit of the Olive Tree, which the said Tree produces by its inbred Heat; out of them is pressed the Oyl after the same manner as out of Almonds, Nutmegs, Lin-seed, Poppy-seed, and Wine out of Grapes.

As to that other Question, Whether the Elements alone are mixed? or whether there are other small Bodies or Atomes which may truly be mixed? The most (truly) of Aristotle's Expositors do conclude also from that supposition of theirs whereby they hold, That all things are made by the mutual action of the Elements one upon another; that only the Elements also are mixed, and that there is no mixture in which there is not a resolution as far as to the Elements. But he that shall diligently consider what is daily done in Nature, will observe that this is not always necessary. The case (truly) is plain in those less perfect Mixtures; since Natural Bodies do retain their perfect Forms in them, as is clear in Metals dissolved in *Aqua fortis*. Nor yet is it necessary in perfect Mixture. And I conceive that it is manifest in Plants and Animals. For neither are they nourished with pure Elements, but with other mixt bodies created for their sakes. A man is nourished with blood, and in that Nutrition which is a true Mixture and substantial mutation blood is not first turned into Elements, that of them flesh may be made, bones, &c. Blood is made of Chyle, Chyle of the meats we eat. In which mutations there is no resolution into Elements, but as the next matter of a Bone, Flesh, &c. is blood: so the matter of Blood is Chyle; the matter of Chyle is Bread, &c. And there are many Documents of this matter. For if in the stomach meat and drink were resolved into the Elements, no Form or Quality of things which are used in meat would remain; whereas nevertheless meats which have a purging faculty may turn to blood, and so to Milk having the like purging Faculty, which qualities could not remain in the simple Elements, if meats were resolved into them. And many Diseases arising from the use of naughty meats do more than sufficiently declare that there is no resolution as far as to the Elements in the corruption of Meat and generation of Nutriment. For all the more ignoble mixt bodies are matter for the more noble. Thus Hippocrates writes of Plants: Such things as grow out of the Earth and are sown in the Earth, when they come into the ground every one draws that which in the Earth is most suitable to its own nature. Now there is in the Earth both tart, and bitter, and sweet, and salt, and such like. First therefore it draws much thereof which is accommodate to its nature, and then also it draws other parts.

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The Edu-  
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the Ele-  
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are mixed?

Most renowned Philosophers and Physicians consent with *Hippocrates*. Not to speak now of others, *Thomas Erastus* in *defens. thes. de saporibus* writes; All Medicaments in a manner do not consist primarily of the Elements, but are compounded of things formerly mixed, and that many times. *Galen* shews that the body of Man is compounded, not of the four Elements, but of the four Humors, as the immediate matter of its Generation. Now it is again apparent that these Humors are made of the Meat and Drink, which are also themselves evidently made of the Juices of the Earth. For Animals are nourished by Plants, Plants draw out of the Earth juice familiar to them, as bitter, sweet, sour, because of them the Nature of each properly exists. The Seeds (truly) sown in the ground while they draw to themselves profitable and convenient Nutriment they draw only such juice as is compounded of the Elements.

And therefore those bodies also of which these are made, although they are termed the smallest bodies, yet are they not absolutely such, but the smallest of their kind, that is, such as to which those bodies when they are resolved do return, and consequently not into Elements, but into those things of which they immediately consist. Milk turns into Butter, Whey, and Cheese. So the same heat acting upon the homogeneal meat changes it into divers humors, according as it is disposed, nor does it of any Particle form every thing. Wine I conceive is rightly held to be not a thing blended and jumbled, but a perfectly mixt Body infused. But if it be put in a Still and stilled, little Spirit that will burn is drawn forth, much Water remains and a little Earth; because there is more Water than either Fire or Earth in Wine; which yet would not so come to pass if out of every smallest Particle, Fire, Air, and Water might be drawn.

Into what  
mixt bo-  
dies are  
resolved.

For indeed, as hardly any mixt body is composed immediately of the Elements; so also mixt bodies are rarely resolved into the Elements. Which is apparent by the corruption and resolution of things, both violent by fire and burning, and natural. That Plants and Animals when they are dead and putrified are not resolved quite into the Elements, that smell and stink does sufficiently evince which belongs to no Element but is proper to mixt bodies. And as of things living some have one smell, and some another: so also is it with Plants and dead Carcasses. Yea, and the pestilence hath been frequently observed to arise from the putrefying Carcasses of dead Animals. The same happens in violent Resolutions which are made by Chymical Distillations and Sublimations. *Zabarella* indeed *Lib. 2. de Mistor. Generat. & Interitu, cap. 2.* writes, That Combustion is the mutation of a mixt body into one Element only, namely Fire, some part of Earth excepted. Also many others do imagine, that if they see a fume or vapor ascend out of any thing, that the said thing is resolved into the Elements. But the matter goes far otherwise; for the fire retains its own, and gives to others that which is theirs. Fire is used in Chymical Distillations and Sublimations, sometimes gentler, other whiles stronger; yet neither of them resolves things into the Elements. For although fumes and vapors ascend; yet if they be received in Alembicks and Receivers, it is apparent that the resolution is made only into Atomes of a peculiar kind; and some flowers are gathered of Mercury, others of Sulphur, others of Sal Ammoniack. So in Distillations although one kind of vapor seem to arise; yet if it be collected in an Alembick, it appears to be Spirit of Wine, or Cherries, or Juniper, *Aqua fortis*, or some other Compound. Yea, although they may ascend insensibly, so as not to be discerned by the eyes, so as to pass through a thick paper four times doubled: yet are they not changed into Air, but into a spirit of its own kind. Yea, if Sulphur, or Pitchwood, or Pitch be set on fire, they turn not into Elements, but their proper Oyls are gathered therefrom.

And from what hath been hitherto said, it is apparent that the primary efficient Cause of that mixture in Plants and Animals, yea, and all perfectly mixt bodies, as Stones, Jewels, Minerals, and Metals, to constitute their Bodies, is that same specifick form of a natural body, which draws matter fit for it self, and disposes the same after a certain manner.

Some Mi-  
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But all other Mixtures which are not directed by a superior form, by what names soever called, proceed from the Consent and Dissent of Atomes, by means of which like are moved to like, and like are assimilated to like. For although this likeness and unlikeness of Bodies of a kind does not a little help towards the more convenient mixture which is made in Animals, and is governed by a more noble Form (as we see like meats are more easily digested than unlike) yet this mixture hath place chiefly in fermentations, either natural or artificial, and in the preparations of Medicaments, as also in those which are called fortuitous. And this similitude of the smallest Atomes of a kind as it is the foundation of many mixtures, so is it of all Solutions. After this manner the fermentation of Wine, Beer, and all Juices

Juyces is made, viz. whiles such as are of the same Nature are united, and expel things different from them, and drive them out as dregs; which is chiefly effected by help of that same inbred spirit which penetrates into all parts; which also we see betide in the fermentation or leavening of Bread.

What we should think of white and red Wine mingled of Honey and Wine, of Medicinal Wines, Treacle, Michridate, distilled and compounded Waters, and such like, whether they are true mixtures, or only things blended together, is a question amongst Authors. Some hold they are but things jumbled together. So *Thomas Erastus, Disput. 2. contra Paracels.* page 212. saies, white and red Wine mingled is but a jumbled thing, and adds this reason, Because our Taste tells us, that the taste of either of them still remains, and that neither Wine hath lost its own nature, and it cannot be the rednets should possess any but its own proper subject. And concerning Treacle *Zabarella* writes, *de Mist. cap. 13.* That Treacle hath no true mixture, or if it hath, that it is the mixture of the Elements, and not of the Ingredients of the Treacle. But these Opinions are founded upon a supposition not yet granted, viz. That nothing is mixed but the Elements, which we have before proved to be false. And therefore if otherwise it is sufficient to the Constitution of Natural Bodies that smallest Atomes of several kinds should meet and be united; of which because sometimes these, otherwhiles those are in greatest quantity, therefore the taste, smell, color, and other qualities sometimes of these, otherwhiles of those do abound, as otherwise in the mixture of Elements, the Qualities of the predominant Element do excel the rest: verily I shall not deny, when such bodies are first blended, they may be termed things jumbled, but when after Fermentation, or frequently repeated distillations, they are united in their smallest Particles, I see no cause why they may not be called bodies truly mixed. And if that cause were sufficient which *Erastus* brings to prove that white and red Wine blended are no truly mixt Body, most Wines should not be true mixtures; since most Wines are made of several sorts of Grapes, and therefore sometimes they taste like one sort of Wine, otherwhiles like another.

whether  
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mixed.



# THE FOURTH DISCOURSE.

## *Of the Generation of Live Things.*

### Chap. I. *Whether Souls are made?*

**S**INCE Plants and Animals do not last in their Individual or particular Beeings, but some die, and others spring up in their place, and so the kinds and sorts are preserved to the end of the World, and as long as it pleases God the Creator: it is altogether worth our Enquiry how this Generation of Living things, and the preservation of their kinds by individuals continually succeeding one another, is brought to pass; especially since renowned Men

*The essential parts of living things.*

have been carefully busied, and in doubt also concerning this matter. Now all living things consist of Soul and Body. Whence they have their Body is clear enough; but whence they have their Souls is not so evident. We are therefore now resolved to make that our Enquiry. Which whiles we do, we shall consider the matter it self, and not contend only with Authorities, nor shall we bring our selves into a Labyrinth and Maze, wherein many wander about and can never get out, whiles one while they follow Reason, another while Authority, and make it their business, alwaies to save the Authority of great Authors, and so vainly labor (oftentimes) to reconcile Truth and a Lye together.

And although there are divers sorts of Living things; yet since all of them have life from the Soul, we shall speak in general whence living things receive their Souls, and whence Souls have their Original.

In the first place, Some do here briefly quit themselves, and deny that forms (such as the Soul is) are made. For thus saies *Toletus*, Lib. 1. *Phys. cap. 9. qu. 19.* We wholly deny with Aristotle, that Forms are made or produced; but Compounds are made, not out of nothing, but of matter; but the Forms are consequently made and comproduced: whence they are not created, because Creation is an action whereby a thing is first made; but the Forms are not first made. And this is the power granted to Natural Agents, that they might produce a Compound, and also mediately the Forms withal, which is not to create, nor have we any other Philosophy from Aristotle, and it is an excellent one, and worthy to be noted. The same Author in the same place saies thus: The Form is not produced by it self, but it is comproduced upon the production of the Compound, that is to say, the action is determinated primarily upon the Compound it self, and consequently, and as it were by accident upon the Form. The *Conimbricenses* in Lib. 1. *Phys. cap. 9. quest. 12. artic. 6.* thus write: We answer, by saying in the first place, that no Form except a *Mans* is properly made; because making is not incident save to a thing subsisting of it self. And *Ruvio Rodensis*, Lib. 1. *Phys. cap. 5. in quest.* writes thus: We deny that the form is made of the matter, or of Privation. For according to the propriety of Nature the Form is neither generated nor made, but the Compound, as Aristotle expressly teaches, Lib. 1. *Phys. text. 64.* in these words: wherefore it is manifest from what hath been said, That whatever is made, is still the Compound. And *Thomas Aquinas* in their Exposition. And this Reason proves: The making of a thing tends to the Beeing thereof. Therefore it belongs to that only to be made, which hath being: but the Form is not; but it is only said to be the cause of being to the Compound, which is properly said to be. Therefore the form

form is not made, but the Compound. Which if it be not made; ergo it is not made of the Matter, nor of Privation, but the Compound is said to be made of both, by means of the Form from which it hath its being, and whose Principles are Matter, Form, and Privation. Now to be drawn out of the Power of the Matter is not to be made of it self, but to go into act, as the cause of the Compounds Being, which of it self is generated and made. So far Ruvio.

Others contrariwise do oppose this foresaid Opinion as false and absurd. For seeing to the Constitution of every Body, Matter, and especially Form which gives the specific being, is requisite, and dayly some Individuals perish, and others are generated; of necessity the matter and form which before were not, must be made. But according to their reason which they propound without proof (viz. That neither the Matter nor the Form is made, but the Compound) nothing should be made; since of the Matter and Form the Compound consists, and the Compound is nothing but the Matter and Form. Nor to the making of any thing is a compleat Being requisite, but any Being is sufficient; and that which now is what before it was not, is justly said to be made, whether it be an incompleat Being, or a compleat and Compound. And those are words and sounds without Sense, that Forms are not produced, but comproduced, and that they are not primarily made, but by accident as it were produced upon the production of the Compound. The Compound (truly) is primarily intended in the whol Generation, but it cannot be accomplished unless all things are made which are required to its Essence and Constitution. Yea, they themselves who deny that Forms are made, forgetting themselves they say they are made, when they teach that such things as are drawn out of the power of the Matter do depend upon the matter in their being, making, and operation. Nor do they remove this doubt; but they are forced to explain whence Souls proceed; and at last they are forced to hold, That they are drawn out of the power of the Matter.

And therefore it cannot be simply denied, That Souls after their manner (for whether it be a proper manner of speaking, when Souls are said to be made, even the most learned Caspar Hofmannus, in *tr. de formarum origine*, at the beginning doubts) are made. Yet if we would speak more properly, they may rather be said to be multiplied than made, according to that vulgar Saying; Every Form hath a power to multiply it self. For those things are properly said to be made which are not at all before they be made. But that is said to be multiplied which whereas before it was one in one Individual, it now becomes manifold, and many in number. Of which I shal speak in Chap. 6.

Souls are  
rather  
multiplied  
than made

## Chap. 2. Whether Souls come from God, or from Heaven?

**A** Vicenna held, That the Souls of living things did not proceed from their Parents, but from a certain Intelligence the Giver or (as Scaliger, *Exercit. 97.* speaks) the Dis-  
penser of Forms, which he terms *Colcodea*; and he teaches, That this Heavenly Intelligence uses the Seed as an Instrument to produce the Vegetative and Sensitive Soul, which when he hath produced in a man by help of the Seed, in process of time without the help of any Instrument the Rational Soul is brought in, and into the Body informed with a Vegetative and sensitive Soul he pours in out of himself a Rational Soul, free from the commerce of Matter. And doubtless Avicenna drew this Opinion from Plato and the Platonists. For they (as may be seen out of Plato in *Epimenide & Timæo*, Marsilius Ficinus *super Lib. Platonis de Sanctitate*, and *super Timæum Platonis, cap. 37.* And Alcinous, in *Lib. de Doctrina Platonis, cap. 23.*) do hold, That Rational Souls do come from the most good and great God, and the irrational Souls from the inferior gods, which are (according to them) either the Cœlestial Bodies, or their Spirits, and moving Intelligences. But such things as are said of those Intelligences in Natural Philosophy, since they are said without any reason, they are worthily rejected by Philosophers. And if there are any Heavenly Causes at all, which make towards the Generation of things, they are remote causes, and universal, as shal by and by be said concerning the Opinion of Fernelius. And if by that first Intelligence they mean the most good and great God, this Opinion is also false. For the Question is not here concerning the Creation, but the Generation of things. But God after he once ceased from Creation, does create nothing unless it be miraculously; but he hath ordained Nature which performs the Course of Generation and Corruption, and defends and observes the same. And now indeed, God concurs as the first and universal Cause in the Generation of things.

The Souls  
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generation  
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neration of all things, but the things produced are the immediate effects of the second Causes: And God is said to be the Efficient Cause of all things, both because he first created them, and because he gave to the Second Causes the force and ability to produce their Effects. This indeed is true, That the second Causes cannot do any thing without the first, viz. Because from it all created Agents depend and have their Essence, and without the assistance whereof they could neither consist nor perform any operation; and unless the first Cause concur to the Act, the second cannot perform their operations. Yet the Second Causes do really act, and God acts in all, so as that they may work also; whence Scaliger in *Theophrast. de Causis Plant. Lib. 5. cap. 1.* writes, That Nature is the Power of God in second Causes, to which he hath prescribed certain Rules. And if the second Causes did nothing, why should there be so various a Fabrick in things created, and why are so many Vertues and activities bestowed upon them? and why cannot lifeless things perform the same Operation as living things? And therefore since in the generation of other things we do not look simply to God, but joyn also the second Causes; why should we reject them in the Generation of living things? And if Souls should proceed from God alone and immediately, like could no waies be said to generate its like, nor could that from whence the seed of a Plant or Animal is taken be termed the Parent of the new Plant or Animal, but God. And if they should say that God uses the seed as an Instrument: yet as an Instrument, viz. a Chizel cannot be called the Efficient Cause of an Image, nor the Image be said to be the effect of the Chizel: so neither can a living Creature be said to be the Off-spring or child of the seed. In a word, if any superior Cause whatsoever, by Plato and the Platonists, or by Avicenna, shall be held the Efficient Cause of Souls, there will be after this reckoning no univocal Generation; whereas nevertheless most certain it is, nor needs it any proof, That like begets its like, an Oak tree an Oak, a Horse an Horse, a Man a Man.

And what the Platonists say touching the inferior gods, if they are to be understood as the words intimate, any one may easily see that they are not only said without all reason, but void of Truth.

*Whether Souls come from Heaven?*  
*The Opinion of Fernelius.* Fernelius differs not much from them, who *Lib. 1. de abdit. rerum causis*, in many places eagerly defends that every Soul comes from the Heaven, & that the Heaven sends every Soul into matter prepared and fitted. For thus (in chap. 5. towards the end) he writes; *In the Generation of living Creatures the seed conceived is by the Vertue and benign warmth of the Womb stirred up to action, not that it might raise up out of it self a Soul, or the form of an Animal, but only that the power and faculty thereof being first stirred up and provoked, and afterwards augmented, might furnish its subject matter with all kind of preparation, that the substantial form may at last be received thereinto from without.* He propounds the same Opinion at large, chap. 7. and afterwards, chap. 10. he adds: *The Heaven (saies he) without any Seed brings forth many Plants and Animals; but Seed breeds nothing without the Heaven. The Seed does only neatly and decently prepare the Matter, the Heaven sends the form into it when it is prepared, and the chief perfection, and stirs up life in all.* And at last he concludes: *Whatsoever things God made of old in Heaven or in Earth, he alone defends and governs them all, the Heavenly things indeed by himself immediately; but living things and Plants, and other mortal Creatures, by help and assistance of the Heavens on whom he hath imposed the Procreative and Conservative Laws of Nature.* And therefore the only form of Heaven does potentially contain the forms of Live Creatures, Plants, Stones, Metals, all that ever have been or can be; and it being big as it were with innumerable forms, engenders and pours all things out of it self: the only power and faculty thereof contains in it all the faculties of mortal things which ever have been, or shall be hereafter. And these Vertues the Soul of the World shed into the whole Universe from Heaven bestows upon all things, as also their form, and native, and vital heat, fit to generate and to conserve them. It contains all things, and cherishes all things with heat and life, so that there is not any where any thing not replenished with the fulness hereof. By the vertue and means hereof both all lifeless things are by themselves, and all animated things have such a Soul as belongs to their kind, some a nourishing, others a sensitive, and others a rational. So she accommodates her self to things, so subservient she is to the Natures of each one, that she gives as much as the Nature and condition of every one desires, and as much as the preparation it self of the subject can bear. The Sun though exceeding far off; yet so bestows his light upon the bodies opposite unto him, that they are bright and shine with splendor: but Water after one manner, a Stone after another manner, Wood after another manner, Silver after another manner; Even so, much after the same manner, that Vertue also which comes down from Heaven is vital, yet so that upon some things

it bestows only a Being, to others also a Soul, and that either nourishing, sensitive, or rational: for it is not received after one manner of all. But of this also I would lastly admonish the Reader, That the said Cœlestial Vertue it self is not alwaies alike, nor does bear it self alwaies alike to sublunary things, but differently at different times, according to the manifold posture of the Stars, whose commixtion and complexion does for the most part vary, although the Substance of the Soul of the World (or carrying spirit) is unchangeably one. It cannot therefore come to pass (as one man saies) that the Soul of the World so imparts life and state to all things as that it needs not the least help of the Stars. If this were so, why I pray you should it not alwaies generate like things, and after the same manner, seeing it is alwaies alike present to things. So far Fernelius.

Now the chief Arguments whereby he endeavors to prove his Opinion are these: The first is, That of putrefying matter many Animals are bred, which since they come of no Seed, and from no Parent, he concludes their Soul comes from Heaven; and therefore since those more ignoble Animals receive their Souls from Heaven, he thinks the more nobler Creatures, as a Man and a Lyon, should much rather receive their Souls from Heaven. Secondly, seeing Aristotle writ, That a Man and the Sun beget a Man, he conceives they do not both concur after the same manner to the generation of a Man, nor that the same thing is effected by both of them; but since two things are required, the Matter and the Form, that by Man as the more imperfect nature the Matter is prepared, and the Soul sent in from Heaven. Thirdly, He disputes at large against the Education of Forms out of the power of the matter. Fourthly, He produces many things touching the nobility of the Heaven, and its action upon these lower bodies. Finally, Since the Soul is united to the Body by help of an Heavenly kind of heat and spirit, he holds the Soul it self must much rather be of a Cœlestial Original.

But in good deed this Opinion is far from the truth. For seeing that living things which are generated are of the same sort with those by which they are generated, how can this be true if the Generator do only dispose the matter to receive the Form, and do not impart the Form it self? and al living things should rather be termed the Off-spring of Heaven, than of those things by which they are generated. And though there be a consent of the upper and lower bodies, and the Heaven as an universal Cause does further the Original of things; yet it does not follow, That the Heaven gives Forms to so many several sorts of things. And what need is there to derive the Souls of things from Heaven, since God the Creator in the first Creation gave to al living things the power to multiply themselves.

Nor are those Reasons which moved him to maintain this Opinion of any strength. For in the first place, That living things Generated of themselves have their cause here below shal be shewed hereafter. Nor if there be any thing noble here below must that needs be deduced from Heaven, but living things themselves have their degree of dignity; and man the most noble of al is nobler than the Heaven. Secondly, though Aristotle wrote that the Sun and Man generates a Man; yet is not that to be otherwise understood than that the Heaven as a remote and general Cause, and Man as the immediate Cause generates a Man. Nor (as was said) is Man more ignoble than the Heaven, so that he only should prepare the Matter, and the Heaven give the Form. Thirdly, He does rightly oppose the Education of Forms out of Matter, and we shal do the same hereafter: but it does not follow, If Forms are not educed out of the Matter, that therefore they are procreated by the Heavens. For we shal hereafter demonstrate another manner of their Original. And as in the fourth place we grant the Nobility of the Heaven, and its action upon these lower bodies; yet it no waies follows therefrom that it is the Author of al Forms. Finally, although it were granted that the innate heat and spirit, which the forms of living things use as their immediate Instrument, and which may therefore be called the band of the Soul and Body, may after a sort be termed Cœlestial; yet that only does thence follow, that the Souls themselves are more noble than that spirit and inbred heat, but not that they proceed from Heaven. In a word, as Thomas Erastus, de Occult. med. propriet. Lib. 1. cap. 17. does wel write: They that dare affirm the Forms of the sorts of things are infused by the Stars will be laught at by Philosophers; and by Christians also rightly judged execrable. The Forms have received their Original not from Heaven, but from the Creator, if they wil rather beleve the History of the Creation than lying Fables. God commanded that every Species or sort of things should propagate it self by multiplication of Individuals endued with the same Faculties; he did not command the Stars either to imprint their forms or vertues on the things created.

Thus have we shewed how some without Reason have endeavored to draw the Original of the Forms of Living things from the Heavens.

Fernelius  
his Opini-  
on of the  
Original  
of Souls  
confuted.  
His Ar-  
guments.

Chap. 3. Some other Opinions of the Original of Souls reckoned up, and a vulgar Error taxed.

A twofold Generation of Living things.

Four Opinions concerning the Generation of Living things.

The Original of the soul in general to be enquired into.

Since therefore the Soul proceeds not from the Heaven and superior Causes, many grant that like begets its like. Which yet most do understand only of univocal Generation. For they hold a twofold Generation; one univocal, whereby like begets its like; the other Equivocal, where the Ingenderer is of a different nature from the thing ingendred; which they say happens in such things as are bred of themselves, and without Seed. But whether there be any such Equivocal Generation, and what the Nature of the Spontaneous Original of living things is, we shal shew hereafter in its place. It suffices in this place that in Univocal Generation so called, it is granted by most, and by all that do not draw the forms from Heaven or a superior Cause, that like engenders its like. Yet in good deed, although all agree herein; yet they differ much as touching the manner, and there are many and divers Opinions of Authors hereabouts, all which may nevertheless be (I conceive) reduced to four Tribes. For first some hold the Seed to be inanimate; who are again divided into two companies; while some hold the Seed communicated by the Generator to be only instead of matter, out of the aptitude whereof the Soul is educed by an external Agent: some say there is a formative Vertue communicated to the Seed by the Generator, and they hold that it is the shaper of the Body of the living thing; or they conceive the Generator uses the Seed as an Instrument to beget its like. But others hold that the Seed is animated; yet they are of two opinions; for some hold there is in all Seed (even that of a Man) its proper Soul; but some conceive the Soul of Man (by reason of a singular prerogative) is to be exempted, and that it comes into the Body after it is formed from without; though they themselves differ about the time when the Soul comes: Touching all which Opinions we are now to speak severally.

Howbeit the Reader must first be warned of a vulgar Error. Since all living things are what they are chiefly by their Souls, and thereby they differ from lifeless things; therefore with good reason our enquiry touching the Original of Souls must be here so ordered that it may concern all living things in general. In which thing nevertheless I see many offend, who deliver what should be said of the original of the Soul, and formation of the Body of a living thing in general, concerning a Man only, and so they offend against the Law of Demonstration, endeavoring to demonstrate the affections belonging to the whole kind of one sort only. I conceive it therefore more convenient to propound in general whatsoever may be said of the Original of living things, and of Souls in general; and afterwards to apply them particularly to Plants, Animals, and Man-kind; and what these sorts of living Creatures have peculiar, to set that down by it self.

Chap. 4. Whether Souls are drawn out of the aptitude of the Matter.

Whether Souls are drawn out of the aptitude of the matter who was the Author of the Opinion of drawing of forms out of the aptitude of the matter.

IN the first place therefore, amongst those who hold the seed to be inanimate, it is a common opinion, that all forms and consequently all Souls, except the rational soul of a man are drawn out of the aptitude of the matter. But who was the first Author of this Opinion, is not so certain. Most do indeed father it upon Aristotle; but I doubt whether it can be demonstrated from his works. Some, and amongst them *Franciscus Bonamicus*, do attribute to *Averroes* this Opinion; and some such words are found in his Books; but it many times happens, that Expositors patch many things of their own upon Authors. But whether he held what is vulgarly taught is a great question. For it is apparent, as from other places, so from 7. *Metaphys. text. 31.* That he held the Cause of the Generation of living things, or rather of the formation of a living Body, to be the form lurking in the Seed. For seeing there Aristotle compares Artificial things with Natural, and touching the Seed which is the Efficient, he saies, It makes, *Averroes* adds; the Seed generates by a power it hath like to an Artificer; because the form of the thing generated is potentially in the Seed; and that of which the Seed is agrees in name and nature with that which is any waies made of the Seed. And a little after: In the matter of things generated there is an aptitude that out of it may be bred a like thing by the power which is in the Seed.

But



But most of the Schoolmen and their followers have fiercely maintained this Opinion of the eduction of Souls out of the aptitude of the matter, and have handed it over to posterity without any clear sense, which a mind desirous of truth might conceive; so that most of them seem rather to have transcribed the words of their Masters, than to have understood the thing it self. And how indeed could they understand where there was nothing to be understood?

But whoever was the Author of this Opinion, and whatever Patrons it hath; it must by all means be weighed and considered, since many contend for it as if their life lay at the stake, and use it as an infallible Principle to decide many Controversies. Now two things these Authors do: First, they set down the reasons moving them thus to think, or rather they oppose the Opinions of others: and in the next place they endeavor to explain and declare their said Opinion.

And in the first place (truly) as appears out of *Fonseca, Comment. in 5. Met. cap. 2. quest. 4.* *Suarez, 12. Metaphys. disput. Sect. 1, 2.* *Bonamicus, Ruvius, in 1. Phys. tract. 2. quest. 1.* and others, they bring hardly any evident reasons for their own Opinion, but only endeavor to bring those that think otherwise into some absurdity; which is a very suspicious way of dealing. For it is the part of a good and Ingenuous Disputer first to prove his own Opinion with firm Reasons, afterwards to oppose the contrary. And nothing can be said so true and manifest which by contentious wits may not be called in question. I count it not worth the while to transcribe the places of Authors entire; seeing they are in the hands of all, and most of them bring nothing new, but repeat the same thing over and over again. But if any reasons may be gathered out of them, they are these:

In the first place therefore, They would prove that Forms are drawn out of the power of the Matter, because they depend upon the Matter in their making, their being, and operation. But this is to beg the Question, and there is no connexion of the major. For we grant indeed that those inseparable Forms cannot be made (or rather propagated) without the matter, and that they are, and work in, and with the matter: but it does not hence follow, that the Form is drawn out of the power of the Matter, and depends in its essence upon the matter, which is meerly passive. But the Question still remains, Whence those Forms which can neither be made, nor be, nor operate without the matter, or out of the matter, have their Original.

Secondly, Unless we hold that Forms are drawn out of the aptitude of the matter, they conceive all Generation is taken away. Which argument whether it be a direct proof, or a deduction to an absurdity, I leave to others to judge. For either (say they) the Forms are something before Generation, or they are nothing. If they were before Generation, there can be no Generation; if they are nothing there will be a Creation, and so Generation is again taken away. But this Dilemma is of no weight, nor is there any strength in either of its horns. For since they were all for the most part Divines who thus wrote, they ought to have considered what that text of Scripture imports, *Encrease and multiply*; yea, and how that axiome of Philosophers is to be understood, That every Form can multiply it self. For if they had understood that Souls can multiply themselves, they had understood withal that when any particular thing generates, a soul is not created anew, but multiplied; and that the Souls of the first Individuals of every sort, created by God at the beginning of the World, did and do suffice to propagate all the Souls of all the Individuals that ever have been, or ever shall be; and they had understood withal that when Souls which were before are multiplied, generation is not taken away, but rather established. For though the Soul were before, and only one in number; yet when it multiplies it self, and diffuses it self into more Individuals, Generation is rightly said to be made. Where notwithstanding we must presently observe when Generation is truly made. They indeed hold, when of a grain of Wheat there springs up a Wheat stalk and ear, or when a Chick comes out of an Egg, then generation is made. And it may indeed be granted, that after a sort Generation is then made. But if we would speak properly, since Generation is (as Aristotle teaches, *de respiracione, cap. 18.*) *The first communication of the nutritive Soul together with the inbred Heat*; that communication is then performed when Seed is bred and separated from the Generator: and then Plants, then Animals breed, when they communicate their Soul together with their native heat unto the Seed, and cast the same forth of themselves, but not when a Plant or Animal is produced of the Seed. Which is hereby apparent, in that when Plants spring up out of the seed the Plant that bred the seed may be destroyed, and when the Chick is hatched out of the Egg, the Cock and Hen whence that Egg came may be both dead, and so can neither communicate the Native Heat, nor the Soul. And therefore *Julius Caesar Scaliger, Exercit. 6. Sect. 10.*

Reasons  
for the E-  
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forms out  
of the ap-  
titude of  
the matter.

How  
living  
things are  
generated

whence  
generation  
of living  
things is  
truly made

The Tree engenders (saies he) when it produces Seed; but a Tree is not generated when it shoots up from the Seed; but then that which was generated and imperfect is perfected. So a Dog does not engender when the Whelps are brought forth, but when the Seed is bred.

whether  
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But when they that hold Forms are drawn out of the power or aptitude of the Matter would explain their Opinion, they variously and miserably vex themselves and trouble their Brains to no purpose; as is usual when there is nothing at the bottom; and while they endeavor to explain the matter, they rather obscure and perplex the same, as may be seen out of the Authors fore-alleaded, also from *Tolet. 1. Physic. cap. 9. qu. 19.* and *1. de generat. & corrupt. cap. 3. qu. 2.* *Benedictus Pererius, Lib. 5. Phys. cap. 22.* and others, whose words I think not fit to transcribe; and at last when they have turned this way and that way with much anxiety, at last they conclude with those words of *Aquinas, Part. 1. Quest. 90. artic. 2.* for the Form to be drawn out of the aptitude of the matter is nothing else but for a thing to become actually what it was before potentially. But whether this can satisfy a mind that hungers after Truth, I leave to the Reader to judge. Whence *Tolet. 1. de Gener. & Corrupt. cap. 3. quest. 2.* I confess (saies he) *this is a wonderful Vertue which partakes of a creating power; but it is not a creating power because it alwaies works upon subjects.* The Vertue also of the matter is wonderful, out of the aptitude whereof are brought things which are not actually. Where rather he should have admitted at their stubborn headiness, who would needs have it to be brought out of the matter which is impossible, and is neither in the power of the Matter nor of the Agent, than at the wonderful power of the Matter which is none at all. And *Benedictus Pererius, Lib. 14. cap. 9.* at the end, where he treats of the Original of Forms, and endeavors to answer some doubts, at last he concludes: *Whether these Answers are true, and whether they quite take away the difficulties proposed, I leave to the judgment and consideration of learned men: they do not (truly) quite take away my scruple, nor perfectly satisfy my mind. For they involve certain things which seem either absolutely false, or more doubtful than that whereof we now doubt; such as is, that there is an ultimum or last of Quality, which may be brought in in an instant.* And indeed they can no waies answer the doubts that are brought against their Opinion. For if you ask them, what it is to be brought out of the power of the matter? or what that power is? they answer, That it is the disposition of the matter to a certain form, that when the ordinary power of the Agent or efficient is added, a form grows and results therefrom. But when they themselves grant, that this disposition belongs to the second matter (not to the first, for that is indifferent to receive all forms, nor more determined to one than another. And if the first matter should contain all forms in its bosom, and the forms did owe their Original to the first matter, that matter were a more noble principle than the form) since one disposition is required to the form of an Oak, another to the form of a Chick, another to draw out the form of a Horse; and the same Expounders of *Aristotle* determine, that the Matter wherein such specificke forms hang, is the Elements variously mixed and disposed: it is demanded (since they hold the form is made actually, which was there before potentially) Whether it be made of nothing? or whether that same disposition and Qualities of the Matter, which are nothing but a certain temper of a mixed body, or the very form it self of the mixt Body or Elements, is changed into the form of an Oak, an Hen, or an Horse? None of which can be said without absurdity; since neither an accident can be changed into a substance, nor one form into another; nor can the forms of living things be compounded of the Elements. And which way soever that disposition to the form can be explained (since it is made successively by parts, and the last degree is of the same kind and perfection with the former) it cannot make up the act of a thing, nor give Essence to a Substance.

Absurdi-  
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follow the  
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out of the  
aptitude of  
the matter

Moreover, Neither can they produce any thing of certainty concerning the immediate and principal Efficient of that Form which they say is drawn out of the power of the matter. The matter it self being a passive principle cannot be the Efficient cause; nor the Sun, or other Stars (since they are only remote and specificke, not universal causes, as was said before, Chap. 2.) Nor the external Heat of the Air, Womb, Hen-sitting, Furnace, or any external thing whatsoever. For so a substance should be produced by an accident. Moreover, there could not be assigned a specificke Cause of a special Effect; but the same special Effect should be produced by divers Causes: as we see Plants sprout out of the Seed both by the heat of the Sun and of a Stove; and the Chickens of one Bird hatched by another Bird not of the same, but a different kind; yea, and the seeds of Silkworms are hatched in the bosom of a Damsel, as *Vida* relates in his *Poeme of the Silkworm*. Moreover by the action of  
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one Agent most different Forms should be produced. For since in the same Garden most different Plants do grow, they cannot all proceed from the same Agent, viz. The external Heat. Moreover, according to this Opinion the things generated should not have their form from the Generator, but only a disposition to the form, which afterwards of its own accord upon the action of an external Agent (as Heat for example) should spring out of the power of the matter, the Agent communicating nothing thereunto. And so according to this Opinion it cannot be said that a living thing begets its like, nor that every form does multiply it self: which yet all sound Philosophers do grant. For if the Generator should transfer nothing of its own Essence into the thing Generated, but should only determine the matter to such a like form, and afterwards the Efficient (which is not of the same kind) should make it actually to break forth; how I pray you can the form be said to multiply it self? Verily, if some Plant in the Indies when it produces Seed gives nothing but the matter with a determinate aptitude to receive a like form, out of which after a year, two, or three, the Plant it self being now burnt or putrefied, the form should break out by virtue of heat, not only of the Sun, but of the fire in a stove, as the Agent: that Plant cannot be said to have bred its like, nor that form to have multiplied it self. Nor is it enough to cause an univocal Generation, and the true production of a like Essence, to afford a matter with some proclivity and propension to receive the form. And after this reckoning the Agent heat (and that an accident) should confer more towards the Generation than the Generator it self, since it makes the form actually to arise which the Generator caused to be there only potentially. And thus it remains yet unexplained, whence the substantial and specific form of a thing, or that more excellent, more divine and chief part of a thing hath its Original. Mean while we grant that the disposition of the matter is necessary to the Generation of living things, since every matter is not fit to receive every form, but a determinate matter a determinate form: but not that the form or soul should be made out of it; but that it may be propagated thereinto, and afterwards dwell therein, as shall be said hereafter.

Fortunius Licetus: *de spont. vivent. ortu*, Lib. 1. cap. 83. endeavors to explain the Education of forms out of the power of the matter, after this manner: We say (quoth he) that the Education of the form out of the bosom of the matter is not the drawing out of that which lies hid into the open view, but the conversion of aptitude into act. For the form which is produced by the Agent only by the transmutation of the matter did potentially pre-exist therein, out of which it is brought into act. Moreover, we deny that the Form is made of nothing, and absolutely created, if it be granted that it is not made of the matter as a principle, nor out of that in which it did actually pre-exist. For in the first place, whatsoever things are truly created they are made simply of nothing, and of no subject at all; but all forms under the Soul of Man are made of nothing of their own, but not absolutely of nothing, as those things which are created; since forms are made by the agent, by a transmutation made in such a determinate subject, on which therefore the forms depend in their Being, and by which added to their Essence they are defined according to Aristotle. Again, if it were not so accidents also should be made of nothing, and most properly created: for no heat did pre-exist in the water which is made hot. But verily forms are not truly created, nor are they out of nothing of their own, but properly out of the bosom of the Matter they are drawn, and out of the aptitude thereof, because they are truly generated of some rudiment of themselves pre-existing in the matter, which rudiment of the form is perfected by the action of the Agent, and turns to a perfect Form. So far Licetus. But this is a vain put-off. For let Licetus teach us what that Rudiment of a Form is. Whether the substance of the matter it self, or some accident thereof. If the former, (to which he seems to incline when he writes that the forms are made by the agent, by a transmutation made in such a subject so determined) then the matter should be changed into Form: if the latter, an accident must be changed into a substance. Let him shew us also, that there is any rudiment and beginning of a form, since forms are indivisible, and have their Essence like numbers; and therefore where they are they are totally, or not at all. Nor does the same Fortunius Licetus explain this matter more happily, Lib. 4. *de spont. vivent. ortu*, cap. 15. where he defines the Beginning of Forms, and holds that in the matter there is pre-existing a rudiment of the future form, that the generical nature of that form remains under the opposite privation, to which the efficient cause joining the specific difference of the form is said both to constitute the form, and to further the Generation, and at once to generate a substance compounded of matter and form. But that same pre-conceived Opinion touching the education of forms out of the power of the matter seduced that man, otherwise a most diligent teacher into Nature. For no form is capable of more or less, but consists in an indivisible

The Opinion of Fortunius Licetus concerning the Education of Forms out of the aptitude of the Matter

visible point, nor can it be remitted, since remission is made by mixture of a contrary, nor is it possible that the form should first have a generical Nature, and receive the specific difference from the Efficient. And whereas *Licetus* denies those axiomes owned byal Philosophers, and saies they hold true only in compound substances, but not in simple; this he does without Reason. For since compound substances become such by reason of the simple of which they consist, if the simple substances, matter, and form, may be remitted, alio the compound might be remitted; and since the form gives being to the thing by reason of the form the compound alio should be more or less such. Nor does *Licetus* agree with himself in this point, since in the same Book, chap. 2. he writes, That those things which are said to breed of themselves are not made by an external Agent, but by an Agent which lies hid in the matter of the thing to be made, which does not generate a new form different from it self, but exhibits it self thereto for a new form, that is to say, communicates it self. Nor is there in the Soul (which is a most simple Essence) any composition of sundry Essential parts, and in such a manner, that like a Genus it might be present without a specific difference. The Soul is one most simple Essence, only furnished with sundry faculties. Nor can he shew how that remission is made. For whereas *Licetus* saies, that only an accidental remission or abatement is made by the mixture of a contrary, but not an essential, such as he holds to be in forms, is asserted without any reason; and it lies him in hand to prove, That (as he feigns) an essential remission may be made without admixture of a contrary. And which way soever he turns himself he falls into absurdities, and contradicts himself. For when he saies that that same rudiment of a form is no true form, but the generical Nature thereof, and that the kinds have an Essence really distinct from their sorts, he confounds Logical Conceptions with the Nature it self of things, or the Logical kind with the Natural. For the Logical kind is in the mind, and is by the mind abstracted from the sorts; but the Physical Genus signifies a common nature, which consists in the things themselves out of the Mind. And the Logical kind indeed may by the mind be separated from the sorts; but the Physical kind does not exist in Nature, save in its sorts, nor does the Animal exist any where save in a Man, a Lyon, a Horse, &c. And therefore it is a vain figment to say that the Generical Nature is the Rudiment of the Form, and as it were half the Form. And from this very Opinion it would follow, that like does not engender its like. For since the specific Form gives to every thing its Nature, but not the Generical; if the Generator should only afford the matter wherein the Generical form is, or a rudiment of the Form, or an half form, as *Licetus* speaks; but the external agent as Heat should introduce the specific difference; not the Generator which might die in the mean time before the external agent come should be the Parent and Author of the thing generated, but the external Agent; and that not univocal, but equivocal. Also I wonder a man so exceeding learned should defend this Doctrine of the Education of Forms, since he hath no need thereof to explain his Opinion, as holding in 1. *de sponte vivent. ortu, cap. 125.* That the seed is animated, and *Lib. 4. cap. 32.* that it is an imperfect Animal: and he holds that such things as are said to be generated of their own accord do not proceed from an external Agent, but from an Agent that lies hid within the matter, as was lately said.

The difference of a Logical & a Natural kind.

But which way soever they turn themselves, the matter comes to the same pass, that they are fain to confess, that besides the disposition of the matter there is somewhat formal in the Seed, the cause of action, and that besides the disposition of the matter there needs somewhat else by which the thing may be brought into its perfect act. And that power of which they speak they are forced at last to explain to be meant not of a passive power, but an active, which makes that that which is in the first act come to be in the second act, or in an act simply; so that that Soul which was destitute of Instruments to operate by is now furnished therewith, so that it is able to operate. Which very thing also *Aristotle* taught; when in 7. *Metaphys. cap. 9. tit. 31.* he writes: *The Seed hath the Form potentially in it self, which after a sort hath the same name with that from whence it came.* And 2. *de Generat. cap. 1.* *It is all one whether you name the Seed, or that from whence it came.* For the Sum of the business is, That that Power which *Aristotle* speaks of is formal, as later Writers phrase it, and differs not from the first act.

whether the Education of the Forms out of the aptitude of the Matter be founded on the holy Scriptures

A certain late Writer (whose Understanding is capable of nothing but what is Elementary) when he saw he could not defend the Education of Forms out of the power of the Matter by any Philosophical reason, at last he flies to the Authority of the Holy Scriptures. But he endeavors to introduce his own mind and pre-conceived Opinion into the holy Scriptures, whiles he holds, that *Moses, Gen. 1.* when he brings in God saying; *Let the Earth bring forth, let the Water bring forth the living Creature,* does assert that the Souls of Plants and

and Beasts were then by God produced, and do at this day arise from the Elementary matter. And thus therefore he explains it, that the specific Forms are not made of the Elements, inasmuch as they are the matter of the mixtion, and the convenient subjects of Forms; or that they are not made by mixture and composition of the Elements, but that the Elements concur to the generation of corruptible things as they contain an universal matter so affected, under the matters of the Elements, that out of the aptitude thereof as out of a rich and unexhaustible Treasure might be drawn and propagated to the end of the World the sorts of all things, such and so many as the most good and great God would have to exist for the accomplishment and ornament of this lower World. For since the Elements contain no matter but the first, he must needs by that universal matter understand the first matter. But who I pray you, either Philosopher or Divine, did ever so teach concerning the first Matter, especially being considered without the Forms of the Elements? Did *Aristotle* (whose Opinion he conceives this of the Education of Forms to be) know any thing of that Divine Benediction given at the first Creation? And where do we read (I pray you) in the Scriptures that God so blessed that Universal Matter? This indeed we read in the first of *Genesis*, That God once commanded that the Earth and Waters should bring forth Animals created by him; and when they being created by God were come out of the Earth and Water like a Child out of the Womb, as *Franciscus Junius* speaks in his Explication, we do not read that God again commanded that the Earth and Water should produce Plants and Animals, and that he blessed them to that intent; but thus we read, That the Earth brought forth the green Herb bearing Seed, and the Tree bearing Fruit, and each thing having seed according to its kind; and that God blessed the Fishes and Birds being created, saying; Encreate and multiply, and fill the Waters of the Sea, and let Birds multiply upon the Earth.

Chap. 5. Of the Formative Principle, and the separated Instrument.

**W**HEN other more solid Peripateticks saw these difficulties and encombrances of this Opinion, they held that the Soul indeed it self did proceed from the Generator, but not immediately. And therefore they denied that the Soul was in the Seed; yet they taught that there was a vertue therein communicated from the Generator, from whence came both the forming of the Body and the Soul of the thing generated. Of this Opinion was *Albertus Magnus*, who taught that the Generator does indeed communicate Seed, but not the Soul with the Seed, but that it only gives a vertue to the seed, by means of which (though the Generator be dead) the Seed gives a Soul to the thing generated, so that the seed which hath not the Soul in it does yet generate a living and animated thing, not of it self, but in the vertue of the Generator. For as we see in the motion of things hurled, that they are moved not by themselves, but by the force imprinted by the Thrower, although the Thrower and thing thrown are no longer together; and by the Hammer an artificial thing is made, not by its own faculty, but that of him that works with it: so by the Soul-less Seed a thing with a Soul is generated by a vertue imprinted therein by the Generator.

The Opinion of Albertus Magnus concerning the formative Faculty.

That most learned Philosopher *Jacobus Schegkius* seems to be almost of the same Opinion, who in *Lib. 1. de Plast. sem. facultat.* attributes a Formative Principle to the Seed, and teaches, That he thereby understands a substantial Form, which could be perceived by no sense, but by the mind and understanding. Howbeit, he holds that the Seed and this substantial Form are not principal but instrumental Agents, and form the animated Bodies like the Hand of an Artificer. He saies, That it is a substantial Act, separable from the substance of the first Act, which hath for its proper subject the Spermatical Humor. And again, that the Seed is an Instrumental Cause, and a certain efficient Principle, but not an efficient Material, making or generating the animated Body, and not being it self animated, but a Medium interposed betwixt that which is animated and that which is to be animated, without the information of any matter able to effect as a certain second act or energie. But unless the Opinion of *Schegkius* be so explained, that this Formative Principle is the Soul it self by which the Seed is animated, and the Seed of such or such a Creature; and that the Formative Power is a proper adjunct of the Soul, which it hath when it is in the Seed, and exercises the same when an Animal is generated; but inasmuch as there is not in the Seed actually an Organical Body which the Soul may inform, in that respect the Form may be said to be absent:

The Opinion of Jacobus Schegkius.

sent: then it cannot be admitted. For to hold a Formative Principle which is not the Soul, is rashly to multiply things more than needs. For since all the proprieties and operations of the Soul are found in, and attributed to this Formative Principle, why should it not be called the Soul? And seeing the Soul in the Seed is sufficient to perform all these operations which are attributed to the formative Principle, why should we hold that to be any other than the Soul? And *Aristotle* himself *de generat. Animal. cap. 1.* names this Principle a part of the Animal, which is forthwith in the Seed. And therefore we need not hold a Formative Principle as it were a second act of another first act, and the Vicar as it were of the Generator in the Seed, which when the motion of Generation is ceased, it self ceases. For to hold that that which made either all or some parts of the Body is perished, is an absurd thing. The same Opinion (in a manner) *Antonius Ponce Sanctacruz*, the King of Spain's Physician, holds, in *opere supra primam 1. Canon. Avicenna, & de Hippoc. Philosophia*, as he is cited by *Fienus* in his Apology. For he holds the Seed to be only an Instrument. But when he easily perceived many absurdities would follow if the Seed should be counted simply as an Instrument, he distinguishes betwixt an Instrument conjoyned and separate. And he conceives that the necessity of this distinction is taken from the diversity of the perfection of Agents, and the Nature of the Order of things. For some operate with a Medium and without a Medium as living things; others of an inferior Rank have not so great perfection, and they work by themselves. He tells us therefore that separate Instruments do work by a permanent Vertue which they have received from the Agent; but the conjoyned Instruments do successively receive the Vertue of the Agent, and therefore operate with dependence upon the first principal Agent. He explains the Nature of a separate Instrument by an Example political. For a King or some Potentate operates in far distant places as if he were present, by power derived from himself, which he confers upon the Laws and Judges: but private men that live only for themselves must operate by themselves. He brings afterward another example wherby he would prove his Opinion, viz. Of Watches, Clocks, and Engines wherein many Wheels are orderly moved in the absence of the Workman, yet by a vertue imprinted upon them by the first direction of the Artist. The Nature of conjoyned Instruments he explains by the similitude of a Saw, which lying still hath such a disposition that it may receive motion in order to cutting; yet is it not an acting Instrument till it receive guidance to motion and cutting from the Sawyer. That there is a separate Instrument he also proves by the motion of hurling. For a stone hurled will fly, though the thrower should presently fall down dead. And so he holds it is in the matter of Seed, how that Animals Generate their Seed being cast out of them, a derivative vertue continually remaining therein, that it can work, and does actually work without any actual Influx from the Generator.

This Opinion refuted.

But this Opinion however explained and palliated is false and far from truth. For *Aristotle* himself, 7. *Metaphys. c. 9. t. 31.* reckons the Seed amongst univocal Agents. But all univocal Agents are not instrumental but principal Causes. Again, all Instruments properly so called are joyned with the principal Agent, and as *Schegkius* himself speaks, an Instrument of it self hath no Efficacy, but only by the Use of the Principal Cause.

There is no separate Instrument which acts by it self.

And those things which are brought by *Antonius Ponce* concerning a separate Instrument (unless rightly explained) are false and feigned without reason, and therefore are not to be accounted a Metaphysical Principle, as he gives them out to be. Indeed the Seed might be called a separate Instrument, viz. Inasmuch as the Seed is not necessarily joyned with the Generator, but is subordinate thereunto, and hath received from the Generator the same power, yea, and the same Soul which the Generator it self hath. But while he denies the Soul to be in the Seed, he labors in vain when he calls the Seed a separate Instrument. For although while an Instrument is not employed it may be really separated from the principal Agent, as a Pencil from a Painter, an Ax from a Carpenter, a Pen from a Writer: yet no Instrument can be named which in the action it self operates by a power within it self (for so it should be a principal Agent, not an Instrumental) but every Instrument in its operation hath no power of it self, but it depends upon, and is directed in its action by the Principal Agent, and when it is separated it can no longer work by it self.

The first & second Act of an Instrument

We must therefore distinguish betwixt the first and second act of an Instrument. That any thing may be an Instrument in the first act, it is sufficient that it be shaped and fitted as an Instrument for some particular action. An Iron Hammer in regard of its hardness, heaviness, and shape, is an Instrument fit to beat Gold and other Metals, and to figure and form them into some certain shape; but this is only in the first act. For an Hammer thus shaped wil

wil never of it self beat out any metal, but the presence and motion of the Artificer is necessary to dilate the same, and then the Hammer is an Instrument *actu secundo*, by the second act. So native heat is an Instrument whereby Nature digests Chyle, and forms Blood, Flesh, and Bones. But the heat cannot perform this, unless the soul which is the principal Instrument concur. And it is the nature of an Instrument to act above its own abilities, and to produce an effect more noble than it self, viz. inasmuch as it is directed and moved by the principal Cause: which while it so directs and moves does not imprint any virtue upon the Instrument, by which it may perform that Action which belongs to the principal Agent. For neither does the Artist necessarily make his Instruments, but he receives them made to his hand, either by Nature or Art, and he makes use of them being by Nature or Art fitted to his turn, as may be seen in the Saw used by the Joyner, which he had of the Smith, and in the Cole or Chalk which the Painter uses. And therefore that political example of a King working a great way off by Laws and Judges, as a moral Instance, does not square with things natural. And the subordinate Judges are rather Ministers than Instruments of the supreme Judg, nor do they act by any Physical Virtue communicated. For neither do Instruments properly so called perform the work of the principal cause as its Vicars or Substitutes, so as to perform the same action with the principal Cause, though after a manner derived and communicated from the said principal Cause; but they are only Con-causes and Co-workers, and unless the Artist did work they should do nothing; and when the motion of the principal Agent ceases, they also cease from their action.

An Instrument directed by the principal Cause acts beyond its own Ability.

As to the example about the motion and impulse of things hurled, it does not sufficiently prove the force impressed upon Instruments. For after what manner that motion of things hurled is caused, is not sufficiently manifest, and much controverted amongst Philosophers. It is most likely that this motion is made by the Air, or through means of the Air, and by the force of the throw. For no man could yet ever tel what that virtue is impressed by the Thrower, & how it can be imprinted by the local motion of the Arm, sometimes immediately, otherwhiles mediately as by a Sling where it sticks; how again it is so suddainly lost and destroyed. And there are doubts lets more absurdities which follow this Opinion, and therefore it cannot be allowed to confirm the received Virtue of a separated Instrument.

The Cause of the Motion of things hurled.

And as to those examples of artificial Engines, as Clocks, Watches, Water-works; these things are artificial, in which the motive faculty it self, which is wholly natural, is not communicated by Art to those Engines, as appears by the weights hung on by the spring: but that motion is directed by Wheels artificially made. But it is far otherwise with natural Agents.

Some do yet endeavor to declare the nature of a separate Instrument by the Example of a red hot Iron, which sets Tow on fire. For they say, the Heat of the Iron doth produce fire Instrumentally, by virtue of that fire which heated the Iron, and it acts now as its Instrument, no longer conjoynd, but separate therefrom. For that fire which heated the Iron may now be extinguished and put out. But in good truth the hot Iron does not set the Tow on fire by a power communicated from the absent fire, but by the fire which is in the hot Iron having by its smal Atomes insinuated it self.

And therefore these are words under which no truth is contained, that the principal Agent transmits its action by a virtue derived from it self: but the whole nature of an Instrument consists herein, as hath been said, that it produces an effect more noble than it self, and that not like it self, but the Artificer. And this is the common Condition of every Instrument. And therefore an Instrument cannot be divided into a conjoynd Instrument, which acts and operates by something participated in a successive being; and a separate Instrument which acts by somewhat participated inherent therein. For it is the nature of every Instrument to operate by somewhat participated from the principal Agent in a successive being. And as soon as that successive Influx of the principal cause ceases, that whole instrumental action ceases also: but that which acts and operates by some participated vertue inherent in it self is not an Instrument, but operates now as a principal Agent; nor does it act above its own ability, which is essential for an Instrument to do. In a word, that Agent whose Effect answers and is equal to a vertue formally inherent in it self, is a principal, not an Instrumental Agent; nor is there any Agent in Nature which receives vertue from another thing permanently inherent in it self after the manner of an Instrument, or which acts by a vertue communicated thereto, and permanently inherent in it self as an Agent *wherewith*; but every thing that so acts, acts as the Agent *which*, as the most learned *Pienus* rightly speaks to this point. And therefore the Seed also sent forth by a Plant or Animal, because by an implanted Vertue though it be no longer governed by another thing it can shape the body of a

wherein the nature of an Instrument consists.

Plans

Plant or Animal, is no Instrumental Agent, because it acts not as an Instrument; but a principal Agent, because it acts as a principal Cause. Now that this Vertue cannot flow from any thing but the Soul implanted in the Seed shall be proved hereafter.

Chap. 6. *That the Seed hath the Soul in it, and that the Soul in the seed shapes the Living Body.*

That the  
Seed is  
animated.

ALL which things when the diligent Searchers of Nature had considered, and knew that all things which were made by Nature or Art were made by that which actually is, and that whatsoever moves ought to have an actual Being, nor were ignorant that a thing unanimated could not be the principal Cause of an animated Body, but that a thing animated was produced by that which is animated as the principal Cause, and that such noble actions they saw could not be attributed to an accident alone, not governed by the Soul, nor present therewith: they concluded rightly that the Seed it self is animated, and hath a Soul in it. Nor is this Opinion first sprung up in this Age; and therefore it is falsely traduced and opposed by some as a new Opinion: but the most excellent Philosophers and Physicians of all Ages have maintained the same; Hippocrates, *Lib. de Diata*; Plato in his *Timaeus*; Aristotle, 2. *de generat. animal. cap. 1. & 3.* (save that he saies the Mind comes from without) Galen, 1. *de sem. cap. 7. & Lib. de marasmo, cap. 1.* Themistius, 2. *de Anima, text. 6.* Philoponus, Zimara, 2. *de Anima, text. 43.* Jacobus Foroliviensis, 2. *in Art. Medic. quest. 38.* Jul. Cas. Scaliger, *Exercitat. 6.* Cardanus, 2. *Contradict. tr. 6. Contrad. 17.* Argentarius in *Artem parvam, tit. de Temperam.* Thomas a Vega, *super Artem parvam, cap. 47.* Christoph. a Vega, *Art. med. Lib. 1. cap. 3.* Volcherus Coiter, *Lib. 2. controvers. cap. 9.* Zabarella, *de Anima facult. cap. 11.* Mercatus, *Lib. 1. part. 4. class. 1. quest. 98.* Capivaccius, *Lib. de foet. format.* Joubertus, *in cap. 5. Lib. 1. Galeni de facult. natural.* Archangelus Piccolhomineus, *Lib. 1. Praelect. Anatom. praelect. 3.* Fortunius Licetus every where in his Books *de spontaneo Viventium ortu.*

Authors  
who hold  
the seed to  
be anima-  
ted.

And although (as was said before, Chap. 3.) Authors are here of two Opinions, whiles some say the Souls of all Living things are communicated by the Generators in the Seed, and others except the Humane Soul: yet it will be sufficient if it can be proved in general of Plants and Animals; but whether or no the same Reasons hold good in the generation of Man, and whether the Generation of Man have any thing peculiar, we shall consider in the last place.

What is  
the Nature  
of the seed

And for our better proceeding we must first say something of the Nature of Seed, and that not as the common fashion is, of the Seed of Man, but in general of all Seed, inasmuch as Plants and Animals are propagated thereby. Touching the Nature indeed of Seed there are divers Opinions of Authors, and most hold that it is an Excrement. For they say that Seed being a thing according to Nature, is either a part of the Body, or an Aliment, or an Excrement of an Aliment. That it is no part properly so called, nor an Aliment of the Body, it is so manifest that there needs no enquiry thereabouts. Therefore they conceive it remains that it must be an Excrement. And therefore they say that the Seed is the remainder of that Blood which is distributed into all the parts of the Body, and can nourish all parts; and because it is voided forth they say it is an Excrement. But this reasoning offends against the Laws of Demonstration; since Seed is bred not only in Animals of Blood, but in Plants without Blood; and though the Seed which in Animals is voided forth may in some sort be called an Excrement, yet this does not betide all Seed, viz. the Seed of Plants. Moreover, the Seed of Animals is not only the superfluity of Blood, which therefore because it is superfluous (as the Menstruous Blood is an Excrement) it ought to be expelled, but by a primary Intention of Nature, as a thing most necessary it is made of the best Blood by the Sperm-making Faculty. And therefore in the foregoing Argument there is an insufficient Enumeration, and besides the Part, the Aliment, the Excrement, there is a fourth, viz. the Fruit. For the Seed is the Fruit of a living Creature brought forth to that end that its like may thereby be engendred. And therefore Epicurus (as Plutarch hath it, *de Placitis Philosophor.*) called it an abstract of the Body and Soul, and as the Author of Medicinal definitions relates, Zeno Citicus defined the Seed after this manner. The Seed is the Abstract of a Man, and a Mixture of the Nature of his Progenitors, which a man transmits with the moist part of his Soul; being such a thing as that from whence it was voided. Yea, and the holy Scriptures teach, That the Earth by the Divine Benediction brought forth the Herb seeding Seed, the Fruit-tree bearing Fruit, and every thing having its seed in it self, according



according to its kind; where the Fruit and the Seed are one and the same thing. And if any man esteem more of the Authority of *Aristotle* in this point than of the holy Scriptures, let him consult with *Aristotle*, who in 1. *de Generat. Animal. cap. 18.* writes, That the Fruit is either the Seed, or that which contains the Seed in it. And since it is manifest in Plants, as also in Fishes and Birds, that the Seed is not simply an Excrement, but somewhat produced by the Generator, which hath its own peculiar Quantity, Figure, and Conformation; why should the Seed be counted an Excrement in other Animals, although it be voided in a liquid and fluid Form; since the same proceeds from it which proceeds from the Seed of Plants, Fishes, and Birds.

But if you wil cal the Seed before it goes away and is separated from the Generator a part of the Animal, you shal commit no absurdity. For (which is chiefly manifest in Plants) it both cleaves unto the whol Body, and is informed by the same Soul whereby the whol Body is informed. Yet because it is generated to that end, not that the Generator may be thereby constituted, but that it may be separated from the whol, I conceive it may more fitly be called the Fruit.

Seed therefore as it belongs to al living Bodies is a Body formed by the Generator, full <sup>what Seed</sup> of inbred heat, profitable to propagate any sort of Soul; or, it is a Body produced by the Generator, out of which a living Body arises of the same sort with that from whence it came. And indeed in the Seed of Plants that same innate Heat is in an Oylly and Fatty Form, and hardly in any part of the Plant is there more Oyl than in the Seed: which appears at least hereby, in that from the Seeds of Plants a great quantity of Oyl may be stilled and pressed; as is manifest in Line-feed, Poppy-feed, Hemp-feed, Juniper Berries, Almonds, and other such like. In such Animals as breed Eggs 'tis represented in the form of an Egg: in such Creatures as bring forth live yong ones the innate Heat is in a spirituous form, and therefore it easily exhales and is dissipated, unless it be presently received or conceived by the Womb, and cherished by the warmth thereof.

Here nevertheless it is to be observed that the name of Seed is taken, sometimes more largely, other whiles more strictly. The Seed is largely taken for al that Body which serves for the propagation and generation of a living Creature. But strictly taken it is a most simple substance, or a certain spirit in which the Soul and Formative Faculty is immediately seated; and containing in it self the Idea or Model of that Organical Body from which it is taken, and therefore having in it the Power to Form a Body like to that from whence it was taken, and to perfect it self into an Individual of the same sort with the Generator.

Now the Seed consists of two Substances, the Matter, and the Form. The Matter is that same Body or bulk of the Seed, which is various in different Creatures, and of another kind in Plants, and variously distinguished by the admirable wisdom of the Creator, according to the Nature of every sort of living thing; of one fashion in Fishes, another in Birds, another in other Animals. And that matter again consists of two parts, of which one is a thick substance, another spiritual, or (as *Aristotle* saies) a Spirit and Nature answerable to the Element of the Stars. And the Spermatick Faculty is as the Form being the Original of motion, and which hath so great a power, that *Plutarch*, (*de Commun. Notionib.*) saies of the Seed, that it is more magnificent and great than that from whence it came, and of which it was bred; and that which *Aristotle* saies in general of Principles, 5. *de generat. Animal. cap. 7.* is chiefly true of the Seed, viz. That Principles though smal in bulk, yet are exceeding great in faculty and ability. Which power of the Seed *Seneca* also admires, *Lib. 2. Quest. nat. cap. 6.* Let us consider (saies he) what a mighty power smal Seeds do secretly put forth; and those whose smalness doth hardly take up any room betwixt the joyning of two stones, they grow so strong as to draw asunder huge stones, and dissolve the Monuments of the dead. And *Gregory the Great*, in his 26. Homily upon the *Evangelists*, writes excellently of the wonderful nature of Seed: Behold! in one grain of the smallest Seed lies the whol bulk of the Tree that shal spring therefrom. For let us set before our eyes the greatness of a Tree, and think with our selves what original it had which is grown so great; we shal doubtless find its original to have been a smal Seed. And now let us consider where (in so smal a grain) lies the strength of the Wood, the roughness of the Bark, the greatness of the cast and smel, the plenty of Fruits, the greenness of Leaves. For if you feel a grain of Seed it is not firm or hard, whence then comes the hardness of the Wood? it is not tough, whence then came the roughness of the Bark? it is not savory, whence then is the tast of the Fruits? It hath no smel, and how then came the Fruits to be so fragrant? It hath no greenness in it, whence then proceed the greenness of the Leaves? All these therefore lie hid in the Seed at

one and the same time; yet are they not produced out of the Seed all at once. For out of the Seed the Root is produced; out of the Root sprouts a Branch, out of the Branch grows Fruit, and out of the Fruit is produced Seed again. Let us therefore add that the Seed also lies hid in the Seed.

Hence therefore some do not unfitly term the Souls Idea's or Patterns, because in them as in a Prototype, the Nature and Fabrick of all Visible Bodies which they form and shape, and of all accidents which they produce in their Bodies, is comprehended.

But that the Principal part of the Seed is the Soul, and that therefore the Seed is animated, shall be anon proved by firm Arguments, wherewith a mind desirous of Truth may be satisfied. But because I see that most men now a days do not regard so much what is true as what is old, it were worth the while to alleadg the Authorities of ancient Philosophers and Physitians; but we have done that already in the beginning of this Chapter. Also the Authorities of Divines (both Greek and Latins) might be produced; but because most of them speak only of the Soul of Man; of which we shall speak hereafter, it shall suffice in this place to alleadg only the Authority of Aristotle, who 2. de Generat. Animal. c. 1. thus writes: *All things whatever are made by Nature or by Art are made by that which is actually out of that which is potentially such or such. The Seed therefore is such a thing as hath such a Motion and Principle in it self that the motion being finished every part exists, and each part also is animated.* And in 2. Phys. cap. 3. text. 31. *The Seed, and the Physitian, and he that advises with him, and every Efficient, are all of them Causes, whence there is a Principle of Mutation, Rest, or Motion.* And more such like places Scaliger produces, Exercit. 6. Sect. 7. Also consider what follows, out of which it manifestly appears that though Aristotle saies the Soul is potentially in the Seed, yet that he holds it is really there. Which appears by the example of a Geometrician sleeping, waking, contemplating, which he makes use of. For as the Geometrician sleeping and waking hath the power to contemplate, the former a remote power, the latter a nearer power, each of which notwithstanding presupposes an Act, such as is not in all men, but only in a Geometrician; so in a Tree (for examples sake) in the Winter time when it grows not there is a near power to grow, because it hath Organs necessary to cause it to grow already perfect: but in the Seed there is a remote power, because it is as yet destitute of Organs; yet each power presupposes an act, and neither the Seed nor the Tree could be called potentially such, unless the Soul were present.

What Soul  
is in the  
Seed.

But it is demanded, What Soul is in the Seed? Aristotle indeed saies, That the Generation of a living thing is the participation of the first Nutritive Soul with the inbred heat. And in 2. de generat. animal. cap. 3. he writes, That a Man lives first the life of a Plant, then of an Animal, and lastly of a Man. But this is not so to be understood as if three Souls came at distinct times. For every living thing (even according to Aristotle) hath but one Soul, whereby it is that which it is. And therefore in all seed whatever there is presently the whole Soul, which nevertheless does at first form the Instruments necessary for Nutrition; which because it is chiefly and almost only conspicuous in Plants; a man is said to live first the life of a Plant. Afterwards in process of time the Instruments both of Sense and Motion are formed in Animals; which being perfected, a Man is then said to live the life of an Animal, and of a Man. For neither (as I also shewed in Lib. 6. Physica, cap. 1.) the Vegetative and Sensitive, or the Vegetative, Sensitive, and Rational, are peculiar and general Forms or three Essences, but only general Conceptions arising and constituted from the comparison and agreement of living things, which exist no where separated save in the Mind of Man; nor is the Nature of any Plant perfected only by the Vegetative Faculty, but every Plant hath a specifick Form, endued with a vegetative power indeed, but yet with other Faculties also.

This Opinion of Aristotle. (and indeed the very Truth) concerning the presence of the Soul in the Seed most excellent Philosophers and Physitians of all Ages have acknowledged, whom I cited in the beginning of this Chapter, and especially Julius Caesar Scaliger, Exercit. 6. Sect. 7. et sequent, and amongst later Writers, the most learned Fortunius Licetus, (who as elsewhere, so in Lib. 4. de spont. vivent. ortu, cap. 32. propounding as it were the Sum of what he had taught elsewhere) writes, That the Seed is an imperfect Animal, and that a Lyon and the Seed of a Lyon are Univocals, and have the same Soul for their Essential Form, and differ only in the Organization of their Bodies; and Lib. 1. cap. 74. That the Father then truly generates when he casts out his Seed, his Soul being parted by partition of its subject, and of one being made two; and that which remains in the Seed being cherished by the temper of the Womb and obtaining a fit matter exercises its Faculties thereupon,

upon, and forms it self a body fitted with those Organs it stands in need of, to perform the other operations of life: so that the seed is an Animal and living, only wanting a multitude of Organs; and the Fathers generation is not performed in the Womb after the Fathers death, but when he issues out his Seed.

But I wil not contend only by Authorities, nor is it fitting to begin the proof of this point from the Generation of Man, since that were contrary to the Laws of demonstration. For some do not a little involve this point with obscurities, when they dispute whether the seed be animated, nor sufficiently explaining their mind, whether they understand the Seed of Man, of brute Beasts, or of Plants; [or when they cannot satisfie themselves, but remain doubtful, they affect obscurity on purpose that others may not easily understand what they think. Lest therefore any doubt may remain in a matter so serious, by a Living thing we understand a substance wherein there is a Soul actually, and our Question is whether the seed be such a substance] which they ought by any means to have declared. For there are some who wil not grant that any seed is actually animated; others that the seeds of Plants indeed are animated, but they deny the seed of animals especially of Man to be actually animated. But I conceive it most probable that al seed is animated. And therefore we undertake to prove in general concerning all living things, that their seeds are animated. Now those most evident and firm and hitherto unanswered reasons which have induced most renowned Men to be of this Opinion, are these. The first is this, that the operations of the soul are most manifestly discerned in the seed. For it is a maxim granted by all Philosophers; every thing that moves is actually in Being. And these three follow one another necessarily; to be, to be able, to operate. And therefore Operations bring us to a power, and a power to an Essence. For such powers do flow from the very Essence of the soul, and they are inseparable from the soul, nor do they pass from one subject to another. And as *Fienus* speaks well, it is so absurd as nothing can be imagined more absurd, to hold that conformation, as also nutrition and augmentation, which begin with the soul it self, do flow from a Principle which is not vital. Nor can a vital power communicate its Virtue to another thing which is not vital. Since therefore the operations of the soul appear in the seed, we do thence rightly and necessarily conclude, that there is therein a soul furnished with the powers to exercise these operations. Now that the seed hath Motion and Action is as manifest as that which is most manifest, and so often inculcated by *Aristotle*, when he calls the seed the Beginning of generation and Motion (1. *de generat. Animal.* 2. § 21.) and the Beginning of the Form or Species, which works the Menstrual Blood into its own proper shape. 1. *De generat.* 20. and 4. *de generat.* 1.

Now there are two operations in the seed which bring us most certainly to the knowledge of the soul lying hid, viz. The quickening of the seed and Conception; and afterwards the shaping of all the parts necessary for the performance of the vital actions. For in the first place, every seed (as is manifest in Plants) is preserved by its own soul, and for a certain season remains fruitful, some the space of a year, others two years or more according to the difference of sorts; and as long as it is perfect and uncorrupted, and hath gotten a fitting place, present nutriment and external heat to excite the same, it is apt to grow up into a Plant of its own kind. It seems indeed an absurdity to *Libavius* and some others, that grains of Wheat lying in the Corn-loft should actually live, but he shews no reason why it should be absurd. Contrarily it is more agreeable to reason that seeds should live. For although in the seeds of Plants there is no motion apparent to the sense: yet the soul lying hid within is not idle, but it vivifies the seed: after the same manner as in Trees in the Winter time no action appears to sense, and yet they are not destitute of their soul, but are enlivened by the same concealed within them, which in the spring time by manifest actions does again discover it self; and the same happens in seeds. For Seeds whiles they live are fruitful and fit to be sowed; but those which are dead are not fit to be sowed, nor wil any Plant spring from them. And if seeds were not alive, whence comes it to pass I pray you that being only moistened and cherished by Heat they presently begin to sprout?

The second operation is the forming and shaping of the living Body: an admirable work truly, and wherein as (*Galen* speaks) there appears the greatest Art and Wisdom imaginable. For if there be any work in nature admirable, and wherein we must be fain to acknowledge our own Ignorance and to admire the infinite Wisdom and Power of the Creator, it is the shaping of the Child in the Womb, the Chick in the Egg, and the Body of a Plant out of the seed thereof. For who does not admire that the Bodies of Plants and Animals are so artificially framed, and in respect of Magnitude, Number, Figure, Order, Scituation, Colour, Smel, and other things, so formed, as to transcend all the Art and Industry of all the Artificers

*'Tis proved that Seed is animated.*

*The Operations of the Seed. The first Vivification.*

*The Second, the shaping of the Body.*

in the World? Hippocrates truly every where, especially in *Lib. de Alimentis, de Corde, de Articulis, in epidemiis*, calls Nature most Sagacious, most Just, most Artful, most Provident, most Discreet. Aristotle compares her to a prudent Houſe-holder rightly manning all things, who in generation makes nothing superfluous, nor omits any thing necessary, changes nothing, nor produces any thing sooner or later than need requires, does nothing in vain; so that there is no member in a living body but hath its action, nor is there any action which wants its member or Instrument. And *1. de part. Animal. ch. last*, he admires the Wisdom and Power of Nature even in the meanest things. Galen also in his *16. de Usu partium, ch. 1.* does teach that distributive justice is in nature very eminent, and in *15. de Usu partium, chap. 1.* that Mans words cannot express the wisdom of Nature; and in the same Book, *ch. 7.* he saies that Nature is more skilful than the skilfullest Artist. Which in *17. de Usu partium, cap. 6.* he proves by example of Phidias, who though he had with such admirable workmanship engraven in a Ring Phaeton in his Chariot with four Horses, that the parts of the four Horses might be discerned distinct one from another, and the sixteen Feet of the Horses were visible: yet the workmanship of nature in the Thigh of a Gnat is more admirable than that of Phidias, in all those members of the four Horses. For besides the Articulation, there is found therein a faculty to move, nourish, and grow. And how great the Wisdom and Power of Nature is, even a Plant the lowest sort of living things does sufficiently shew; in which there is so much variety and beauty, in figure, colour, scituation, that no man can sufficiently admire, much less imitate the same. And from the Praises of Nature Galen fitly raises himself in many places to praise the God of Nature; and no Philosopher is more large in setting forth the praise of God, and all his Books of the use of the Parts of the Body (as himself saies) are nothing but an Hymne in Praise of the Admirable works of God. But especially *Lib. 3. de Usu part. cap. 10.* he writes excellently indeed; But truly (saies he) if I shou'd speak any more of these kind of Cattel, men better minded might justly be offended at me perhaps, and say that I defiled that sacred discourse which I frame as a true Hymne in praise of our Maker, and I conceive that herein is true Piety, not to Sacrifice to him many hundreds of Oxen, or to burn Cassia Lignea and a thousand other sweet perfumes and Oynments, But if I first know my self, and then declare to others what his Wisdom is, his Virtue and Goodness. For in that he would adorn all things with convenient furniture, and suffer nothing to be deprived of his benefits that I count as a token of most perfect Goodness; and in this respect his Goodness must be celebrated by us with Hymnes. But to have invented all this, how and after what manner every thing should be adorned, is a point of the highest Wisdom; and to have been able to bring to pass all that he pleased, is an argument of an invincible and unconquerable Virtue and Power. Thou must not therefore so admire the Sun, Moon, and universal order of the other Stars, being so exceeding artificially marshalled & disposed; nor let their Greatness, Beauty, perpetual Motion, or so certainly described Circuits render thee so astonished as to think these sublunary things mean in comparison, and void of all ornament. For here also you shal find a like Wisdom, Power, and Providence. For do but consider the matter whereof every thing is made, and do not vainly persuade thy self, that of menstrual Blood and Seed an immortal Creature could be made, or one that is impassible, or alwaies movable, or as bright and fair as the Sun. But as you estimate the Art of Phidias, so consider the Art of the Maker of all things. But you may perhaps be astonished at the wonderful Ornaments of the Statue of Jupiter Olympius, the bright Ivory, the store of Gold, the largeness of the whole Image. But if you should see such an one of Clay, you wil pass by the same it may be with contempt. But so wil not an Artist do nor one that is able to judge of the works of Art, but he praises Phidias as much, if he see his workmanship in common Wood, or Wax, or Clay. For a vulgar and unskilful Eye is astonished at the richness of the matter, but an Artist is only amazed at the Beauty of the workmanship. Come on therefore, be thou a skilful Naturalist, that we may not term thee a rude Plebeian but a true Philosopher. Leave the difference of matters, and consider the bare Art it self. When thou observest the Fabrick of the Eye, think that it is the Instrument of Seeing, and when thou viewest the Foot, think that it is the Organ of Walking. But if thou thinkest of Eyes made of the substance of the Sun, and of Feet made of pure Gold, thou forgettest the matter which is Bones, and Skin, and Flesh, whereof they are made. Remembering that therefore consider whether light be an Heavenly Substance, or an Earthly Slime: for so give me leave to call the Mothers Blood flowing into the Womb. As therefore if you give Phidias Clay to make an Image of, you wil never require of him an Ivory Statue; after the same manner having given Blood to the Work-master, you cannot receive from him a Sun, or a Moon, or such a bright and beautiful Body. For those Bodies are divine and Heavenly, and we but Statues or Images of Clay, and yet the Art of the Work-master is equal in both. So far Galen.

Galen  
sings an  
Hymne to  
God the  
Creator.

Yea, and this Work can hardly be sufficiently admired, concerning which *Franciscus Titelmannus* writes excellently and piously, *Lib. 8. Physic. c. 11.* (I will give you the whol place) and thus he saies. Is it not superadmirable that of a smal Seed (taken from some Herb or Tree) cast into the Earth, a green Herb should spring up, or a Tree, and that the same in proceß of time drawing its nourishment out of the bowels of the Earth should joyn to itself its just quantity, and fit all its parts according to the condition of its own Nature, with so beautiful a variety, so comely a disposition, and so admirable an order that the wit of Man is not able to comprehend the Workmanship that is in one smal Herb? For consider as a Tree grows up from the Seed, how it sends its Roots into the Earth beneath, and fixes them so fast, makes them stick so close in the bowels of the Earth that after a little time it can hardly be stirred or plucked up without great violence; how it sends its Stock and Trunk upwards, which outwardly it cloaths with Bark as with a Coat, against the inclemency of the Air, and the injuries of cold and heat. And in the inmost part the marrow is placed, and round about Veins great and smal are dispersed through the body of the whol Trunk; and they in an admirable order springing, the lesser from the greater, through which all parts draw nourishment to themselves. And in the upper part how wonderfully do the Leaves spring out of the Branches, wherein also we behold a wonderful Connexion of Veins and Arteries. Also the Leaves have all the same shape, the same smoothness or roughness, a like longitude and latitude well-neer, the same color, tast, and smel; and in every respect Trees of the same kind are exceedingly one like another. I pass over the beauty of the Flowers, the sweetness of the Fruits, and in both a wonderful Artifice And all these Originally spring from the Vertue of one Seed. And in the Seed likewise of a living thing, and consequently of a Man (out of which the Child grows as to its Body) is not that alone exceeding wonderful, that by reason of the Vertue which is in so exceeding vile altogether deformed and filthy matter, such a decency of Members, so beautiful a composition, so convenient an order, so effectual a disposition of Members, so rare a conjunction of parts should arise? namely, That beneath a broad part should be shaped upon which the whol body might firmly stand, and move from place to place; the extreame part whereof should have a manifold division, so that the matter should be carved as it were into particles, viz. That the Feet should have Toes, and that these parts again should have such an order that that which is in the first place should be longer and thicker than the rest, and so to proceed gradually, as that the last Toe is of all the smallest and the shortest. Likewise, That these parts at the end of the foot should be so regularly and generally five in number, that he is counted for a Monster that hath six. Also that each of these parts hath its joynts wherein they may be bowed, and the first and greatest hath only one joynt in the middle, the rest every one two. And all these things are manifestly apparent in the composition of the Foot and Hand to him that shall look no further than the out side. And in the uppermost Part of the Body, how there is framed with rare Artifice a round part, which is covered above with the Skull, of so hard and indissolvable a boney substance that lying many yeers together in the Earth it cannot be consumed. Which Skul is covered with flesh and skin, whence flow the Hairs which cloath the part all over. But under this Skul is formed a certain noble and most tender substance which we term the Brain, and that in several parts variously formed that it might be a fit receptacle for divers Vertues, and the Organ of sundry noble Operations. In which upper round part the Eyes also are placed, beautifully formed in their sockets, yet so as they might be most readily moved, which also have their Eyelids and Eyebrows. Under these the Nostrils, and on the sides the Ears; and under the Nostrils the Mouth-hole to receive the Meat, and round about the Jaw-bones full of Teeth; the foremost of which at the entrance are thin and sharp to cut and mince the Meat, but the hinder are more than twice as thick, which like Mill-stones grind what the other hath cut into smal particles, in which regard they are also called Grinders. But on the back-side of the Head all is shut up, and no opening to be seen: but there are strong Nerves, and wonderful Joynts which fasten the Head (the upmost part) to the Shoulders beneath; so that though the Head do not touch the Shoulders, yet it is beautifully supported by them without burden by interposition of the Neck. And hence from the Shoulders (as it were two Boughs) the Arms are stretched out for the performance of any work, which in the middest (namely the Elbow) are made to bend, and have their utmost parts orderly divided into Fingers, as was said before of the Feet. Moreover that same most noble member the Heart is so wonderfully seated in the middest of the Body, having the Lungs placed round about to fan and temper its heat, drawing the Air continually in by their respiration like a pair of Bellows, and so tempering its Heat: also having the  
Liver

Liver its neighbor the Work-house of Blood; and the Stomach as the Cook of the whole Body, receiving the Nourishment of the whole: also the Spleen, the Kidneys, the Guts, all wonderfully knit together and rowled about. That all these things, I say, which we have only touched at, and other things hid within much more wonderful, should be so orderly, so perpetually shaped in the Body of a Man, yea, or of another Creature, by the power and vertue of so vile a substance as the Seed, who can chuse but count this the greatest miracle in the World? Had not the Psalmist reason to say to the O Lord, thy Knowledge is made wonderful in me, and strengthened, and I cannot attain there unto? And have not we had reason in the Preface of this Book to aver that Men carry Miracles alwaies about them more wonderful than all the Miracles in the World besides? And truly it would not seem so great a wonder if we should aver, That God by his Omnipotent Power of himself did frame all this connexion and disposition of Members which we see in our selves. If as in the beginning he created Adam of the Earth, and Eve of his Rib without the power of any seed, taking only the Earth for matter, and administering all the power himself; so he himself also should frame our bodies in their most beautiful disposition and proportion. Also, if as at the first he created Trees and Herbs without the Vertue of any seed; so he should now by his all-powerful Command cause them to spring up out of the Earth. For we know that to him nothing is impossible, and nothing difficult. It is to us no news if he does great things, of whom it is written; He alone does wonderful things. But that this disposition of the Body of Man should proceed from the Vertue and Power which lies hid in the Parents seed (a most filthy, and hardly to be named substance, which no man beholds without abomination) and that therein so rare a vertue should lie concealed to make and shape so admirable a body; that the whole efficacy of this wonderful disposition of parts should really exist therein, this justly adds weight unto our consideration above measure, this renders us amazed and astonished, and compels us to cry out, and to confess with open mouth, that he is not only great in himself, nor only great in great things, but that even in the most abject, contemptible, and smallest things, he is full of Glory. So far Titelmannus.

The shaping of the Body of a live Creature is the work of the Soul.

But since certain it is, That God does not immediately and alone effect all these things which come to pass in the Generation of Living things, but that Nature is constituted, which is the ordinary Power of God, and which performs all the vicissitudes of Generations; the Question now is, What is the immediate Author of this admirable Fabrick in living things, both Plants and Animals. And although Galen despaired to find the cause by which all these things are done, and confesses that he could find nothing so much as probable in this point, which made him exceeding sad, *Lib. de factu formato, cap. 6.* Yet if he had considered that these Operations were proper to the Soul of every sort of living Creature, he might without great difficulty have known that all these operations did proceed from the Soul which lies hid in the Seed.

That these are the Operations of nothing but the Soul of every living thing, he will easily understand who considers what it is which of a small Birch makes a large Animal, preserves in Nutrition the same Figure of the Body, lest by the continual growth of the parts it should be changed, restores the flesh lost, breeds oftentimes large Veins. Which Galen saies he saw in the Head of one, *Lib. de semine,* repairs the teeth which young people do cast, restores every year the fallen Leaves of Trees, brings forth the Flowers and Fruit, in Peacocks and other Birds supplies new Feathers suitable to their kinds. For since it is certain, that the Soul and form of every sort of living thing is the specificck cause of all these operations, and that hence every yeer each Tree hath its own Leaves restored, of one fashion to the Oak, of another to the Pear-tree, of another to the Peach-tree, and Harts-horns to the Hart in room of those are fallen off, but not the Horns of an Ox, Claws of a Crab, every one according as suits with their particular Nature: What need is there I pray you in the first structure of every living thing out of its Seed, to seek any other cause of Formation than the Soul it self, which is one and the same in the Seed, and in the living body formed? For it is altogether the same work, when the Soul lying hid in the Seed, and drawing matter, shapes the body of a Plant, and when the same Soul repairs the fallen Leaves, restores the Flowers, produces new branches, boughs, and roots. And so since the same operations in the Seed, and in the Plant, are seen in every respect absolutely perfect, they shew that there is the same Principle and Agent in both. And therefore since in the seed it self are performed the operations proper to the soul, why should we deny the soul to be in the seed? For all the faculties of every form, and especially of the soul, are properties inseparably flowing therefrom, and therefore it may be most rightly concluded; Where the faculties and operations of the Soul are found, there

there the Soul also it self is present, and we easily come by the operations to the knowledge of the hidden Essence and Soul. For if one Faculty were in the Seed, another in the grown body, of what form was that the power, or when went it away, and whither, when the body was formed? It is an absurd thing truly to hold, that the Formation of the Flesh, Membranes, Bones, and other parts, is begun by one faculty, and continued and perfected by another different therefrom; and that so as to continue the work begun with the same thread without any Error. Doubtless one and the same continued Operation, which lasts from the Beginning of Generation to the end of Life, cannot proceed from divers Principles.

This also confirms the same that in Plants we see a Root, or Branch, or also a Leaf only, as in the Indian Fig-tree, being pluckt from the Plant and stuck in the ground, does grow into a compleat and perfect Plant; which is the work of nothing but the Soul present therein. And since the same thing is done in the Seed, we justly conclude that the Soul is present and therein, and performs the same work. Yea, and when we see the same Plant (as Rosemary for example) propagated both from a Seed and Branch we acknowledg the same cause in both cases. For otherwise there would be two different causes of one special effect, and two conforming Faculties of one and the same Plant, which is false and absurd.

To answer this Argument, *Fienus* (truly) labors and sweats hard, *de form. foet. quest. 5.* *Fienus his Reason against the Animation of the seed of Plants.* *Conclus. 6.* but yet in vain. For he saies that a new Plant is produced one way out of the Root and Branches, another way out of the Seed. For of the former a new Plant is not made, but they being severed from their stem are themselves a new Plant; because being cut from the whol they have already a vegetative soul multiplied, but do not acquire the same, by which they augment themselves and attain to their perfection. Contrariwise, that the Seed is no new Plant, because it hath no soul, but it becomes a new Plant by the coming of a soul into it after it is planted in the Earth; or by the soul which is newly produced in the seed after it is put into the Earth.

But *Fienus* can by no means thus free himself. For in the first place, though it seem another manner of propagation to the sense, that which is by the Root or Branch, from that which is by the Seed: yet in respect of the principal Efficient it is indeed one and the same, since it proceeds from the same soul. *Fienus* denies indeed (by reason of a pre-conceived Opinion) that the soul of the Plant is in the seed, but he proves it by no reason. Contrariwise, from the operations of the Formative Faculty which are in both alike we firmly conclude the same soul to be in both, viz. in the Seed (for examples sake of Rosemary) and in the Branch thereof. Moreover in the same sence, as a Root, a Branch or a Leaf may be called a new Plant, the Seed may also be so called. For in each there is its Soul, but in the Seed there is wanting the ultimate perfection springing from the Organs. Thirdly, if he grants the whol soul may be in the Slip of a Root, and in one Leaf of a Tree, and that by cutting off the soul is multiplied, and that the soul which before was but one in number, viz. while the said Root, or Branch, or Leaf did grow to the Plant, by cutting the same off is multiplied; why does he not grant that the same multiplication may be made by the seed? especially since all seeds are rarely fashioned, and some of them have a more artificial shape than the Root of an Hop or any other Plant, or the Leaf of an Indian Fig-tree? The same Operations in both do argue (doubtless) the presence of the same Soul in both.

We do therefore rightly argue from this wonderful Fabrick of the Body which is made in and of the seed, that the soul is present therein. For, *whatsoever is made by Nature or by Art must be made by that which hath an actual Being; and that which moves must have an actual Being;* and every immediate efficient Cause must necessarily be joynd with the Patient. And therefore in the generation also of all living things that which forms the Body must be present, and must be joynd to that Body. And that which is yet more, the ministring powers themselves which wait upon the Formative Faculty do all appear in the seed. For the first Operation which is performed in the Seed is in a Plant the drawing of nourishment from the Earth, and in Animals the drawing of the Mothers blood. The second is the Vivification and Animation thereof, or Communication of the Soul thereto. For the Nutriment drawn out of the Earth is inanimate, and the blood also is of it self inanimate. But when of these the parts of a Plant and of a Child are made, they must needs then be animated. But nothing can give a Soul but that which hath it, and therefore the Seed is animated. The third Operation is the separative. Since the Liver is made of one kind of matter, the Stomach of another, the Heart of another, the Brain of another; a Vein, a Nerve, an Artery of another, the Soul in the Seed discerns and separates these matters one from another. Fourthly,

Fourthly, when these matters are severed by the same Soul each is put in its own place, the Brain and Stomach in one place, the Heart and Liver in another. The fifth is the Formative peculiarly so called, by which its own shape, quantity, number, and the like, are allotted to each part.

*There is no Agent in the seed except the soul.* Secondly, There can be no other Agent here assigned save the seed. For first of all, the Generator himself is many times absent. So in the Spring, when a Plant springs from seed, the Plant which bare that seed is many times dead long before; and while the Animal is in the Womb of the female receiving its shape, the Male which ingendred the same may happen to be dead.

*The innate Heat in the Seed is not the Principle of conformation.* Again, Neither can the inbred Heat of the Seed be the Cause of Formation. For though it cannot be denied, that the innate Heat is an Organ wherewith as other actions in the body, so conformation is shaped, yet it is not the primary Cause; since so admirable a work cannot be ascribed to a bare quality, as to give to so many different parts almost infinite in number, each its peculiar figure, quantity, number, situation; but there is need of a far Diviner Agent. Of which Scaliger, *Exercitat. 6. Sect. 5.* If (saies he) the form comes from without (as they tel us) and in the mean while the matter is furnished with all kinds of perfection; of necessity both the Qualities and Quantities, the numbers, orders, and situations, must be provided and ordered by somewhat which is within, and in conclusion the whol Body must be shaped by the same internal Principle. Now this shaping of the body is performed, either by a substance, or by an accident, or by both. Not by an accident alone. First of all, because no accident works but in the vertue of its substance. Again, because no accident hath knowledg. But that same Vertue and Power which is Architect of so noble a Temple hath been judged by all Philosophers to be most exceeding wise. It must be therefore framed and built by a substance. And this substance is the Form of the Seed. Doubtless the form of the Seed if it be not a Soul it is a bruit thing: and if it frame the body, it is equal to the Soul. But in growing and restoring of wasted Flesh the soul is it which does all. There must be therefore in the Seed a shaping Soul which comes before that Soul for which it prepares its house. And therefore that former Soul is more wise and noble than this latter. And a little before: The Form it self is the cause of this preparation. For it both alters the whol, and disposes of the parts for its own use. Nor when the body arrives to the perfection of its preparation, does it then also arrive to the substantial Form. For the Form it self exists before-hand. And therefore there is no progress made to it, but to its act, that there may afterwards be use made thereof.

*The vertue of the Mothers womb is not the Cause of the formation of the young one.* Nor in Animals can the Vertue of the Mothers Womb be the cause of the Conformation and shaping of the Body. For if the Formative Faculty were in the Womb, and not in the Seed, the Father should confer nothing to the Conformation of the young one, and should afford only a passive Principle, and consequently should not generate. Again, there can be no cause assigned why the Child should be sometimes like the Father, and why Females should not alwaies be ingendred. Thirdly, in Eg-bearing Animals the Conformation is not performed by the Womb, but the Eggs are perfected into Chicken, without the Body of the Hen; as neither the Earth (which to Plants is as the Womb) hath any power to shape the Plant; but all that Faculty is in the Seed. Moreover, if heat brings (as they say) the power of the Seed into act, a Quality engenders a substance. Nor can they avoid the force of this Argument who answer, That this substantial Power is so ordered and disposed by the Generator, that the said Quality being awakened it breaks forth into an act like the Generator. For what I pray you is that substantial power? Certainly unless it be the Soul it is a meer figment; which appears by their own rule, when they say that the next power is reckoned for an act. For since a thing cannot be at once both in act and power; if the next power be an act, certainly it cannot be a pure passive power, but a formal one, and so the Soul it self.

*The Objection of Fienus against the presence of the soul in the seed.* Nor is that of any moment which Thomas Fienus brings against this argument, *de form. foetus, quaest. 5. conclus. 6.* For seeing he grants that there is no other cause of the Conformation of an animate Body save the Soul, it is rightly hence concluded; That whatever hath in it the Efficient Cause of Formation hath in it the Soul. But the seed hath in it the cause of the Conformation of an animate Body. Ergo it hath in it the Soul. Here indeed Fienus answers; I acknowledge the Premises are true; but I deny the Consequence. It is indeed rightly inferred that there is some Soul in the Seed, but not that it is the Soul of the Seed. There is indeed a Soul brought into the Seed after that the Seed is conceived in the Womb, or planted in the Earth, or the Eg is set under the Hen, when all things are put into act; but



that is not the Soul of the Seed, or which did pre-exist in the Seed, or which was bred in the Stones, the Tree, or the Hen, but the Soul of the young Conception which was afterward introduced thereinto. But in very good deed, how can the Consequent be denied if both the Premises be true? For in a Syllogism, that which is false cannot be inferred from true Premises. He saies nevertheless that the Minor is false, and he denies that the soul which is the Cause of Conformation is the soul of the seed: but falsely. For it must be shewed, as hereafter shall be said, what is the cause of those operations and of the conformation in the seed before the soul is come, according to his opinion. Moreover since he saies the soul is not present til all things be actuated, he ought to shew what is the Author of that same actuation and conformation, in Plants, Eggs, Bruit Beasts, before the soul comes. Thirdly he ought to have told us, whether the Souls also of Plants, Birds, and Beasts, are introduced, and from what cause they proceed. Doubtless when some Seed is cast into the Earth, or in any place is moistened with water (without any other cause) first it puts forth a Root, and a little after it begins to sprout. What I pray you is the cause of this operation and formation, save the Soul already pre-existent in the Seed? Or if it be not the Soul pre-existent in the Seed, Let *Fienus* shew whence it should afterwards come.

And this Argument which hath hitherto been propounded and explained, drawn from the operations of the Soul appearing in the Seed might alone suffice to perswade a mind not pertinacious, but desirous of truth, that the Soul is in the Seed: howbeit there are other Arguments evident enough to prove the same.

For in the second place, whatsoever ingenders its like must needs communicate its Essence to the thing ingendred; otherwise it would not be essentially like it. But every living Creature begets its like, Ergo it communicates its Essence to the thing ingendred; and consequently not only the matter, but also the form, whereby the Essence of a thing is chiefly accomplished. And if this were not so there could be no univocal Generation, and the Generator could give nothing but the matter, nor could any man tel us whence the Soul should come; when frequently the Generator before a Plant or Animal is made of the Seed may come to die, and afterward nothing should be found to form the Plant or Animal save external Heat. Thus the Seeds and bulbous Roots of Plants are sometimes kept many yeers before any Plant grow therefrom, the Plant which bare the Seed or Bulb being long since dead. So out of an Egg even by the Heat of a Furnace a Chick is hatched, the Cock and Hen from whose copulation the Egg proceeded, being long since kil'd and eaten. And questionless if there were not in the Seed an active Principle communicated by the Parents, the Parents could not be truly said to generate, since they should afford only the Matter.

Like would not beget its like, if the Seed were not animated.

*Thomas Fienus* indeed makes answer, *de Format. Faet. quest. 6.* that the Parents do herein really and actively generate, in that they afford the Seed and Matter of Generation, and imprint thereupon all dispositions necessary for the Introduction of a Soul. But this is the Begging of the Question. For we deny that that which only affords the matter of Generation however disposed to fit it for the reception of the form, does communicate an active principle and truly Generate. For all these dispositions do belong to the matter, and he that does not communicate the principle of acting, he cannot be said actively to ingender.

Thirdly, If the Seed had no Soul in it, and yet should produce a Creature with a Soul in it, the more noble should be produced by the less noble, and the Virtue of the Seed should produce a Substance, which is absurd. For nothing acts beyond its ability; also that which is not animated should perform actions proper to the Soul, Conformation, Nutrition, Auction, Attraction; should make Bones, Flesh, Membranes: all which actions are performed at the first conformation, which happens soon after the Beginning of the Conception.

A Thing Inanimate cannot ingender that which is Animate.

And though it be objected by some, that an Agent by virtue of another thing may produce an effect more noble than of it self it were able to compass: yet if this be done, it must be done when the principal Agent is present, and not when it is absent, which does not happen in generation. For the Father may be absent from the place where Generation is made, yea and he may be dead before that time. So also the Mother may be absent or dead, as it happens in Chickens, which are hatched by the Heat of a Furnace, or by some Fowl of another sort.

All the Premises therefore being considered, it is most rightly determined, that the soul it self is in the seed, and as *Zabarella* wel saies *de Facult. Anim. cap. 11.* that Living things when they generate their like do communicate some of their Matter and some of their Form, when they afford an animated seed furnished with the same vital faculty which was in the Generator.

How Living things are generated.

Souls are  
co-extended  
with  
their Bodies.

For though the Souls of living things of themselves have no Quantity nor are divisible: yet according to the extension of the matter wherein they are they themselves are extended, which *Fortunius Licetus* hath proved in two Book *de Anima Coextensione Corpori*, and when it is divided they are divided, or rather multiplied, and yet they themselves are neither greater nor less than they were. So the Soul which is in a small Twig that first shoots out of the Earth, is no less than that which is afterward in a tall Oak; nor is the Soul of a Calf less than that of an Ox. After the same manner the Soul diffuses it self into the Nutrimment which is newly adjoynd to the Body, and so according to the extension of the Body which it informs it self is extended, and yet becomes not greater than it was: as on the Contrary, when a Branch is pluckt from a Tree, the Soul of the Tree is not made less than it was. After the same manner it is in Generation. For whereas before a Plant generates the soul is but one in number, because it is but in one subject: yet now that the Plant generates seed, viz. such a matter as wherein the soul which was before in one numerical subject may now be multiplied in its existence; & that Seed being ripe is separated from the Plant: in each seed though never so small the soul remains entire, and now it lives by its own soul and subsists by it self; and since of one Plant of Poppy more than an hundred seeds are bred, the same soul of the Poppy exists entire in each seed; and then the Soul is said to multiply it self: which when it doth, it becomes no lesser than it was; since of it self it hath no Quantity.

How the  
Soul multi-  
plies it  
self.

But which way the soul it self remaining entire can communicate its Essence to another, this is that which hath perplexed great Wits, and not being understood hath raised many disputes and bred many Errors. For *Jul. Caesar Scaliger* saies rightly concerning the Soul, *Exercit. 307. sect. 29. We see the shallowness of our Understandings. Who dares say he comprehends the species of substances? We cannot attain to that exquisite knowledg, how of two things one is made; how the Form is totally in the whol Body, and totally in every part. So divine a thing is the Form, that being a substance it fills another substance full of it self, so that of both one is made. Therefore to enquire further is the part of an over curious and busie mind; for it is a part of humane Wisdome to be contentedly ignorant of some things.*

Whether  
the soul be  
divisible.

But chiefly that question hath much troubled many, whether the Soul be totally in the whol Body, and totally in every part thereof: also how the Soul is divisible, whether in regard of its extension by means of the Body. Where some hold that all the Souls of perfect Animals (and they only) are indivisible and unextended: others hold that all the souls of perfect Animals are divisible and extended, only the rational Soul of man excepted. But the Conimbricentian Collegiates do hold both these Opinions to be very probable, and therefore they answer the Arguments brought to prove both, and so leave the Reader unresolved: yet they confess they had rather maintain the former. *Fortunius Licetus*, in his two Books of the Coextension of souls with their bodies, holds that all souls, yea the rational, are co-extended with the Body.

How souls  
are co-extended  
with  
the Body:

Hence also another controversie hath risen, how in the Augmentation of the parts of the Bodies of Animals which grow the growing parts do receive the Soul; which is attended with exceeding great difficulties, as *Zabarella* also confesses, and is so obscure, that it moved *Sebastianus Basso* (a man otherwise quick-sighted enough in the things of nature) to deny that there is any such thing as a substantial form, and absurdly to hold that the form in a body natural is nothing but a certain collection of particles of the same kind into an excellent kind of Harmony. Now among others, *Jacobus Zabarella* hath written largely of this Question, *Lib. 1. de Accretione*, where having in Chap. 13. recited contrary Opinions, and rightly rejected the Opinion of *Scotus* and others, who hold that the Soul flows with the matter, and that in the parts of the matter bred of the Aliment particles of the Soul are bred, and that so just the same soul does not last during the life of the Animal; and had undertaken to defend the other Opinion, that the Soul all the Life time remains the same in number, and when new matter comes is extended to inform the same, Chap. 16. he propounds two very urgent doubts against the same: The first is, That after this manner, when the Soul which is in the old flesh passes over to inform the Flesh newly composed of Nutrimment, the Form seems to go out of one subject into another, which seems to be absurd. The other is, That thus the Soul wil seem to be movable of it self; whereas *Aristotle* in the 6. *Physic.* teaches, that Bodies only are of themselves movable; and that the Soul is movable only by accident according to the motion of the Body, in 1. *de Anima*. But *Zabarella* rightly answers to the first, that the Form in this manner does not totally forsake his subject but remains therein, yet passes over to inform new matter, which transition, or diffusion wants a proper name. And

And to the Second; That the Soul does not pass over to inform new matter by motion, but after a certain manner to us hid and unknown. Which things although *Basso* does laugh at, yet if rightly explained they are most true. All the Errors which many run into in this point do proceed from hence, because they attribute such things to the Form and Soul as belong only to the Body, viz. Quantity, Divisibility, and parts. But that which *Scaliger* writes concerning the motion of Angels, *Exercit. 359. Sect. 12.* is also true of the Soul; that it is extended without predicamental Quantity, and moved not with corporeal motion, by passing from place to place, but with the motion of a thing incorporeal and extended by changing its *Ubi*. For as it is in *Exercit. 307. Sect. 13.* *Whatever is moved is in a place. But the Soul is not in a place, because it hath no quantity. For that which hath quantity cannot be at once in all the parts of a living thing that hath quantity. But the Soul is in every part of the body which hath quantity.* And a little after; *The Soul it self becomes no greater, by means whereof the body is made greater.* And therefore he himself calls it not motion properly so termed, but in the same place he writes: *When it is introduced into that part which is added to the body, the Soul which before was in the magnitude (for example sake of a foot and an half, is advanced half a foot.* And a little after: *The Soul is transferred by promotion of it self, from it self to all that which is newly added to the body, even to the utmost circumference, all the matter being mean while filled which lies betwixt.* For thus when the Nature of a thing is not very clear, neither is it easie to invent names, and those names we use are equivocal, and taken from things more known.

But that we may in some sort explain the Nature of the Soul as far as the weakness of our Understanding will give leave, and that we may declare how we are to understand what is commonly said, that the Soul is a total Being, which may be divided, extended, multiplied, and that some light may be given to all this Doctrine of the Generation of living things, thus the case stands. All natural Bodies consist of Matter and Form, which in living things is the Soul. The matter of the Body is of it self subject to Quantity, and divisible into parts having Quantity, and a Body so takes up place that it will admit no other body thereinto, and it is movable from place to place. But the form and soul hath no quantity, and therefore it fills and penetrates the whole Body, it is indivisible of it self, yet is co-extended with the whole Body without quantity. But since (as the Schoolmen rightly teach) a thing is said to be some where three manner of waies, either Definitively, or Repletively, or Circumscriptively and Locally: the Body only is circumscriptively in a place, and so said to take up a place. For two Bodies having quantity can never be in the same place, and that place which one body hath taken up another cannot possess unless the body first by local mutation pass into another. But substances free from quantity (as also sensible species) can be either divers of them together, or with other bodies in some place; of which we have spoke more largely in our 1. B. of Natural Philosophy, chap. 5, and 6. And although the manner of existing any where repletively does properly belong to God, who (as *Damascen* writes) *is all, and totally everywhere, wholly in all, and wholly above all,* high, glorious, immense, incomparable, incomprehensible; but Souls are not every where as God is, but are limited and contained within their own Bodies; yet learned Men (and amongst the rest *Johannes Faber stapulensis, Dialog. 2. Physicarum Introduct.*) do attribute the manner of being some where repletively to the Soul also, and being carried aloft by the wings of their Mind from the lowest plenitude to the highest and infinite, they acknowledg the Image of God who fills all things, and exists totally in the World, and totally without, even in Souls; and that rightly. For the Soul of all Animals fills the whole Body which it informs, nor is it hindered though the Body have filled this place before, but that it also can be in all the parts of the Body. And all Dimensions being taken away, the form of any of us may be in the same *Ubi* with that of another, nor would the presence of one hinder the presence of the other. As we see many lights scattered through the same Air, nor does the presence of one hinder the presence of another; and although there are many in the same place, yet they are not mingled, which the shadows declare. Also we may see the same Soul which at first fills the Body of a small Branch sprung up from an Acorn, and of a small Infant; afterward when the said Branch is grown up to a tall Oak, and the Infant is become a large Man, yet it fills the same Bodies though it self be not augmented.

And to apply what hath been said to our present purpose; as when of a small Branch a tall Tree is grown up, or of a Calf an Ox is made, of an Infant a strong well-set Man; the soul in the Tree, Ox, Man, is not made larger than when it was in the Branch, Calf, Infant: so the soul when by the seed it gives Essence to divers individual matters, it is not made lesser,

whether  
the soul  
move?

The nature of the soul declared.

The Body hath quantity, is divisible, takes up place, is movable.

The soul of it self hath no quantity, fills the body, is indivisible, is co-extended with the Body.

Three manners of being any where, two bodies cannot be together in the same place.

What things are repletively any where. God fills all things. The soul fills the whole body.

How the soul can be multiplied.

nor does it lose any thing, and the soul which is in the seed born by a tall Tree is no lesse than that which is in the Tree it self.

The soul properly is not divided: whether the soul be co-extended with the body?

By al which it appears that it is more proper to say the soul is multiplied than divided. For since nothing is divided but what hath Quantity, and one part without another, but the Soul hath no quantity, nor hath it one part without another, properly it is not divided neither by it self, nor by accident. The body indeed as having quantity and one part without or behind another, is divided, nor is the part taken from the Body of the same Essence with the whol: but that part of the soul which is separated from the Generator is of the same Essence with the soul of the Generator; and although it be in a smaller body, yet is it as totally and entirely there, as the soul of the Generator is in this Body. And that Extension may offend no man, nor cause him to think that the Soul because it is extended hath parts; let him ponder with himself how that of *Scaliger* is to be understood, *Exercit. 359. Sect. 12.* That the Soul is extended without predicamental quantity. Where we must distinguish betwixt extension properly so called, and extension taken only analogically. Extension properly belongs to quantity and bodies which have parts so disposed that where one is the other is not; for examples sake, where the Foot is there the Hand is not. But the Soul although it be joynd to the body, because it informs a body measured and extended, and the plenitude and replency thereof (for so the School-men term it better than Extension, and *Fortunius Licetus* might better have used this word in the Title of his Book *de Coextensione Animarum cum Corpore*) is as large as the body it self, and its dimension, and fills it though it grow never so big, no part being added thereto. Yet there is not one part of the Soul in the Eye, another in the Foot, nor is the Soul in a Man greater than that in an Infant; but as God is immense and infinite every where, not having part without part, or behind or after part: so also after its fashion the soul fills the whol body, not having part after part. Whereby we may easily answer that Objection which hath troubled many, and *Basso* amongst the rest; That if the Soul be totally in the whol Body, it wil follow that when a part of the body is cut off (as for examples sake, the Hand) the Soul wil be divided with the division of the Body. For in such things truly in which the Seminal Principle is spred al the body over, as in a Willow, the Soul is multiplied by cutting off a branch, or as they commonly speak, is divided: but in Animals where Propagation is made by Seed the soul remains intire in its body, though a part of the body be cut off; as also in growing, although the soul communicates it self to the parts added to the body, yet it does not pass out of one subject into another. *Fortunius Licetus* also acknowledged thus much, *Lib. 2. de anima Coextensione, cap. 4.* where he makes a twofold extension, one material belonging to magnitude, which is only in a thing which hath corporeal quantity; the other formal and belonging to an incorporeal substance: and he rightly adds, That although these two extensions, Material and Formal, have an analogy and proportion one to another (viz. Because either of them bounds the thing defined within certain limits: for God alone is totally every where) yet herein they differ, That extension formal so called makes not the thing to which it belongs to be subject to quantity, nor necessarily divisible, either of it self, or by accident: but material extension so called makes a thing both to have quantity and divisibility. Sensible species do also afford an Image of this thing. For if a bright shining thing be in some place, or any other image of a thing, and there be only one man that sees it, or one Looking-glass to receive the Representation; the whol Image of the visible thing is in the eyes of one Man, or in one Glass. But if an hundred, or a thousand, or more men come, or a thousand Glasses be set, the same image which was before received by one Man and by one Glass, does now appear in a thousand Men, and a thousand Looking-glasses; nor yet is the Species or Representation of that visible Object divided into Quantitative parts.

Every form can multiply it self.

And hence arose that famous Axiome of Philosophers; That every Form multiplies it self. Which although *Zabarella* quotes, *de sensu agente, cap. 5.* where he treats of sensible Species: yet it does not therefore follow (as one unskillfully imagines) that it is only true of accidental Forms. Contrariwise, it is rather generally and primarily true of the substantial forms, and only consequently of the accidental. For substantial forms are really forms; but accidental forms are only their Images and shadows as it were. And therefore if accidental forms have a power to multiply themselves, much more have substantial forms the same power; since accidents do al that they do by vertue of their forms. So that it is apparent that *Zabarella* understood this Axiom of substantial forms, from *Lib. de facultat. anime, cap. 11.* where he writes, That it is the proper condition of the Vegetative Soul that the Generator should afford some of his own matter and some of his own form; and in that whol Chapter he teaches expressly, that that same vulgar Opinion of the Eduction of Forms out of the

the aptitude of the matter by the action of an external Agent hath by no means place in living things. And Aristotle also himself expressly teaches, 2. de Anima, cap. 2. text. 20. That some Souls do multiply themselves, when he writes that some Plants divided and separated do therefore seem to live because the Soul which is in them is actually indeed one in every Plant, but potentially many; which also he grants in some Animals. Which if it be true in Plants which live divided, why should it not be true in them also which are propagated by Seed, that so the Soul should be said to be one, but potentially many, viz. by the Seed, as well as they can multiply themselves by the division of their body?

Now this multiplication is performed divers waies, as shall be said hereafter. But this is common to all, that the Soul should have its proper subject wherein it might cleave, and by which it might be separated from the Generator, and might constitute a new Individual; which is the Seed, or somewhat analogical to the Seed. All four-footed Beasts do communicate their Souls by their seed; Birds, Serpents, and Intests some of them, do bring forth Eggs, or somewhat analogical to Eggs, and by them they multiply themselves. In Plants there is a various manner of Propagation, as shall also be said hereafter. For some propagate themselves by Seed, some by Branches, some by a Root or Bulb, and some by divers of these waies. For it is not in them as in Animals, where the Soul is tied to the seed, or to somewhat which answers the Seed, but it is diffused through the whole Plant, or through its parts, so that it can multiply itself by any part if it be put into the ground, so that thence a new Plant will arise. Nor are the Souls nevertheless divisible in Plants although it be commonly so said; since they have not one part without another, but the body of the Plant only is divided, and is made less by cutting off some bough, branch, or Root: nor does it give part of it self to the Seed, the Branch, the Root, but its whole self, and so multiplies it self.

Here also I must explain how that is to be understood which I have written in Chap. 9. de Consens. & Dissens. Chymicorum cum Aristot. & Galeno, that the forms also of Metals are multiplied after their fashion; since a certain malignant Person hath charged me to hold that a stone begets a stone, and metal begets metal. For I am not so blockish and foolish as to believe that this Load-stone, this Diamond, this Crystal, this Gold does engender, as one Poppy breeds another, and one Lettuce another. For multiplication taken in this sense does properly belong to the living and Vegetative Soul; and Generation is the Work of a living body only. Yet this is true in the mean time, That Jewels and precious stones were not all particularly made at the first Creation, but Experience and Histories cited in the place aforesaid, do evince that the Mines and Matrixes of Jewels and Metals being once exhausted are filled again, and others succeed in the room of those that are digged up. This therefore is my Understanding, wherein I agree with Anselmus Boetius, and other most learned men; that as in Plants and Animals, by the soul lying hid in the seed is formed a Plant and an Animal; so also by a certain Gold-making, Silver-making, Stone-making, Crystal-making Spirit, containing the Architectonick form in it self, Stones, Jewels, and Metals are generated in the Earth; and from it according to every ones kind, figure, color, and other proper accidents are given to them; and that this Spirit diffuses it self into the exhausted Mines and Quarries of Metals and Jewels, and there generates new Metals and Jewels. But where that Spirit lies hid, and which is the seat thereof (in this darkness of Humane Minds, and the ignorance we are in concerning the Constitution of the inner parts of the Terrestrial Globe) is to us unknown. This is certain, that those Architectonick Spirits are various according to the sorts of Jewels and Metals, nor are they found in all parts of the Earth, but in some places only. And so much by the by, concerning the Generation (as it were) of Stones and Metals, I have said in this place to free my self from Slander.

Now the Souls and several sorts of things received their Power of multiplying themselves from the divine Benediction at the first Creation of the world, when God said, Let the Earth bring forth the Herb seeding Seed, the Fruit Tree bearing Fruit according to its kind, wherein is its own Seed upon the Earth. And Increase and Multiply. For God did not only command, as Thomas Erastus well writes, de occult. med. propr. cap. 15. that the things created should exist, but also that they should so propagate themselves as he had created them. Nor was that Command of his in vain, but very effectual. For when he commanded, he gave to each a power whereby they were able to accomplish his Command. By virtue therefore of this benediction, and help of the Seed, Souls are propagated as one Candle is lighted by another; and where ever they meet with a fit matter wherein they may subsist by themselves, such as is the body of the seed, they can transfuse themselves thereinto; and as

Many manners of the souls propagation.

The soul is multiplied in its proper subject.

Whether the forms of Metals are multiplied.

How Metals are generated.

whence souls have power to multiply themselves.

*Scaliger* saies, cloath themselves therewith, so that that part (if I may so call it, for it is not properly a part) of the form hath the same Essence with the whol form, which is in the whol from whence it was separated, and afterwards also it begins to perform the same operations; and so the same Essence of the Soul which is in a tall Walnut Tree is in the Nut and that Sprout which arises from the Nut, and afterwards also having obtained fitting matter whereby to augment it self it performs the same operations, produces every year new Branches, and ingenders Nuts. And thus out of the first Individuals of all four-footed Beasts, creeping things, Buds, Fishes, Plants, Animals, at first created, the sorts and kinds have been since continued, and all Beasts, Creeping things, Birds, Fishes, Plants, have been generated by multiplication of their Souls.

### Chap. 7. Arguments to the contrary Answered.

**A**ND although this is a plain case, so that a Mind not prepossessed with Opinions may easily perceive the truth: yet as commonly happens in this darkness of humane Minds, some are of another Mind, whose Opinions and Arguments to the contrary come now to be examined.

The first thing which hath troubled many so as they could not see the truth, is, that neither in the seeds of Plants, nor in Eggs, nor in an imperfect Conception, those operations are to be seen which are performed by perfect Plants and Animals. But they themselves are not ignorant that the first and second act do differ, nor does an Argument hold from denial of the second act to a denial of the first act. For the Essence of the Soul is in the Seed by the first act, nor can it be proved by any reason that it should afterward receive the same from elsewhere: only the second act is wanting to the Seed since it wants only express Instruments necessary to perform its operations, which nevertheless it hath a power to prepare. And so the Seed wants only that perfection which belongs to the Body and the structure of its parts, but not that which belongs unto the Soul. Nor can we argue in perfect Plants from the negation of the second act, to the negation of the first, as may be seen in Trees and other Plants which last all the Winter, in which there is no manifest operation: and yet the Soul is really present in them.

Again, Those actions which proceed from the Soul are twofold, Organical or Second, which are performed in a perfect Body, and Prime or Inorganical, viz, the Vegetation of the Seed, the Formation of the Body, with its nutrition and augmentation. For as soon as the Body begins to be formed, it begins to be nourished. And although the Seed in the Corn-loft be not nourished, yet it hath a Vegetative and Nutritive faculty: after the same manner as Plants pluckt up are likewise not nourished, yet are really animated, and being transplanted into another soil they are again nourished.

Another thing which troubles *Galen*, is, that the Vegetative faculty being void of Wisdom and reason seems unable to perform so wonderful a work, wherein the greatest Art and wisdom appears, and which cannot be done but by a most wise and powerful Artist. But no man wil wonder at this who knows that the Soul is the Principle and immediate cause of these operations, but yet that it hath not its power from it self, but hath received the same from the most wise and powerful Creator; whence also *Scaliger Exercitat. 188. & 359. sect. 11.* defines Nature to be the ordinary power of God, and in *Theophrast. de Causis Plant. cap. 1.* the power of God in the second causes, to which himself hath prescribed certain rules to act by. For as *Thomas Erastus* writes, *de occult. med. propriet. cap. 15.* Nature is nothing but that same command of God by which all things are what they are, and perform that which they are commanded. For God did not only command them to exist, but also to propagate themselves as they were created by him. And what reason hath *Galen* to admire that so wonderful things are done by the formative Faculty, since he might have observed things as strange in the Elements themselves? The Elements are moved in a straight perpendicular Line, upwards and downwards, although they know not what a perpendicular Line is, because God hath commanded them so to do.

A third thing which hath moved many is this; That they conceive nothing can be the subject of the Soul but an Organical Body, [being moved thereto by *Aristotle's* definition, who defines the soul to be the act of an Organical body. But *Aristotle* did not define the soul simply considered in its Essence, but in order and respect to the Body. Which nevertheless, since it finds not, but forms and shapes it for it self, it must needs at first be in an inorganical Body.]

Body.] But that an organical Body is not necessary to receive the Soul into, many things do shew. For in the first place, since to an organical constitution is required a certain Quantity, Number, Figure and scituation of parts; all these things are not necessary for the reception of Forms. For Forms (such as souls are) having of themselves no quantity, are received into matter without Quantity or Figure. And this we see manifestly in Plants, in which the Quantity and Figure are variously changed the same soul remaining. For the Quantity and Form of a Branch springing up from a Seed is one, and of the same grown to a tall Tree, another. The stalks of many die in the Winter, the Root remaining alive, and in it the Soul. Again, the figure of bodies is an Effect of the Forms and Souls. And therefore it is not a previous disposition foregoing them. For the Form it self is that which determines the Quantity of its own body, and each Soul brings in a determinate Figure into its own Body, and preserves the same in Nutrition and Augmentation; hence there are so many figures and magnitudes of living bodies as there are differences of souls, and a Rose hath one magnitude and figure, an Oak another, a Fir Tree another; a Partrich hath one, an Hen another, a Peacock another. Thirdly, the Soul is of it self and primarily in the parts as they are similar, and not as they are organical. But the similar parts as such have no certain figure: and therefore the soul is not in them as they have a certain figure, or quantity, but only as they are such similar parts. And it is in the organical parts, only as they consist of similar parts. So that the Soul is not in the Bone, as it is a Tooth, a Shank, an Arm-bone, or an Ankle-bone, but only as it is a Bone, and it is equally in all Bones. And therefore in fractures in which the Bones have many times another figure than naturally they should have the Soul remains nevertheless, and is as much in a great *Callus* as it was before in the sound Bone. And therefore in Nutrition it is brought into the aliment which hath no figure; and it suffices that it hath this or that temperament and similiary Constitution. And so the organical disposition is not necessary for the first act, but only for the second act, or to perform the operations. Nor is the body as it is organical simply the adequate subject of the Soul; but then only an organical body when the body is now perfect, and ought to operate, and by its operations to preserve it self alive. And the Organs are required for operation and not to simple being; and then only are necessary to being when the being cannot be preserved without operations; which happens when the Body is already brought to a perfect state. But the figure and organization (as some speak) is after the Soul and not before it; and therefore it is not a disposition necessary to the reception of the Soul. Moreover the dispositions to the form are immutable: but the figure and organization in living things are not immutable. Both is apparent in Animals and Plants. The fortieth day is the longest term set by those that hold the Soul is infused. But then the parts are only rudely delineated. And what shal be said of bruits whose Souls none hold to be infused? Is not the Soul there presently on the first daies of the Conception? And this happens much more in Plants. For in the first daies when Plants begin to shoot and sprout out of their seeds the shape of the Plant is yet so rude that it cannot be known (save by most skilful Herbarists) to be this or that Plant, which afterwards in process of time is many waies changed.

The Form determines the Quantities and Figures.

The Soul is in the parts as they are similar.

Nor is that of any moment which *Sanctacruzius* objects here; since Souls are more noble than the forms of Elements and Bodies simply mixed, they require also a noble configuration and formation, and by how much living things are more noble, by so much the more noble body they require, and hence the so many sundry figures of Plants and Animals have their original. True it is indeed, that all living things by reason of the divers operations they are to perform do require divers organs; and therefore Plants have one manner of shape, Animals another, and every sort is differently figured according to the nobility of the forms. But it does not from thence follow, that those figures are required for the fabrick of the organs, before the introduction of the Soul, and that they are a disposition necessarily foregoing the Introduction of the Soul; because (as hath been said) that same formation of all the Organs is not necessary to simple being, but only for the better being and performance of operations. And if those that contend so eagerly that the body must be organized before the soul can come into it did but observe such things as dayly happen in Nature they would think far otherwise. *Fortunus Licetus* the most renowned professor at *Padua* hath taught sufficiently, *de spont. Vivent. Ortu*, that the soul may remain safe and sure in a matter far more vile and ignoble than any seed can be thought to be, although it be destitute of such things as are requisite to its second Act; which at last having attained a fitting matter does rouse it self up and becomes a Plant or Animal. Of which I shal speak hereafter in my *Discourse of the spontaneous original of living things*.

Fifthly,

*Whether the seed acts upon it self?*

Fifthly, Some do also use this Argument, which is also the fifth Argument of *Thomas Fienus*, *quest. 6. de format. foetus*, which *Alphonzus a Caranza*, a Spanish Lawyer, does so highly esteem, in *tract. de partu naturali & legitimo*, *cap. 1. pag. 44.* that he calls it a singular and irreprehensible Argument, and which quite overthrowes the contrary Opinion, and therefore he thinks fit to set it down word for word; whose words I will also transcribe intire, that the Reader may see whether the force of this Argument be so great as *Caranza* imagines. Now thus saies *Fienus*. If in the seed there were an active Principle of Conformation or Generation (as others confound them) the seed should act upon it self; but nothing acts upon it self, as *Aristotle* teaches, *1. de Generat. & Corrupt. cap. 7.* Ergo. Because if any thing should act upon it self, the same thing should be Agent and Patient, in act and power in respect of the same; which is impossible. Secondly, because it would be destructive to it self, especially the seed: because that action thereof should tend of it self to its destruction. For it would tend to the Generation of a living thing, which cannot be done without the destruction of the seed. *Scotus* in *2. sentent. distinct. 18. in fine*, after he had said that the seed is not the active principle of the last form, viz. the rational soul, he enquires whether it can be the previous alterative Principle of an Organical body which is generated; and he concludes that it cannot, and brings this reason among others; because (saies he) this absurdity would follow, that somewhat should act upon it self: which argument he counted so strong, that he said, to find the principle of Conformation we must be forced to fly to the Action of God, and of the Heavens. To answer this argument it is commonly said that in the seed there are two divers substances; the one thin and spirituuous, the other gross and terrestrial. That in the former resides the Activity, and the latter is the matter and passive principle; and that the active vertue out of the spirituuous part does act upon the thicker part of the seed as upon matter; and that for this reason one and the same thing does not act upon it self, but on a different subject; nor that one and the same thing hath the notion of an active and passive principle in respect of one and the same thing, but only in respect of divers things; which is not absurd. That that same active principle or vertue does reside in the seed, *Aristotle* teaches in *2. de Generat. cap. 3.* in these words: *There is in the seed that which makes it to be fruitful, viz. That which is called Heat; and that not fire, nor any such faculty, but a spirit which is contained in the froathy body of the seed, and that nature which is in the seed having affinity with the Element of the Stars.* *Thomas Aquinas* teaches the self same thing, *1. Parte, quest. 118. art. 4.* in these words: *And therefore there is no need that that same active faculty should have any organ in act, but that it be founded in the spirit it self inclosed in the seed, which is froathy, as the whiteness thereof shews.* And the very same he saies, *2. contra gentes, cap. 89.* and in some other places. But this Answer is not worth a button, and in very truth, is no other than a meet evasion invented to shun the force of the argument. Because it is not true that such a vertue resides in the spirit of the seed. Which is proved first, because the spirit which is in the seed is either an essential part thereof, or it is not. If it be, it wil follow that one essential part of a being is destructive to the other essential part of the said being. This cannot be, first because infinite things are found in the World consisting of divers and heterogeneal parts, in which nevertheless we never find that the one destroyes the other. For if one were ordained to destroy the other, it would follow that it were ordained for the destruction of the whol, and consequently of it self. For one essential part of a thing being destroyed the whol thing is destroyed. But the contrary is true; because the essential parts of one Being are not made to fight one against another, or to destroy one another, but that they may be friendly united, and by their friendly union be able to sustain the form; and the form again is ordained to hold those parts united, and to govern them, that they may not part asunder, nor mutually destroy each other. For if it were not so, the form could never persist and abide in things heterogeneal, no not the smallest time imaginable. Add hereunto, that all action proceeds from a total being, and a perfect being; but the essential parts of one being are not the whol being, nor a perfect being; and consequently they act not by themselves. So far *Fienus*.

*The soul is the first Agent in the seed. Two parts in the seed.*

But this Argument is not so strong as *Caranza* doth imagine. For in the first place we must know, that to speak properly the seed is not the cause of Conformation, but the soul in the seed. And so when a living body is formed out of seed, the same thing does not act upon it self. For there are in the seed two parts; the soul and the body of the seed. Now the first Agent is the soul, which does not act upon it self, but upon the subject matter, viz. the body of the seed, and also upon the Mothers blood, which in Animals it draws to form the yong one, and in Plants upon that Aliment which it draws out of the Earth. And although



though when a Plant or Animal is generated the seed ceases to be: yet that Generation is no corruption but perfection, and that body which is called Seed while it turns to a Plant or Animal it is brought into a more noble state and perfected; nor (as *Ful. Caf. Scaliger* speaks, *Exercitat. 268.*) is the Seed otherwise said to be corrupted than that it ceases to be as it was before, viz. in aptitude, and becomes as it was not, viz. in act. Now it is the same matter with the same formal Principle, to which nothing else is added than the expression of the Organs which were before confused. And thus while of the Seed is made a Plant or Animal, the Body of the Seed does not transfer it self into another condition, but by the Soul lying hid therein it is thereto advanced. Nor (as *Fienus* thinks) will he that shall diligently weigh all these things use that answer which *Fienus* brings and endeavors to refute, that there are two divers substances in the Seed, the one thin and spirituous, the other gross and earthy; and in the former resides the active vertue, the latter being the matter and passive principle. Such a spirit there is indeed in Seed, but it is not the primary cause of conformation, but the Instrumental; but the Soul which uses that spirit is the primary cause. And whereas he dares deny that there is a spirit in the seed, I can scarce sufficiently admitte it, and the reasons whereby he would prove it are very sleight. For in the first place that spirit which is in the seed as an Essential part tends not to the destruction but to the perfection thereof. Also it is false that every action proceeds from a total being. For is there no action of the soul upon the body which it informs? And whereas he denies there is a spirit in the seeds of other living things, we shall refute that hereafter.

Fifthly, This also offends some that they suppose that thus the distinction is taken away betwixt the internal and external Causes: of which the former are the matter and form, the latter the Efficient and End: and they aver that no Efficient Cause does ever go into the Essence of the Effect, and that Animals in Generation do not produce seed either out of their own matter, or out of their own form; but that the seed is generated of the mixture of blood and spirit in the stones, and that a man does not generate by communication of his Essence, but by his form as an Efficient Cause. But in very deed, this Doctrine of the propagation of Souls does no waies take away the distinction of Causes. For it is known even to Novices in Philosophy, that the same Essence may be both the Form and the Efficient Cause, the Form as it informs the Matter, the Efficient as it is the cause of all Operations performed in the compound. The rest are but Beggings of the Question, and are said, not proved. I like *Zabarella's* Opinion better, who writes, *de facultat. animæ, cap. 11.* That living things when they generate their like do confer and bestow some of their matter, and some of their form, inasmuch as they confer an animated seed, and endued with the same vital faculty which was in the Generator. For although they communicate no part of their own body, yet they communicate that self same matter of which they are nourished, but changed into a more noble substance. But that which hath brought very many into this Error is this, Because they conceit living things are generated after the same manner as artificial things: are produced by an external Agent. But there is a great difference betwixt Artificial and Natural things. For every Artificer communicates nothing of his own: but living things which beget their like cannot do the same unless they communicate their own Essence.

whether the Efficient cause be alwaies external?

The difference betwixt Nature and an Artificer.

Sixtly, Neither is that of any moment that they suppose if Generation should be made by transmission of the soul, that then the soul should pass into another matter as a new subject, or should be of it self divisible. For as in Augmentation, and when of an Acorn a tall Oak grows up, the Soul when it communicates it self to new matter does not pass from one subject to another, but remaining still the same communicates it self to new matter: so when the soul communicates it self to the seed it does not pass from one subject to another, but remaining the same in the Generator it diffuses it self into the seed. Nor is it therefore of it self divisible. For as when a root or branch is pluckt from a Plant, of which (being set in the ground) a new Plant arises, the soul of the former Plant is not diminished, but remains entirely the same: so also when a soul is communicated by the Generator to the seed, the soul of the Generator is not made lesser, but remains the same it was. Nor is there here any difference betwixt the Root and the branch pluckt from the Plant and the Seed. For there are several waies of propagating Plants. And that the root and branch is animated, but not the seed, is only said, but not proved. For though the Seed be not a part as the root and branch is; yet it is the fruit of the Plant which is animated as much as the parts are, yea, and contains the soul after a more excellent manner.

whether the soul goes out of one subject into another.

The soul is not divisible.

Seventhly, Many do also object this, That if the seed of the Plant were animated it should be already essentially a Plant. But if it were essentially a Plant when it grows out

whether  
the seed be  
a Plant?

what  
things are  
required  
to genera-  
tion.

when Ge-  
neration is  
made.

How many  
waies the  
form is in  
a thing.

whether  
the seed be  
an Animal

whether  
the seed  
lives?

How ma-  
ny waies  
life is  
taken?

of the ground, there would be no Generation of a Plant, and so in the Tree and that Herb in which the Seed was produced there should be a generation, and a Tree or Herb should be generated in a Tree or Herb, and not in the Earth; which is absurd. But the whole argument is granted in its sense, and that which is counted absurd is no waies absurd indeed, provided it be rightly explained. For truly the generation of the seed in a living thing does not finish the Generation; howbeit the principal and chief work which is necessary to Generation is the Elaboration of the seminal matter that it may be a fit subject wherewith the soul may be propagated, and the communication of the Soul to the matter so elaborated. Howbeit this also afterward belongs to Generation, that the seed which hath received the Soul from the Generator may no longer adhere to the Generator, but may be separated therefrom, and that that which before was but one individual of the same kind may now become more than one. Which when it is performed a Tree or Herb is truly said to generate, but not when the Plant grows up out of the Earth. And when a Plant shoots up out of the Earth that is not its generation, but it is the bringing of a Plant which is in its imperfect act to its perfect act. Nor is it considerable, as *Ficinus* himself writes, *quest. 5. conclus. 6.* (though he be otherwise of a contrary Opinion in this Question) what the common People call Generation, or what not; nor what agrees with their understanding, but what is suitable to right reason and to truth. For the common people are ignorant of Philosophy, and know not when or where the true production of a Plant is made, and its Essential Generation; and know not how to distinguish betwixt the first and the second act; betwixt that which is imperfect and that which is perfect, and therefore takes one for another, and conceits that a Plant is then generated when it is perfected and operates, and when it brings forth roots and Leaves, whose production is not the very Generation of the Plant, but the operation and perfection thereof being already generated. And *Aristotle* himself calls the seed and that out of which it is bred, *Synonyma's*; We must therefore distinguish betwixt the Entitive and Formal Act, and that which is simply Formal, and respectively. For then is the Form said to be present in a perfect act when it hath all its Organs necessary to perform its actions, but not when it is in a part, or in the matter of the seed, and that not yet fitted with all its Organs. For otherwise the branch of a Fir-tree (in which it cannot be denied that the soul is) should be called a Fir-tree; and the Foot of a Man should be called a Man. And therefore we cannot argue from the presence of the Form to the denomination of the thing formed, but then a thing is rightly said to be an Animal or other living body when the soul is in its subject rightly disposed, or can perform the Operations belonging to its kind.

Eightly, Out of which their Objection may easily be answered, who say, If the seed were actually animated, the seed of a Poppy were a Poppy, and the seed of a Dog would be a Dog. For the sorts of Natural things are not denominated from the Essence which the Form gives, but from that Constitution whereby they are sensible species of the World. And therefore though in respect of the Form the Essence of a Dog and of the seed of a Dog is one and the same; yet since the Constitution of the seed and the Dog differ in respect of the Corporeal and sensible parts, the seed is not called a Dog, but the seed of a Dog. After the same manner though there be one and the same Soul in the Butter-fly and the Silk-worm, yet the Silkworm is not called a Butter-fly till it hath wings and can fly.

Ninthly, They say, if the seed were animated it should live, if it lived it would grow, for every living thing is nourished as long as it lives, as *Aristotle* testifies *de Respirat. cap. ult.* But because seeds lying in Corn-lofts and granaries, or shut up in Chests and Boxes are not nourished, therefore they do not live, and consequently they have no soul in them. But life is taken two manner of waies, either for the first act, or the essence it self of living things, or for the second act or operation. Seeds live by the first act, but not necessarily by the second act, nor do they necessarily perform the actions of living things. And that place of *Aristotle* is only to be understood of living things perfectly formed. But in the mean while the soul in the seed is not quite idle, but it keeps the seed alive, and therefore seeds are so long fruitful as they retain the soul in them: but after they have lost the soul they become dead and unfruitful. Nor are the Operations of the Soul confined to nutrition only, but there are also other Operations thereof, as Conformation. Yet as soon as any Conformation is made, and as soon as the seed hath attained a fit place and matter, the soul presently draws nourishment for the formation and nutrition of its body.

And thus I conceive it is proved in general, That the soul is in the seed, and that it is the Cause of the Conformation of the Body animate, and I conceive all Objections are fully answered.

swered. Howbeit some when they can hardly object any solid reason against our Opinion do fly to the Authority of *Aristotle*, but mis-understood, and they say that *Aristotle* writes that the seed is potentially animated, and that therefore there is not actually any soul in the seed. But here the most renowned *Caspar Hofmannus* rightly answers, *tract. de origine formarum*, that *Aristotle* does so often attribute an act to the seed, that it is the part of a man very unskillful to urge only those places wherein he saies it is an aptitude. Howbeit, more Reasons shal be produced in the following Chapters, wherein we shal treat particularly of the generation of living things, viz. Plants and Animals: and what hath hitherto been alleadged shal be explained and confirmed, and such objections as may yet be made shal be answered.

Whether  
the seed be  
potentially  
animated?

See also of this Subject the lately commended Doctor *Caspar Hofmannus*, who in *tract. de form. origin.* joyned to his Books of the Generation of Man, proves the same Opinion by most firm reasons, and solidly refutes the contrary Opinion of *Bonamicus*, the *Conimbricentian Collegiatus*, *Peter Fonseca*, *Franc. Suarez*, *Ant. Ruvio*, *Benedictus Pererius*, *Franciscus Vicomercatus*, *Fredericus Pendasus*. And in good deed the judgment which he makes of the *Conimbricentian Collegiatus* is most true of al those who defend the Education of the Soul out of the aptitude of the matter, and deny that seeds are actually animated. Not to say (quoth he) that they mix many things not belonging to Natural Philosophy, they invent distinctions little less than foolish, they put conditions where they ought not to be, the greatest difficulties they touch not so much as with their little finger: in a word, they intangle and obscure, but do not explain the Question.

But the Soul frequently uses the Spirit (in its shaping the Body) which is in the seed, and makes it to be fruitful, and resembles the Element of the Stars, as *Aristotle* tells us, *2. de generationat. cap. 3.* And as long as that spirit is in the Seeds, so long the soul is as it were in its proper subject: but as soon as that spirit vanishes, the Soul can abide no longer in the seed, and the seed becomes unfruitful. Which spirit I admire that *Fienus* could not discern. Certainly if he had seen a spirit drawn by Chymical distillation out of dry seeds which wil take flame, he would not have written, *de format. mat. quest. 6.* what spirituous substance can there be in the seeds of Plants, kept a long time in a Box, and dry, but yet fruitful?

The soul  
uses the  
spirit  
when it  
shapes the  
body.  
Whether  
there be a  
spirit in  
the seeds  
of Plants.

He indeed objects in *Apolog. Adversus Sanctiacruzium*, pag. 99. If there are (quoth he) Spirits in Plants, in what place are they generated? For there ought, as in Animals, so in Plants some place be assigned, in which they spring, and from which they flow into the Plant. Again, he saies; there is no actual Heat. But in Plants there seems to be no actual Heat. For if there were it would be perceived some way or other. For a tangible quality is the proper object of the sense of feeling. Therefore where it is it must needs be perceived. How comes it therefore that in a great heap of Herbs, and a great heap of Seeds, Corn, Pulse, there is not at least some smal heat perceived? Thirdly, heat and cold are contrary qualities, and mutually destroy one another, and the greater and more intense does overcome and corrupts the lesser; how can it therefore be that this heat in so many Plants which last all the Winter, should not be extinguished. For the Heat of infinite living Creatures being much greater, is extinguished by the Winter cold, and why should not that of Plants be extinguished if they have any?

But these are toies unworthy so famous a man. For, first there needs no place nor cavity in Plants for this spirit to breed in as there is in Animals: for as they have not any thing answering to the stomach or Liver of Animals, wherein their nutriment is bred, but that nutritive power is spred through their whol body: even so that spirit is bred in the whol body of the Plant. And if any man shal hold, that in the root or trunk rather, as the nutriment so the spirit also is chiefly elaborated, he wil hold nothing that is absurd. And that there is such a part in Plants that are tender is manifest, as in the Colewort and many more. For although the cold and frost do so hurt the Leaves that they die: yet if that part which is in the middle, which the Germans call the Heart, remain safe and sound, the Plant recollects it self and grows again. But if that part be also hurt the whol Plant dies. For although (as *Fienus* objects) branches cut from the Tree do grow; yet that makes not against our Assertion. For as those souls according to the division of their subject, are in some sort divisible: so also the spirits are which make the proper subject of the Soul.

Secondly, That also is of no moment which he saies: where there is no Heat, there is no Spirit; and where Heat is it must needs be felt. Is there not I pray you Heat in the Spirit of Wine? and is it actually felt? Is there not fire in all mixt bodies? and yet are they al actually hot? by no means. For as *Zabarella* rightly teaches, *Lib. 2. de mist. generat.*

rat. & Interit. the Qualities in mixt bodies are after a sort hidden by the tempering of contraries, so that neither of them can be distinctly discerned. Nor is that objection of any force if it be not felt in one Plant, it ought to be felt in a great Heap of Plants. For the Nature and proportion of mixture is one and the same in a great Heap of Plants as it is in one Plant. But hath *Fienus* never seen what an Heat is raised when such an heap of Plants comes to putrifie, or when an heap of Corn begins to sprout? Certainly in Granaries even in the coldest time of Winter, heaps of Corn which have lain long unstirred do conceive no small Heat, which a man may feel with his Hand. Yea and the Corn it self if it lie long unstirred does sprout.

Thirdly, That this same Spirit and Heat in some Plants (for all do not outlast the Winters cold) is extinguished, comes from the nature of mixture. For there is a several mixture in several Animals and in several Plants. Geese go bare-foot in the cold Ice which men cannot do. Rosemary is hurt with a small cold, but so is not the Fir-tree. But I easily agree with *Fienus* that some hidden Quality of kin to the Element of the Stars does concur.

### Chap. 8. Of the Generation and Propagation of Plants.

**A**Nd so much may suffice to be said of the Original of Souls in General: and it hath been sufficiently declared that all living things do multiply themselves by their seeds, and that in the seed is the Soul which is transfused from the Generator into the thing generated. For the clearer manifestation whereof I think it best to declare the same particularly with reference to the several kinds of live things. Now there are two kinds of live things, *How many kinds of live things* Plants and Animals, or living creatures: which have also a different way of propagation. For there is in some living Creatures sexes, in others not. In such as have no sexes one seed is sufficient, which is a body so elaborate and disposed by the Generator, that when it is perfect it may be separated from the Generator, subsist intire by it self, and with it the soul of the Generator may be transferred into the thing generated. And then a Tree ingenders as (*Scaliger saies, Exercit. 6. sect. 10.*) when it produces seed. And that this seed is animated, appears from the reasons propounded in the foregoing Chapter; and it is so manifest, that *Job. Gallego de la serna* a Spaniard, was forced to grant that the seeds of Plants were animated, *de Princip. Generat. Lib. 2. cap. 6.* (although he denies that the seeds of Animals are animated) and writes that this opinion is so founded upon the most firm reasons of Philosophy, that they being understood no true Philosopher can deny the same. And the reasons are indeed most strong whereby it is proved that the seed of Plants is animated. For in the first place since when the seed was in the Plants it was animated as being a part of the Plant, surely when it is separated it must be animated; since no cause can be assigned which drove out the soul, nor can separation alone do that, for even in the separated seed also the actions of a soul appear, and therefore as Branches, Roots, Buds, Bulbs, by avulsion do not lose their soul, but grow and flourish: it is also so ordered that the seed being separated from the Generator can subsist intire and fresh, although some seed a longer, other some a shorter while, which other parts pluckt from Plants do not commonly do, but presently die. Moreover as soon as by the Heat of the Sun, yea and of the Fire in the Winter time, it is but warmed in a stove, and finds fit matter, or but a little Water if it be moistened therewith as is seen in the making of Malt, it begins to display it self, and first thrusts out a Root, by which afterwards it draws nourishment, and forms the body of a Plant like that it came from: which formation of the bodies of Plants is no less wonderful than the Generation of Animals. *The wonderful Generation of Plants.* For so it attracts matter fit for every part, Roots, Flowers, Fruits, and gives all parts their Magnitude, Figure, Scituation, Colour, in a certain measured proportion, that no Geometrician or Painter can imitate its workmanship. Moreover, since we see that Plants not only by their Roots, but also by a small Branch of a Willow, a bit of an Hop or Acorns Root cut off do grow up into a like Plant, the Soul being pluckt away with the part; and it is manifest that of a branch of a Willow or a Vine, or of another Tree, although in it there is no Root, nor all the parts of a Plant, yea of a Lease only of an Indian Fig-tree an whole entire Plant is formed; and no other cause can be assigned of the formation of this new Plant than the soul pluckt away from the former Plant with a part thereof: why should we not conclude that a Plant is formed of the seed after the same manner? Nor is it credible that all the other productions of Plants are made by the communication of the soul from the former Plant and

and only that made by the seed should be performed without the presence of the soul in the seed. But more likely it is that as when Roots, Bulbs, Branches, Boughs are put in the Earth they do not from thence receive their soul, but that with the soul which they actually had they perfect themselves by producing necessary parts and organs: that in the same manner also it is in seed. Nay we have more reason to think that this should happen in seed, because it is generated by the Plant to this very Intent, and hath a much more perfect disposition necessary for the conservation of the soul and its propagation than the Roots or Branches; since the wonderful artifice of Nature is apparent in many seeds. There is indeed one man who conceives that this does not declare the manner of the souls propagation, for this reason, because in Growing whatever grows on the Plant is a part of its body, and the part ought to have the same soul that the whole hath: but the seed is no part of the body nor grows fast to the same. But although it cannot be denied that the seed of a Plant since it is not generated to that end to abide upon the Plant, nor does always stick to the same, but may be separated therefrom, is not after the same manner a part of the Plant: yet because while it is in the Plant it lives by the common soul of the Plant, in that sense also it may be called a part of the Plant. But since it is made to be separated therefrom, it may most conveniently (as was said in *Cap. 6.*) be termed the fruit. Which is equally animated with, yea and after a more noble manner than the parts, viz. inasmuch as thereby the soul may be propagated, which in Animals by the parts it cannot be. Sure it is in the meanwhile, that as when the Soul is diffused into new matter it becomes neither greater nor lesser: so also when the soul is propagated with the Seed; the soul of the Parent is not diminished thereby.

For here it is to be noted, That there is not one and the same manner of propagation in Plants; which being observed that may easily be cleared which hath scrupled some, and among the rest also *Franciscus Vallesius, de sacra Philosoph, cap. 1.* how that should be true which we find written in *Genesis 1. verse 11.* that God commanded that the Earth should bring forth Herbs or Plants, having Seed in themselves according to their kind; when as the Willow, Fern, and very many Plants besides, do bear no seed. For the seminal nature in Plants is not one and the same, nor does it confine the seed to Fruits and Cods only; but this happens to some alone; but in others the seminal Vertue is adherent in other parts, sometimes in one, sometimes in more, and sometimes in different parts. For examples sake, Poppy is propagated only by its seed, not by its root, stalk, or leaf. And so it is with Lettuce and very many more. Rosemary is propagated both by seed and branch, and so are Pear-trees and Apple-trees; the Hop by its root; the Indian Fig-tree by its leaf; Onions and most bulbed Plants by root and seed both; such as bear buds, gossings, or palms, are propagated by their branches, as the Vine, Willow, and others. Also some have their seminal vertue in the tears or liquor which drops from them. For as the souls are more or less noble; so for the multiplication of themselves they require a more or less noble matter wherein to propagate their seminal vertue. And hence it comes to pass that Mushrooms or Toadstools being the most ignoble of all Plants are propagated only by pouring their decoction about the Roots of Trees. Yea, the seminal matter of Plants may be transferred in inundations of Water, and in Rains, as *Theophrastus, Lib. 1. de Causis plant. cap. 5.* relates, how by reason of a certain thick shower of Rain, *Laserpitium* sprung up in *Apturea*, whereas it had never grown in that part of the World before; and that there a great Wood hath grown up where there never was any before. So that it may rightly be said of such things which are beleaved to spring out of the Earth of their own accord, that the nature seminal rather lies hid than is not, as shall be said hereafter when we handle the Original of things which spring of themselves. Nor am I inclined to say with *Vallesius*, that there are either Animals or Plants, which though at the first they were not created, yet they might afterwards grow naturally from the Elements of the World. For the Elements of the World have no vertue to produce such a seed. Nor let any man attribute this Formation of Plants to the Suns Heat. For this Formation is not only made when a Plant is cherished by the Heat of the Sun, but by the Heat of the Fire also. And it belongs to the Form and not to the Sun to determine Quantities. For Nature uses Heat as a Minister or Instrument, not as a Law-giver or Work-master. Otherwise in all Plants that same Quantity would be produced, and the same figure. For the Sun is the same to all; and the store-house of Mother Earth is the same; and the contrary is seen to happen, as *Jubius Cesar Scaliger* writes in *1. de Plantis.*

Sundry manners of the propagation of Plants.

Plants propagated by Inundations of water, and by rains.

The formation of Plants not caused by the Sun.

Nor

Nor let that trouble any man in this place which *Thomas Fienus* alleadges *de format. fact. quest. 5.* as also was said before, that a Plant is produced after one manner from a Root, a Branch, or Leaf, and after another manner from the seed. That out of the former a new Plant is not produced, but they themselves when cut off from the Plant are new Plants, because by the cutting from the whol, they have already the vegetative soul multiplied by division, but that the contrary happens in seed. For that the seed is not a new plant, because it hath no soul, but it becomes a new Plant by the souls coming into it after it is planted in the Earth. But here is no diversity of propagation; for the Root, the Branch, the Leaf, is not an entire Plant, and after the same manner as by the cutting off of these from the Plant, the soul is multiplied by division; so also by the Generation and emission of seed the soul is multiplied. And whereas he grants the Soul is in the Root, the Branch, the Leaf, and denies it to be in the Seed, he does it without Reason. For since in it the same Operations appear as in those; why should we not grant the soul to be as well in it? And if in the Seed cast into the Earth there is no Soul, whence I pray you is it afterward produced therein, and whence communicated? Also that is false which he writes, That the Soul which is in the Branch or the Root planted, is the same numerically with that which is in the Tree or whol Plant. Indeed it was the same in number while the root or branch was on the Tree, but after it was cut from the Tree it began to exist by it self; and was made different in number from that in the Tree. I wonder also that *Fienus* should deny the Seed of Plants to be animated, since nevertheless in the Chapter foregoing, *quest. 5. Conclus. 6.* he expressly holds that the Conformation of the Seed in the Earth is not an essential Generation, but only the perfection of a new Plant already constituted and generated in the Tree. For there is no other Generation of a Plant in the Tree, save when seed is generated.

The wonderful multiplication of Plants.

But concerning the Seed of Plants, two things are here to be observed: the first is, That that same multiplication whereby the Soul diffuses it self into the new Plant, is most of all manifest in Plants, and almost infinite. Not to speak of Poppy, Turkey Wheat, and very many others; Tobacco does so multiply it self, that he who first by numbring, and then by weighing (for it were an endless labor to number all the seeds) wil take a scantling and compute the number of the seeds, he shal find that of one Seed more than three hundred thousand seeds do spring; and if the product of these be sown the third year, he shal find an encrease of an hundred thousand Myriads (a myriad containing ten thousand.) So powerful was that Divine Benediction; *Encrease and multiply.*

Two parts of the seed in Plants.

Moreover, This also is to be noted touching the seed of Plants, That in them as in all seeds there are two parts; the one primary and which is only worthy of the name of seed; and another which serves only as a covering. The former consists of the Soul, which is the Author of the life and formation of a Plant, and the matter, of which the first rudiments of the Plant, viz. the Root and the first Sprouts are constituted. For the Seeds of Plants in what ever place moistened and cherished with heat, even without the Earth, do first gape and thrust out their roots, and afterwards their first sproutings: but the body of the perfect Plant cannot be entirely formed, unless aliment be drawn from the Earth by the first small roots. And so in these there is not the same Agent and Patient, but the Soul is the Cause of Formation, I say the Efficient and Agent Cause, and the Matter is the Patient on which it works. But that which in Plants is properly the Seed, and hath the soul and matter out of which the

The pulp of the seed.

first Rudiments of the Plants are framed is only that pulp which contains in it the Idea and delineation of the whol Plant. And indeed the whol pulp of the Seed is not animated, but only that part thereof which is commonly called *Corculum*. Which part if it be corrupted, the seed wil not grow. And therefore the Pismires are reported to gnaw that part of the seed that when it is by them hoorded up it may not sprout. Contrariwise, although the rest of the Body be gnawn by worms, yet it grows, provided the Heart be safe, as we see in Beans and Pease, and French-beans. But the rest and greatest part of the Pulp is not made in vain, but is in place of Nutriment as it were for the tender Plant which is immediately produced of the seed most properly so called, as is easie to see in French Beans, which being set in the ground, when they begin to shoot one part goes downwards and makes a root, the other goes upward and makes the rest of the Body of the Plant. On one side of this tender Plant lies the rest of the body of the seed, out of which a channel or pipe of Conveyance goes into the tender Plant, by which alimentary juyce is carried thereinto, until it grows up and gets strength of it self to draw alimentary juyce out of the Earth to it self, and to elaborate the same. In respect

The Bark of seed why made

therefore of the pulp of seeds it happens that the remaining part of the seed so called, viz. the external Bark, is only the Case (as it were) of the true seed which defends the pulp or true

true seed against external injuries, and that external Bark to the Barks, and Shells, and Membranes of Eggs. For since the seeds of Plants are not presently cast into the Mothers Womb as the seed of Creatures that bring forth live young ones is, but are many times kept long out of the Earth which is their Matrix, this Bark defends that same internal seed against the external injuries, lest before it begins to sprout, or in the very sprouting, it should be hurt by external occurrent causes.

From which it appears, although (as was said before *cap. 6.*) the seed may also be called Fruit: yet that there is some difference betwixt Fruit and Seed. For that is properly seed which is simply necessary to generation such as is the marrow of the seed, which also nevertheless because it is produced by the Generator it may also be termed the Fruit. But because the Creator hath compassed some seeds with Pulps which are not necessary for the generation of that species, but serve for meat for man or for other uses, as in Cherries, Apples, Pears, Peaches, Grapes, all that wherein the Seed is is commonly called the Fruit. And so according to nature the Fruit is either Seed, or that which contains seed in it, as *Aristotle* writes, *1. de generat. Animalium, cap. 18.* Yet by Art it may come to pass that the fruit so called may be without seed: as Cherries without Cherry stones, and the Berries of Grapes without stones: which is performed by taking the marrow out of the Branch. From which it appears that the Marrow in Trees does chiefly make towards Generation.

### Chap. 9. Of the Generation and Propagation of Animals in General, and of Bruits in Special.

HAVING said thus much in general of the Original of living things, and then more especially of Plants; in the next place we are to treat of the propagation of live things, and first of Bruits. Where in the first place we are to give warning that some think too meanly, yea, and grossly of the Souls of bruit Beasts. For some (truly) there are whose understanding is so plunged in the Elements that they can understand nothing above them; and therefore they endeavor to deduce all things out of the Elements, and dare to write that the first individuals of bruit Beasts were totally and according to either part (*viz.* their matter and form) produced of the Elements, and that all bruit Animals both in respect of their body and their soul are in all generations Elementary, and shall continue such to all Generations. But *Scaliger* was much more in the right, *Exercit. 307. Sect. 20.* judging of the Souls of Bruits from their actions which are far above the forces of the Elements. For admirable and wonderful actions appear in Bruits, which can proceed from no Element nor Elementary nature, but depend upon a more noble Principle. Such wonderful things are related of the wit and capacity of Elephants, that they seem to transcend all belief, unless they were related by credible Persons, *Pliny, Lib. 8. cap. 3. 4. 5.* *Christopher Acofta*, and at large by *Justus Lipsius, Cent. 1. Epist. 50.* What wonderful things in Peace, what admirable things in War an Horse performs, the same *Lipsius* shews plentifully; *Century 3. ad Belgas, Epist. 56.* What happened to the Sybarites who could dance both they and their Horses, Histories testify. And who will not believe the most credible *Scaliger* being an Eye Witness, who relates a strange story of the apprehensiveness of an Horse, *Exercit. 209.* concerning *Alexanders* Horse *Bucephalus* who does not read strange things both out of *Gellius*, and many other Historians? Also what the Sagacity of Dogs is, and their fidelity to their Masters, and their aptness to learn any thing may be learn'd from *Pliny, Scaliger, Camerarius*, and *Lipsius, Cent. sing. ad Italos & Hispanos, Epist. 59.* & *Cent. 1. ad Belgas, Epist. 44.* yea, and it is manifest by dayly Experience. What tricks Apes play, and how they counterfeit mens actions, is unknown to none. That an Hare learn'd to keep company among Dogs without fear, and would go on hunting with them (among many other such things) *Julius Caesar Scaliger* testifies, *Exercitat. 224.* Among Birds *Justus Lipsius* reckons the Letter-carrying Pidgeons, in *Epist. 59. Cent. sing. ad Italos & Hispanos.* Who knows not that Parrots will learn to speak as men speak; yea, that the Mag-pie, Nightingale, and Thrush will do as much, *Martial, Plutarch, Ovid, Pliny*, and many others witness. That Cranes journey with a certain Discipline and keep watch, is averred by those that write the History of Birds. The wit and industry of Bees and Pismires is vulgarly known. Every Cottage is full of the Artificial Works of the Spider. Beasts know their own strength and Arms and their own weakness; and have their familiar Medicines which they are acquainted with.

whether  
the Souls  
of Bruits  
spring  
from the  
Elements?

the won-  
derful un-  
derstan-  
ding of  
Bruits.

Which

Which wonderful abilities and works of Brutes they that endeavor to derive from an Elementary principle do but wash the Blackmore.

And as the Operations of Animals are more various and wonderful than those of Plants; so their propagation is more labored and curious. It is not my intent in this place to propound all that may be said of their differences and various Originals, but only as much as shall suffice to declare the propagation of their souls. Now to the Generation of perfect Animals there is required a double Generator, and neither is of it self sufficient to Generation; though there is a controversie as touching the manner. For I know the disputes betwixt the Aristoteleans and Physitians concerning this point, whiles the former conceive that the seed of the Male is the only efficient, and that the Female affords nothing but matter: but the latter hold that the Female affords seed also which is both effectual and fruitful. Which great Controversie being *prolixæ* I think not fit to handle the same in this place. Certain it is that neither Male alone, nor the Female alone is sufficient to generate a living Creature, but both of them contribute their share whatever it is to the constitution of an Animal. Whence *Empedocles* also (as appears in *Aristotle*, 1. *de gener. animal.* c. 18.) said, That it is the joynt contribution of the male and female, but the whol proceeds from neither

The seed of the female is prolifick.

of them. They indeed that hold that the Seed of the male only does concur actually to generation may easily free themselves from many Objections urged against their Opinion. But most Physitians think the contrary, who hold that the formative vertue is as wel in the Seed of the Female as of the Male; and they conceive they have reason so to think, as for other causes, so because of the likeness of the yong ones, sometime to the Father, sometime to the Mother, and sometime to both: not only when Animals are generated by Animals of the same sort; but then also when Generation is made by Animals of different sorts, wherein the work of the Fathers and Mothers soul does manifestly appear. So a Mule is made of a Mare and a hee Ass, a Mulet of a stone Horse and a shee Ass; of an Ox and an Ass the strongest sort of Mules; the Indian Dog of a Tiger and a Bitch; the Dog-lyon of a Lyon and a Bitch; a strong Dog of a Wolf and a Bitch; the Laconick Dogs of a Dog and a shee Fox; of the Pard and Lyoness the Leopard; a Musmus of a shee Goat and a Ram; and many other Animals: of which see *Johannes Baptista Porta*, Lib. 2. *Mag. Natural.* Yea, and Histories record that a Woman coupling with a Beast hath brought forth a Creature like her self. Yet these men can easily free themselves from dubious objections. For this Law hath been established by the Creator, that as it were from two partial causes one principle and one total cause should arise, from whence one motion and efficiency should arise to the production of the yong Animal, but in a certain Order and Method. Nor should the Mixture of Souls or Forms offend any one in this case, by reason of some feigned Metaphysical Axioms, For the Male and Female are of the same sort, and therefore it is as little absurd that the soul of the two seeds should be conjoynd as for two flames to be united. *Hippocrates* did not count the mixture of souls so absurd a thing, as appears by that Speech of his, Lib. 1. *de Viſt. rat.* text. 61. *If any man cannot think that souls are mingled, he is void of reason.* Here *Fiennus* objects in his 6. *Quest. de form. fact.* If the Seeds should be mixed, and the actions of both should concur, their effect would alwaies be mixed, and alwaies half Masculine and half Feminine, and no yong one would ever perfectly resemble the Father or the Mother, but alwaies partly one, and partly the other. Also he thinks it impossible that those two vertues can alwaies so evenly conspire to one effect, but that they should often err, and instead of one part make two; or instead of two one, one formative vertue making one in this place, and of this part of the seed, and the other making another in another place and of another part of the seed; so that Monsters would be frequently ingendred. *Averrhoes* and others do easily answer this Objection who hold there is no active Principle in the Seed of the Female. But they also who hold that there is an active Principle, and a formative Faculty in the Females seed, have an answer for this Objection. How that God made two Sexes, and in all Animals created both Male and Female is a sure thing; but why he made Sexes is known to his own Wisdom. *Plato* relates a Fable in *Symposio*, That in the beginning there was no difference of Sexes amongst Men, and that all were then Hermaphrodites, but because of their Pride and Arrogance God cut Men asunder, and established the two Sexes distinct one from another, so that one could do nothing towards its own preservation without the other. But Sexes are not in Man-kind alone, but in other Animals also.

The mixture of Forms is possible.

But to the Objections of *Fiennus* it may be answered, That there alwaies appears a sign of the conjunction of both souls, and there is no creature but the yong one does resemble both the Parents, either in the external form of Body, or the dispositions of the mind, or in both.

Yet



Yet it is not necessary that they should alwaies equally resemble both Parents. For if either of the seeds be stronger than the other the yong wil most resemble the Parent which that seed came from. Nor is it any way necessary that an Error should be committed in conformation if the souls be conjoynd. For they are of the same species & like as when two flames are united they perform one inseparable effect, so two souls joyned together do conspire to make up one effect. And there are also examples hereof in Plants; whereof Scaliger *Exercit. 106. sect. 6.* thus writes: *I wil tel you a greater matter which wil more advantage you in searching out the manner of Generation, than to know all unprofitable rules and Laws of Cylinders. Set three Date Stones, and so many Palmes wil thence grow up, and so distinct, as the Stones themselves were; and these three branches wil grow together and become one Palm with one Stock. And of these Stones no oiberwise set than aforesaid springs the Palm-tree as Theophrastus informs us: one stock in number arising from three Trunks, separated in Original, Matter, Quantity and Place. So far Scaliger.* For every stem and each palm first springing out of the Earth hath its own soul: yet nevertheless these three Palms grow into one numerical Palm; which is not only to be seen in the palm, but in the Ingrafting of all Plants in which the Stock on which the Branch is ingrafted hath its own soul, also the Branch hath its soul: of the branch and stock one Plant and Tree is made and furnished with one only soul. And not only of the same sort, but different souls are also joyned, as was said, and may be seen in the generation of a Mule, in which the souls of an Horse and a shee Ass are joyned, as is manifest by the shaping of its parts; also in the ingrafting of a Pear upon an Apple, and of other Trees of several sorts. For where the power and faculty of the soul is, there is the soul it self: but in the conformation of a Mule the actions of each soul, both of the Horse and the Ass, are apparent. And therefore here also with Scaliger in *Lib. 1. de Plantis*, we must say, *where the thing it self is apparent, if Opinion contradicts the same, we must seek a reason, and not be Ignorant of the thing.* And therefore whatever objections are made concerning one seed whether of the Male or Female, they are of no moment. For neither is one seed alone sufficient for Generation, but both are necessary.

The Con-  
junction of  
souls ab-  
surd.

Now the Generation of Animals is twofold; for some bring forth Eggs out of which living things are hatched; others conceive live things within themselves and afterwards bring them forth. To each of these Generations the seed of the Male and Female are requisite, and of them joyned together the Conception is made in which the soul is the principal cause of the shaping of the young Creature. For al the reasons which prove that the seed of Plants is animated, the same do also firmly prove that the seed of Animals is animated; and the reasons which prove that generation is made in Plants by the animated seed, the same reasons demonstrate the same thing in Animals. Some indeed do count it a vain way of reasoning, to argue and demonstrate the Generation of Animals from the Generation of Plants. But in my judgment they are therein much deceived. For since Generation is an action of the vegetative faculty, or of the natural faculty as Physicians call it, and that faculty is most vigorous in Plants, the way of generation in Animals may thereby wel be proved. For since all Generation is performed by communication of the Soul and the Body, or as *Zabarella* speaks, every Generator when it Generates does communicate some of its matter and some of its form, and this communication of matter and soul is most conspicuous in Plants, so that it can no waies be denied that Plants communicate their souls by Seeds, Branches, and roots, and that no Generation is made without the soul be communicated by the Generator, Why should I not hold that it betides after the same manner in Animals? And since in Plants the presence of the form in the subject is collected by firm demonstration from their operations; and in the seed of Animals the operations of the soul, Attraction, Formation, Augmentation are found, we justly conclude that the soul is present therein. And since no Agent can immediatly concur to the production of a living Creature, but it must have the same degree of life formally; and the seed of Animals by its own proper virtue, without any new assistance of the Generator, or any motion or direction thereof, yea separated therefrom in place, and many times also in time, does produce a living Animal, and is the principal and immediate Agent in the production of the young one; it must of necessity have formally a like and univocal Soul. And this appears both in such as breed Eggs, and living things.

The Ge-  
neration of  
living  
Creatures  
twofold.

The Seed  
of Animals  
is anima-  
ted.

For in the first place, as concerning Eggs, that the soul of the future Animal is already in them, this shews, that as soon as Eggs are cherished by a convenient Heat the soul in them begins to rouse it self and forms an Animal, like that from whence the Eggs came. Nor can the Generator be the cause of this form; since it is many times dead when the Eggs are hatched

Eggs have  
a soul in  
them.

ched; nor can any other univocal cause be so much as imagined. That the Eggs of Silk-worms are hatched by a temperate heat, Hieronymus Vida does testify in the first Book of his Poem of Silk-worms.

Nor are the Silk-worms Eggs hatched one way  
Alone, for some do in the Sun-shine lay  
The little seeds, until they hatched are.  
Nor shouldst thou be asham'd, O! Lady fair,  
To give them (wrapt up in thy Lilly Breast)  
Betwixt thy Rosie Nipples a warm Nest:  
If thou do'st love to wear a brave silk Gown:  
For in a day or two, thou up and down  
Shalt see the wonderful little Worms to creep,  
Who in their Eggs did lie before asleep.

Eggs com-  
pared to  
the seeds of  
Plants.

'Tis commonly known that Hens Eggs are hatcht by Ducks, and Ducks Eggs by Hens. Yea and *Jul. Caf. Scaliger* relates that in the City of *Grand Cairo* Chicken are hatcht by the Heat of a Furnace. In all which waies there can be no univocal Agent assigned, but the soul which lies hid in the Egg. For the Eggs of Animals being of a middle nature betwixt the seeds of Plants and Animals do agree with both in some things, and in other things they differ: they answer to the seeds of Plants herein, because they contain in them both the soul and the matter of the future yong one; moreover the true seed is covered with a Bark and Membranes: but herein is the difference, that the seeds of Plants when they are committed to the Ground, from it they draw the matter which is necessary to form the body, and of the matter of the seed the first smal Roots and sprouts only are framed, the other parts of matter being drawn out of the Earth: but in Eggs since the soul is so barricadoed and shut up in Skins and Shels, that it can draw nothing from without, and in the mean while the yong one is in a manner perfectly formed in the Egg. Eggs do not only contain soul and matter fit to shape the first rudiments of the yong Creature, but also matter necessary to shape so perfect a Body and to nourish the same. And with the seeds of Animals they do herein agree, that the seed is first of all bred in the Stones or the parts analogical to the Stones, and that the seed is perfectly cast by the Male into the Womb of the Female, which is not so in Plants whose seeds are exposed to many external Injuries, being out of the Earth their Nurse. And herein such as breed Eggs differ from those which bring forth living Creatures, in that the seed of the Egg-bearers is not perfected in the Womb of the Females, as the seed of such as bear live young ones is, but is perfected without, and therefore their seed does not remain liquid like that of the others, but had need to be governed by an external help and receptacle.

Now the Generation of living Creatures from Eggs is not after one manner. For some are excluded by the Females while they are Eggs, and after become Animals being cherished by external Heat. But in Crabs the Eggs stick fast to the Mother, and Crabs are generated in them while they are there sticking.

Animals  
which  
bring forth  
quick  
young ones.

But such Creatures as engender within themselves or in their Wombs, do all generate by the meeting together of the seed of the Male and the Female; which seeds as soon as they are conceived in the Womb the souls displaies it self and begins to frame it self a fitting mansion house, which being perfected is called a living Soul Live-wight or Animal. Now the seed of both the Parents although it hath the soul in it, and therewith lives of it self, yet is it no Animal, nor can an Animal be made thereof unless both are joynd together. That thing is animated which hath a soul in it, and lives thereby of it self: and that is an Animal or living thing which is furnished with a Soul and Body that hath all the Organs requisite to such a Creature. But the seed of the Male or Female alone cannot become an Animal, but the Conception which consists of both seeds, or of the seed and menstrual Blood, becomes an Animal. And therefore the Male does neither Generate in himself, nor doth he engender an Animal essentially perfect, nor does he engender alone.

The Seed  
of Animals  
is anima-  
ted.

Now that this seed of Animals is animated or hath the soul in it, the Conformation or shaping of the yong one shews. For either the yong is formed by a cause without the seed, or within it. Not without it, for none can be imagined; or if any, it must be the Womb. But that formation does not spring from the Womb is the common opinion of learned men, nor is it destitute of reasons to justifie the same.

Among

Among late Writers (truly) *Johannes Gallego de la Serna*, de princip. generat. Lib. 3. cap. 20. endeavors to prove that the Soul of the Mother is the principal cause of the Organization and Animation in other Animals, and of the formation and union in Man. And to prove his own Opinion he alleadges certain Authorities of some Philosophers and Physicians; but contrary to their own evident Understanding, which therefore I list not to set down in this place: And the Reasons which he uses are evidently frivolous.

The yong ones of Animals are not shaped by the womb.

The first is, That there is no Organ in our Body, which by its own similitude and natural Inclination hath the power of attracting any useful substance, for attractions sake alone, but to enjoy the same, and consequently to change the same; but the Womb hath a power and most vehement Inclination to draw to it self the matter of the child; ergo it draws it not only for attractions sake, but to enjoy, and consequently to change the same. But I answer to the minor, that it is false that the Womb in Creatures that have blood does draw to it self blood necessary to form the yong one; but the soul which is in the Seed draws the same, and therefore also changes the same. For as in Plants the seed cast into the Earth, or a branch or bulb set therein, does first form and produce roots by which it draws nourishment out of the Earth; so the soul in the yong one in the Womb forms the umbilical Vessels, by which it draws blood and spirits.

Moreover he conceives the Generative Faculty hath need of a peculiar Organ, and that the Womb is that Organ, since in the whol body there is none like it so accommodated for such an action.

But both of these suppositions are false. For in the first place the changing faculty is not Organical, nor is it performed in a part as it is Organical, but as it is similar, and furnished with its innate heat. And although the stomach and Liver, and other parts, which do change and generate some substance are Organical: yet they change not nor generate any thing as they are Organical but as they are similar. But they have their Organical constitution for their more convenient Reception, Retention, and Expulsion. So the stomach hath the upper Orifice which receives the meat and drink, the Cavity wherein it holds the same the lower Orifice, by which the generated *Chylus* is sent forth. But Concoction is performed in the stomach inasmuch as it is a similar part, and furnished with its Natural Heat. Again, that pre-supposition is false, That the Womb does change and inform that blood which comes in for the formation of the Child; since that is done by the soul in the seed. For as when the yong one is formed it hath in it self a nutritive and growing faculty which does not proceed from without: so it is also in the formation or shaping of the said yong one. But the Womb only affords the place wherein the formation is made, and all the Organical Constitution thereof is contrived to that intent and purpose.

On the contrary, There are most evident Reasons which prove that the Womb of the Mother does not perform the shaping of the Child, and that it does not give the soul to the Child. For in the first place, if the Womb did shape the Child or yong one whatever, the Male should not communicate the active Principle of Generation, but only the passive. Yea, and the Female alone should be the cause of Generation, as bestowing both matter and form, and so the female might conceive in her self without a male. Secondly, no reason could be given why the yong one should be sometimes like the Sire or Father. Thirdly, why should not Females be alwaies generated, and how comes there to be Males? Fourthly, That which performs the work Formation must needs immediately touch the Child or yong one: but the Womb does not immediately touch the yong one, but Membranes come betwixt it and the Womb, and those watry Excrements contained in the Membranes. For whereas *Joh. Gallego* conceives it conveys its vertue to the yong one through the Membranes themselves, it is absurd, nor are the Membranes parts of the yong one, as *Gallego* would have it. Much less can that vertue pass through the Excrements. Nor is that of any moment which he saies of the Torpedoes benumbing a Mans hand who touches it only with the end of a very long rope, and that the Load-stone moves Iron through a thick board. For those actions are performed by spiritual Species, as was said before in the Second Discourse, chap. 4. of this Treatise, which are as a Ray continually thrust forth, as *Ful. Casar Scaliger*, Exercit. 344. Sect. 5. speaks. But the concocting and changing and forming Faculty is immanent, nor does it pass from one subject to another, and remaining in its own proper subject, performs its operations, but does not transmit its force through the Membranes and excrements out of the Womb. Indeed *Johannes Gallego* conceits that it is the part of a blockhead to doubt, Whether the Soul of the Mother can animate the internal parts of the child, although they are covered with Membranes. But I am of Opinion the quickest wit in the World cannot conceive how the Soul being absent and distant in place, can animate the yong one.

one. For suppose the Womb could work some alteration thereupon, through the Membranes and Excrements of Water, yet could it not cause animation.

*In the seed  
itself is  
the Cause  
of Confor-  
mation.*

Therefore we must needs hold that the Cause of Conformation is in the seed it self. Which is the common Opinion of learned Men, viz. of Aristotle, 2. de generat. animal. cap. 1. 3. 20. 1. de generat. animal. cap. 20. 21. 4. de generat. animal. cap. 1. and elsewhere. Galen, Lib. de format. foetu. cap. 2. 3. 5. 14. Lib. 1. de sem. cap. 8. 18. 2. de sem. cap. 1. 2. 5. 14. de usu partium, cap. 7. 8. and others. And it hath questionless strong reasons to support the same. For in the first place, since Conformation is a Natural act, it proceeds from an Internal principle, not an external. Secondly, conformation begins in the seed equally, and all the parts within and without are equally conformed. Thirdly, since in Birds which breed Eggs the principle of Conformation is internal, no reason can be shewed why it should not be so in all other Animals.

*The soul  
is the  
cause of  
the shaping  
of an Ani-  
mal.*

And if you now enquire what that internal Principle is, no other can be assigned save the Soul. Some say it is *logos Plasticos*, or a formative Understanding or Faculty: but unless thereby they understand the soul it self furnished with a formative Faculty, this Opinion cannot hold, and hath been sufficiently refuted before, chap. 5. Others hold it is the Native Heat: but neither is that the principal Cause of Formation. For so noble an action which all Philosophers cannot sufficiently admire, can only be ascribed to a quality. And heat is only a common Instrument, nor can it give to all parts their quantity, figure, and number, and out of question no quality can act unless it be directed by a principal and superior faculty, of which there is need in this case.

*The Con-  
troverſe  
touching  
the forma-  
tion of  
the young  
one stated.*

Nothing else therefore remains which can be the cause of Conformation in the Seed, save the Soul it self. Which while Thomas Fienus denies he is in great Error, *quest. 5. conclus. 6.* and in the first place he hath not indeed rightly stated the Controversie. For whereas he ought to have disputed concerning all Souls living, or all Animals, he contrary to the Rules of Demonstration, goes about to demonstrate an adjunct of the whole kind of Animals, touching one sort, viz. Man-kind. For it is not a thing proper to Man alone to generate from seed cast into the Womb, but common to all Creatures which bring forth young ones alive. And in the beginning of *Quest. 5.* he does not rightly form the Question, where he writes. The Question here is not, Whether the Soul brought into the Seed after Conception is the Efficient Cause of Conformation? but whether the Soul pre-existing in the Seed before the Conception, and bred in the Testicles of the Parents is the Cause. For there is no Question concerning the latter; but this is the Question in controversy; Whether the seeds of the Male and Female joyned together in the Womb, have an intrinsecal formative Faculty (which he grants) and consequently a Soul (for that necessarily follows) in them.

*'Tis pro-  
ved that  
the soul in  
the seed is  
the Cause  
of Confor-  
mation.*

For let us put the case that in a Man the Soul is introduced and confused by God: yet since in Brutes there can be no such Infusion it must needs be presently in the seed, and that communicated from the Parents. And this is sufficiently proved by one Argument which Fienus himself brings, so that there is need of no more, and that is this; that which shapes the body is within the Seed, as he proved, Conclusion the third. That which shapes is some Soul; for shaping is a proper power of the Soul. Ergo, there is a Soul within the Seed, or a Soul of the Seed: for that which he answers (as was said before, chap. 6.) is of no moment. I confess (saies he) the Premises are true. But I deny the Consequence. It is indeed rightly inferred that there is some Soul in the Seed, but not that it is the soul of the Seed. There is indeed a Soul brought into the Seed after that the Seed is conceived in the Womb, or planted in the Earth, or the Egg set under the Hen, when all things are put into act; but that is not the Soul of the Seed, or which did pre-exist in the Seed, or which was bred in the Stones, the Tree, or the Hen, but the Soul of the young one conceived being afterwards introduced thereinto. For suppose indeed that the Soul is introduced into humane Seed; yet into the Seeds of Plants, the Eggs of Hens, and the seeds of Brutes, 'tis false to hold that the Soul is afterwards introduced; For what introduces the Soul into the seed thrown in the ground, what introduces it into an Hens Eggs while a Duck sits over them, or while they are hatched by the heat of a furnace? Here can be no cause assigned by which the Soul should be introduced. And if the Parents should not give the Soul, but some external thing, like should not ingender its like. And what need is there I pray you (in this case) to multiply things to no end, and to hold two Souls; one which is the Soul of the Seed, or which did pre-exist in the Seed, and was bred in the Stones, or the Tree, or the Hen, and another introduced afterwards. And he contradicts himself in this point, while in *Conclus. 6.*

*when a  
Plant is  
generated.*

he writes: That the shaping of the Seed in the Earth is not essential generation it self, but only the perfection of the new Plant already constituted and generated upon the Tree; and

the

the bringing thereof now to a perfect act, which was before constituted only in an imperfect act; nor is it any matter what the vulgar people think or call Generation, or what they do not so call; nor what agrees to their understanding, but what agrees to the Truth. For the common people are ignorant of Philosophy, and knows not when and where a Plants form is truly produced, nor when is the Essential generation of a Plant; and knows not how to distinguish between the first act and the second, betwixt that which is imperfect, and that which is perfect: and therefore they take one for another; and conceive that a Plant is then first generated when it is perfected and operates, and when it brings forth Roots and Leaves; whose production is not the Generation of the Plant, but the operation and perfection thereof, being generated before. So far *Ficinus*. And in very deed it *Ficinus* as he rightly understood the presence of the Seed when Conformation it made, so he had also known the propagation and original thereof he might easily have freed himself from all doubts besides. For the truth in that point being discerned all doubts are easily resolved.

For although they that think otherwise do alleadg many things: yet they can bring nothing solid and firm for their Opinion: which knowing, that they might abuse the Reader contrary to the Laws of Demonstration, such things as they should dispute of the seed and formation of Animals in general, those they dispute in particular touching the Soul and formation of Man; which when they are examined in general and in their own place they prove of no force. For many being of Opinion that the soul of Man is not propagated from his Parents, but infused by God when the body is formed, and the same being also immortal; all those absurdities which are objected against the Animation of Seed from the Prerogative of the Humane Soul do fall to the ground if they be propounded in general so as to concern bruit Beasts also. For they are not able to shew whence proceeds the soul and formation of the Body of an Horse, a Lyon, a Dog, unless the Soul be derived from the Parents with the Seed; nor can they tel us who it is that begins the Delineation of the yong one in all Animals, or why it should be necessary that the said Information should be begun by one, and perfected by another. But especially they are not able to shew how out of the Eggs of Birds yong ones of the same kind are hatched, especially by a Bird of another kind sitting on the said Eggs, or when they are hatched by the heat of a Furnace, unless the Soul were already in the Egg. And therefore since in Bruit Animals those Arguments are of no force, the most of those also which are urged concerning the Generation of Man wil also be of no force. And although some distinguish betwixt the Conception and the Seed, and cal that white substance bred in the stones the Seed, which is shed into the Womb in the time of Copulation; and that Body bred of the Seed in the Womb the Conception, wherein there are some lineaments of the future Animal already drawn; yet they themselves cannot shew a Reason whence the Soul in Bruits (for here we wil set aside the Humane Soul, thence thereabouts, for the reasons aforesaid there is a peculiar dispute) should come into the Conception, if it were not in the Seed before; nor tel us what cause began that first delineation and figuration of the parts of every Animal. For whereas *Johannes Gallego de la Serna*, saies it proceeds from the Womb, that is altogether false. For to the Female should only generate, since she alone gives the soul, and the Male affords only the matter.

But let us see their Objections. In the first place many indeed Object, and therein also triumph, That nothing is animated but a body and its parts; but the Seed is an Excrement and a certain superfluous moisture bred in the stones, being just like the Chyle in the stomach, the blood in the Liver and Heart, and the milk in the Dugs. But in good deed this Argument of theirs is of no weight, as shal be also shewn hereafter in Chap. 14. For in the first place, they beg the Question, and this very thing is a part thereof, whether only the parts of the body, or the seed also be animated. For although the Seed is bred in the stones, as Chyle in the stomach, and is no nutriment of the body; yet it does not thence follow that it is an Excrement. For there is a third thing generated in living Creatures, viz. the fruit or seed, cal it which you please, which the seed of Plants does evidently declare. For some do make exceptions and say, that there is a difference betwixt the seeds of Plants and Animals, and that the Seed of Plants is not like the seed of Animals, but like the Conception made in the Wombs of Animals. But suppose it so to be; yet thereby is proved, that there is also somewhat bred in Animals which is neither a part of their Body, nor a Nutriment, nor an Excrement. Nor does that prove the contrary which *Johannes Gallego de la Serna* objects, *de princip. generat. Lib. 2. cap. 5.* while he writes that the seed of Animals cannot attain to that ultimate disposition to the Introduction of the Soul, which those parts of the same substances have attained, which have been turned into the substance of the parts; and that the seed hath only received from its organ assimilation, such as the concoctive Faculty was able

A refutation of arguments brought against the presence of the soul in the seed of Animals. The seed is not an excrement.

to give it, and such as Milk hath received, and that therefore it remains inanimate. For they are meer beggings of the Question, and the seed of Plants does demonstrate the contrary. For if the seed of Plants could receive that disposition necessary for the propagation of Plants; why cannot the seed of Animals receive the same? And milk it self which *Johannes Gallego* brings for an example, evidently declares that somewhat may be ingendred in the bodies of Animals which is no part of the body nor its Aliment (for the Mother is not nourished with the Milk she breeds) nor a meer Excrement: such as seed also is, which is not therefore bred in the stones by the concoctive Faculty only that it might be voided forth as all Excrements are, but therefore and to this end that by it a new Individual might be generated, and so the kind might be preserved. And therefore though the Concoctive Faculty does not animate the Seed, as neither in other parts does the aliment receive the Soul from the Coctive Faculty: yet after the Seed hath received from the Concoctive Faculty such a disposition that it can be a fit subject for the Soul, the soul which is in the animate body does communicate it self thereto as wel in Plants as Animals: which after it is separated from the Parent, by vertue and power of the soul which it possesse and hath received from the Generator it is able to constitute a new individual, or particular distinct live thing. For in them also the seed is first elaborated by the Concoctive Faculty; and when the seed is wel wrought and ripe, then the soul communicates it self thereto. The same comes to pass in Animals, nor is there any reason to shew that it is otherwise; save that in Animals as being more perfect there is a more labored preparation, and both the male and the female communicates somewhat to the Constitution of the yong one; nor is the seed cast into the Earth, but into the Womb. Nor let that trouble any one that the seed of Animals which bring forth quick yong ones, is of a different Nature from the seed of Plants, and that the seeds of Plants are wonderously and variously shaped: but the seeds of Animals represent only a Liquor like milk. For seeing the seeds of Animals are presently cast into the womb of the Mother, and cherished thereby, and therein receive blood necessary to nourish the yong one; there was no need that they should be fenced against external Injuries, by external coverings as the seeds of Plants and Eggs also are.

Howbeit in the Womb it self the Seeds of Animals do frame many things which are necessary for the Formation and augmentation of the yong one; such as are the Coats which in-fold the same, the Umbilical or Navel Vessels, and such things as belong to these. Finally, in such Creatures as produce Eggs, because the Eggs were to be kept long before the Chicken are hatched, and that is not performed by the heat of the Womb, but by an external Heat, yet they are covered with shels after the same manner as the seeds of Plants. For Eggs do herein agree with the seeds of Plants, that as in Plants to the marrow or pap which is properly the seed, other things are added either to guard the seed, or to make food for Man-kind, or for other uses; so also in Eggs other things are found besides the true seed. Which does even hereby appear, That the Eggs which the Hens lay untrodden by the Cock have all that is food in Eggs, yet are they unfruitful because they want the seed of the male. Which happens also in Insects. All female Silkworms without difference yield Eggs: but such as have not coupled with the male all their Eggs or seeds are unfruitful. Yet this difference there is betwixt the seeds of Plants and Eggs, that of those things which are added to the true seed, the Plant is neither formed, nor nourished, nor augmented; but the seed draws nourishment to it self out of the ground, save that (as was said before in Chap. 8.) the first rudiments of the tender Plant do draw their Nutriment out of some part of the Pulp; but Eggs, because without the Womb and out of the Earth, they become a perfect Animal, and the seed (of which at first the Chick is formed) is covered with a shel that it can draw nothing from without: in the Egg there lies already so much matter as may suffice to perfect the Chick til such time as it is hatched.

Secondly, *Johan. Gallego de la Serna*, Lib. 3. de princip. sem. cap. 5. promises that he will prove that the Seed is only a material principle of Generation, that no man unless he be blockish and stubborn, wil hereafter dare to deny the same. But he performs not his great Promises, and those are sleight Arguments which he brings. For in the first place he saies that the Seed is much more imperfect than the Generator, and the yong one to be generated. For it is a certain Excrement of the Generator. But I answer, That the seed also of Plants which he grants to be animated, is more imperfect than the Generator and the Plants generated therefrom, not because it hath no soul, but because it hath no formed Organs which lie hid nevertheless aptitudinally in the seed, which contains in it an Idea or Plat-form of them, and they are fabricated by the Soul it self. But that the Seed should be only an Excrement was before refuted.

Again,

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the seed of  
Plants and  
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Again, He conceits that the virtue of the same sort cannot be received in a matter of a distinct sort. But the form of the seed differs from the form of any Individual of what sort soever. But he does not rightly understand the nature of Seed. True indeed it is the soul cannot persist in a perfect manner, nor last long save in a body fit for it, and furnished with such Organs as it hath need of, but that it cannot be propagated by a different body, viz. the seed, and abide therein so long til it have generated and built a Body for it self, experience it self teaches that to be false, and he himself granted as much before in Plants. For there is indeed one soul in the seed, and in the Animal ingendred thereby: but yet that which is in the Animal differs not from that in the seed, save in the accomodation and perfection of Organs. Verily neither the seeds of Plants, nor the Bulbs, nor the Rootes, nor the Branches (if you consider the perfection of Organs) are of the same condition with perfect Plants; for example sake, the seed and bulb of an Onion after a sort is not a perfect Onion; the seed of Poppy after a sort is not an entire Poppy Plant; the Branch of a Pear Tree is not a perfect Pear Tree: yet in all these there is the perfect soul belonging to that sort of Plant. Nor is the matter in the seed and that in the young one of a different but of one and the same sort.

Thirdly, Gallego does also very much urge this Argument, 1. *de princip. Generat. Lib. 3. Cap. 18.* when a thing is by Nature & Art so made for some other thing that the latter cannot exist without the former, it must needs be that *that* which is made for the necessity of another should go before it in time. But the matter and all its dispositions are for the form: Ergo they ought to precede the same in time. For the form should never be united to the matter save for the Instrumental actions, Ergo the Organs and necessary Instruments ought to precede before the Introduction of the form, and the whol preparation of the matter necessary for the actions of the soul cannot any waies be made by the same form whose actions they are, but by the Agent to which the whol work of Generation is committed. For to the same Agent to which it belongs to Introduce the form into the new matter, it belongs also before its Introduction so to prepare the matter that by no means it can be received in another, nor the matter it self can receive the active form. But both the Major simply taken and the Minor are untrue, and the proof thereof is false. That the Minor is false, both the formation of the Body of Plants, and Nutrition and Augmentation of Animals do teach. For first of all, when the seed of a Plant is cast into the Earth, or a Branch or Root or Bulb is set therein, there is no other Agent which can first form the Body and Instruments fit for the soul, but the soul in the Seed, Bulb or Branch, does first form the Roots, by which it draws out of the Earth convenient matter to form a body fit for it self, and of it forms the parts of its own body. Why then should not the same thing be done in Animals? Yea the thing it self tells us that the same is done. For the seed being received into the Womb, the Soul first forms the Membranes in which the seed is included, and then the umbilical Vessels by which it draws blood necessary to form the body withall. Which thing also Eggs do testify, which being cherished by any heat whatsoever Birds are thence produced. Where no cause can be so much as imagined which should fit the matter to receive the soul save the soul it self which is in the Egg. Again, The proof of the Minor is false, which builds upon that never granted Hypothesis, that after the ultimate disposition of the matter then the soul is educed and springs forth. This indeed is true, that al the organization (as he phrases it) is for the form, that is to say, that the form may have fit Instruments whereby to act; but that the soul could not be there in its first act before it can perfectly operate by the Organs can no waies be proved.

whether  
the Organs  
introduce  
the souls.

Fourthly, Others object that if the seed of an Animal ( for example of an Horse ) hath actually the soul in it, the seed of an Horse is an Horse; since the form of a thing being supposed, three things are supposed, the Essence of that thing, the Name, and the Operation thereof. But here is no consequence at all. We grant indeed that the Essence of a thing does chiefly depend upon the Soul, and consequently the denomination, and that from it the operations flow: yet the soul is not the whol thing, but a part thereof. And therefore the other part being wanting, viz. the organical body, the soul cannot be called an Animal.

Fifthly, Some do Glory in this Argument, viz. that it is a metaphysical Principle, that the same thing cannot be at once actually and potentially. Since therefore the seed is potentially an Animal, it cannot be actually an Animal. But there is no strength in this Argument. For not to dispute in this place of the genuine sense of that metaphysical Axiom, since the same thing in divers respects may be said to be both actually and potentially: I shall only speak to that, whereas the seed is said to be potentially an Animal; and I Answer, That this Argument is drawn from Authority, and that which upon a like occasion the most learned

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learned *Thomas Fienus* said from *Plato's Charmides*; it is not to be regarded what any man saies, but whether he speaks true or not. Again saving the Authority of *Aristotle*, the most renowned *Casparus Hofmannus* hath wel written, as before we hinted more than once, *In tract. de formatum Origine, rat. 2.* *Aristotle* hath so often said that the seed is an Act, that it is the part of a very unskilful Person to urge only those places where he saies it is potential. For seeing (as was said before) that which moves is actually, but the animated seed actually moves, certainly the seed must have a certain act which moves. This act is that same beginning of Generation and Motion (as *Aristotle* calls it) *1. de Generat. An. cap. 2.* and the beginning of the shape which turns the Courses into its own likeness. *1. de gener. animal. cap. 20. & 4. de Gen. cap. 1. 1. de part. animal. cap. 1.* And lest any should feign I know not what spermatick Principle (of which we spake *cap. 5.*) different from the Soul, he terms this Principle, a member or part of the Animal, which is immediately in the Seed, *2. de gen. anim. cap. 1.* And whereas *Aristotle* sometimes saies, that the seed is potentially animated; this he therefore said, as *Scaliger* wel observes *Exercit. 6. sect. 7.* not because it needs another substance to draw forth and perfect the same (for so it were but begun) but because it wants perfect Instruments which are in its power to make. Which also *Zabarella* held, who (*de Mente humana cap. 9*) expressly writes, that the Seed hath a Soul potentially, because its soul does not yet work by its proper Organs.

Sixthly, They say if the Soul frames its own Mansion house, (as is asserted) Why does it not presently frame the same in the seminary Vessels? But let them tel us, why the Soul of a Dog does not see in the Dogs Tail, nor produce Seed, nor form a Body in the same place. For where the Place and Organ is wanting, there no Operation can be performed.

what is  
the most  
common  
action of  
the soul.

Seventhly, They say if the seed is actually animated, why is there no nutrition discerned therein, which is the most common action of the Soul? But it is denied that nutrition is the most common action of the soul, for vivification is its most common action. For Nutrition belongs only to the Body already formed, and when Nutriment is at hand. Hence the seed of Barly, Wheat, or other Grain lives in the Granary, which *Johannes Gallego* does grant, but it is not nourished, because it is not in a convenient place wherein it may be cherished and receive aliment.

whether  
souls are  
united.

Eighthly, They object if the seed be animated and both the Parents contribute the same, the soul will be a thing compounded of the soul of the Father, and the soul of the Mother. But mixtion and composition as hath formerly been said does only belong to things of different sorts; but if things joyn which are of the self same sort there is no composition; nor is the fire which arises from many flames united called compound: and the example of Palmes was formerly alleadged out of *Scaliger*. And that example also *Fort. Licetus* (*de perfecta constitutione hominis in utero chap. 8.*) alleadges; that by ingrafting when a branch is put into the trunk of a Tree, two and sometimes more souls do joyn, and yet the Tree is but one, and hath but one soul. Whence that falls to ground which some do urge touching the Commigration of two Essences, and the subsistence of two Essences in one, which they count absurd. For all these things are true only of compleat Essences and which can subsist of themselves; but not of those which are ordained to make up the perfection of one thing.

whether  
the Parent  
in genera-  
tion loses  
any of his  
soul:

Ninthly, Whereas they count it absurd that many souls should proceed from one Parent, and that the Parents in every time of copulation should lose a part of his soul, all this proceeds from their ignorance of the nature of the soul. The soul (as hath been said before) hath no parts properly so called, and it is deprived of no part thereof, but remaining still the same does variously multiply it self. For though one Tree in one Summer do produce a thousand Apples, and each Apple hath sundry seeds, and out of each of them a like Apple-tree wil grow: yet the soul of the Apple-tree is not diminished but remains totally the same. And the same holds in Animals. And therefore it is more decent to search and admire the wonderful works of God than to calumniate the same. And all those absurdities which are objected against the wonderful work of Generation are nothing but disparagements of the works of God proceeding from Ignorance.

Finally, That the seed is animated, *Thomas Fienus* does (*de format. fact. quest. 5.*) thus Impugn: Neither the Blood (saies he) nor the Spirits are animated: ergo, not the Seed. He proves the Consequence because they are produced in parts much more noble than the Stones are, viz. in the Heart, the Brain, the Liver, which if they could not impart the soul to the Blood and Spirits, neither can the stones. But the Principal parts have their dignity. And therefore although the Liver, Heart, Brain, do generate Blood and Spi-  
rits:



rics: yet for the Generation of Animals the Stones have a peculiar seed-making faculty; such as no other parts have, that of the blood and spirits bred in other parts they may form a peculiar matter which is the fit subject for the soul to be propagated in, which is termed Seed, which is much more excellent than the Blood since it is the fruit of an Animal, and the Blood is only the nutriment.

Chap. 10. Of the Propagation of the Humane Soul.

And hitherto we have demonstrated by firm reasons (as I conceive) that Plants and brut Animals are generated by Seed which hath a Soul in it communicated from the Generator; which lying hid in the Seed forms it self a fit Mansion house according to the kind of Plant or Animal from whence it came. It remains that we speak of the Generation of Man, concerning which Authors are of divers Opinions. Some had rather suspend their Judgments than determine any thing in so difficult a matter. Others hold that as the Body, so the Soul of Man is propagated from the Parents into the Children by vertue of the Divine Benediction. Others conceive that new Souls are created for every person by God, and infused into their Bodies after they are formed, and so they ascribe the production of Souls immediately to God. As to the first Opinion, I acknowledg indeed the difficulty of the matter, and I contents that it is here dangerous to determine any thing. Howbeit since in matters difficult 'tis prave-worthy to do a mans endeavor, and we ought to labor with al our might to know the Truth, setting aside the first Opinion we shal examine and weigh the two latter. And in the first place I am not indeed ignorant what Priviledges the Soul of Man hath, viz. To it alone immortality is granted by God, which is denied to the Beasts, and it alone shal be partaker of eternal Blessedness. But whether the Propagation thereof by the Seed can derogate any thing from this Prerogative of Mans Soul is a question. Nor would I (truly) hereabouts hatefully contend with any man, but I allow every man to abound in his own sence, and to enjoy his own Understanding; but if I may speak my own mind, there are three things which lie me in hand to prove. First that it is more probable and likely that the Soul of Man is propagated from his Parents by vertue of the Divine Benediction. The Second is, That whether we hold the Soul to be created and infused, or to be propagated and traduced from the Parents; yet neverthelets we must hold that the Soul is present in the Seed at the first conception, and when the seed of the Father and Mother are joyned together in the Womb and retained, and as soon as ever the work of shaping the Body begins, and that no other efficient Cause can be assigned which performs the work of Conformation, saving the Humane Soul it self. Thirdly, though I know great Authors differ in this point, yet (if setting aside Authority, Reason shal be only considered) I shal demonstrate, That scarce any solid Reason can be brought against the Propagation of the Humane Soul by the Seed. And whereas this point is disputed both with Philosophical and Theological Reasons, I shal not put my Sickle into other Mens Corn, but use only Philosophical Arguments. And if any man wil defend the other Opinion by Theological Reasons it concerns him to see and shew how these Arguments may be answered. Which if he shal do I wil not be wilful in defending mine own Opinion, but shal willingly follow him that shews me better. In the mean time, and til that be done, as far as I am able to judg in this darkness and weaknes of Humane Understanding I cannot think otherwise. But I give others free leave to think otherwise. For I desire not to be a Dictator, but only to propound my Opinion as wel as others do theirs.

Now that the Soul is propagated from the Parents into the Children by the Seed is first hereby proved, in that (as was said before) like begets its like. Which Aristotle evidently shews, 2. de Anima, chap. 4. text. 34. where he thus speaks: *This Operation is of all others most natural to living things; I mean to such living things as are perfect, not maimed, and which are not born without seed: every thing I say to beget another like it self, an Animal an Animal, a Plant a Plant, that thus they may continue alwaies, and attain as much as may be a Divine Condition.* For since God made every thing in its kind perfect, but Man most perfect of al; verily he could not be called perfect, but should according to Aristotle be reckon'd amongst maimed things if he could not beget another like himself, and that intire. And therefore both according to Philosophers and Divines, Man ingenders Man, and the whol Man an whol Man, which could not be if the Generator did not communicate the Soul. For since a Man consists of Body and Soul, if the Soul should not be communicated

Divers Opinions touching the original of the Soul of Man.

The proposition of what is to be said of the original of humane souls

The Humane soul is propagated into the children by the seed.

ted by the Parents, a Man should not engender a Man. Also that a Man communicates his soul to his Child is altogether agreeable to the holy Scriptures. For God, *Gen. 1. 18.* said to Man (as well as other Creatures) when he blessed him, *Encrease ye and multiply*: by vertue of which Benediction the whol Man ingenders an whol Man; which could not be if the Soul were infused from without. Of which more largely in Chap. 11. For what ever pertains to the Essential Integrity of a Man that is propagated by Generation. But not only the Body, but the Soul pertains to the Integrity or entire being of a Man. And therefore the Soul also is propagated by Generation. Whence also *Damascen, Lib. 4. de Orthodoxa fide, cap. 7.* defines Generation to be the Procreation of an Individual of like substance by the Copulation of a Man and a Woman. Nor is the beginning of the Soul of Man to be fetched from Creation. For every thing that is created is not immortal. Yea, rather whatever is created is of it self mortal. And that some things are mortal, others immortal, proceeds not from the condition of Nature, but from the most free good pleasure of God; who created what he pleased, when he pleased, and how he pleased. And such is the Nature of Man, as God would have it to be; and it is so propagated, retaining its Essence given by God, even as he pleased.

*The humane soul is present at the beginning of the Conception.* But let every man hold here as he pleases, and let him believe that the soul is infused or propagated: yet this (in the second place) I conceive to be most certain, That the Soul is present immediately upon the first Conception as soon as the seed of the Man and Woman are joyned and retained in the Mothers Womb, and the body begins to be shaped; and he that holds the contrary, whether he stand for the Propagation, or for the Infusion of the Soul, he is in an Error. For there are in the first place some of them who hold that the Rational Soul is not immediately created and infused by God, but propagated from the Parents, who notwithstanding slip back into that vulgar Opinion of the School-men concerning the Education of Forms, and hold, That the Soul does not at first lie hid in the Seed actually, but only potentially, and when the seed is somewhat wrought, and the members of the body are in some measure delineated, that then at last by the formative faculty inherent in the seed the Soul is educed out of the power of the matter excited and kindled, so that whereas before it only lay hid potentially, now it begins actually to be, to live, and to inform its body.

*The humane soul is not educed out of the power of the matter.*

But all which hath been formerly alleadged, Chap. 4. and 5. against the Education of Forms out of the power of matter and the formative Principle in the seed do make also against this Opinion, which it is needless to repeat in this place; only I think fit to produce here what is alleadged by *Balthazar Meisnerus, in Philosoph. sobr. part. 1. sect. 3. cap. 6. quest. 1.* And to omit his other Theological Reasons which he brings, many Inconveniencies and absurdities follow from this Opinion. For in the first place an accident, viz The formative power which is in the second rank of Qualities should produce so noble and excellent a substance, which is absurd. Secondly, the formative faculty should be without a subject. For the Prolifick Faculty is not a faculty of the seed, but of the soul. And therefore where there is no soul there can be no prolifick faculty unless we would have an accident to be without its subject. Again, this faculty in the seed is either corruptible, or not. If you say it is not, then the seed being corrupted either it passes into the soul newly produced, or else to some other place. But neither of these can be. Not the former, because the powers inherent in the soul are produced thereby, but do not produce it. How absurd were it therefore to say that the formative faculty does first raise the Soul out of the seed, and afterwards insinuate it self thereinto, and flow therefrom? Not the latter, because either it would go away by it self, or pass into another subject. The former is contrary to the Nature of accidents which do not subsist separated: and the latter is improbable, because no subject can be named to which it mixes it self. Therefore that Formative Faculty must needs be corruptible; which being granted, it follows that the Soul it self is corruptible and mortal: for an incorruptible thing cannot be generated out of a corruptible.

But those who hold the Creation and Infusion of the Soul do all of them conceive that the Soul is not infused at the first Conception, but when the body is formed.

But they who setting aside Authority and anticipated Opinions are willing diligently to weigh and consider the matter it self, cannot otherwise hold than that the soul of man is present immediately after the first Conception, and as soon as a Mans body begins to be formed.

*The soul of a Man is present at the first conception.* And for the proof thereof I wil use the same Argument which formerly I used in general to prove the presence of the Soul in the Seed. viz. Where ever the operations of the Humane Soul are, there that must of necessity be present. But at the first Conception the operations of

of the Humane Soul are forthwith present : ergo the Humane Soul is there also. Now these Operations are first the formation of the membranes which infold the Child, and afterward the shaping of the Child it self, which (as afterwards shall be said) begins at the first Conception. Afterward the augmentation of the Child it self. For sure it is, as soon as the parts of the Child are delineated they begin to grow. But in growing the Soul is communicated to the parts which are added to the Body. Therefore also in the first augmentation the parts which accrew must needs be animated. And absurd it were that the child being born should be augmented by one Soul, and in the Womb by another.

The most renowned *Thomas Fienus*, Professor of Physick in the University of *Lovaine*, was moved (*de form. foet. quest. 8. Conclus. 11.*) by the force (doubtless) of this Argument to dissent from all those who hold the soul to be infused, and that not till about the fortieth day after Conception, and to hold that the Rational Soul is infused the third day after the Conception of the Seed : which he proves by these Arguments. First, That which shapes the child shapes the membranes ; but that which shapes the membranes ought to be the third day in the Seed. Therefore the Rational Soul ought to be about the third day in the Seed. For that which shapes the membranes ought to be in the seed before they be shaped, or at the same time when they begin to be shaped ; since every Efficient Cause is in time before, or together with the Effect. But the membranes are shaped at the furthest on the fifth or sixth day. Therefore they begin to be shaped on the third day at least ; and therefore the Rational Soul ought to be in the seed at least on the third day. For two or three daies at least seem requisite to perfect the same ; since they have a structure artificial enough, and little Veins and Arteries running through their substance which cannot be formed in a moment of time.

The Opinion of Thomas Fienus concerning the presence of the soul in a child in the womb. The Coats of the child in the womb are formed by the soul.

Now that what forms the Child does also form the membranes, he thus proves : Beings are not rashly and without necessity to be multiplied. Now one and the same soul can perform all the Conformation which is requisite to the seed. For all parts are begun at one and the same time though all do not so soon appear perfect. And therefore more than one Soul to shape is needless. Nor can any other soul or vertue be assigned which might form these membranes save the Rational Soul in the seed, which in *quest. 8.* he proves at large. Yea, and he further shews that it is the Office of the same formative faculty which makes the child to make the membranes also. For in the first place the membranes are shaped for the child's sake, and the Seed is covered with them lest it should be defiled by the filth of the Womb, and the Menstrual blood, lest the seed should run about and slip out of the Womb, and that the spirits therein might not exhale. Secondly, the Membranes are formed of the same matter that the child is formed of, viz. of the seed, and consequently of the same formative Faculty. Thirdly, the membranes live, ergo are formed by the same soul where-with they live. Fourthly, the Navel Vessels are formed by the same cause the child is formed by ; ergo the membranes also. For the Membranes ought fitly to be joynd to the Navel Vessels, and the Navel Vessels ought to be cloathed by them, and to perforate and go through them. But that union and connexion cannot be made by different formative faculties. And ridiculous it were to think that the membranes are not made by any formative faculty, but are only bred by the heat of the womb as the crust of a Loaf by the Ovens heat, and the skin upon milk by the heat of the fire. For the generation of the membranes and their conjunction and connexion with the Navel Vessels is far more artificial than that it can be caused only by the drying of the fire ; nor is it made by necessity of the matter, but it is specially intended by Nature, as without which there could be no Child made of the Seed.

Now that the Membranes are made the fifth or sixth day, Experience it self, and the observation of Physicians does witness ; as appears from *Hippocrates, Lib. de Natura pueri*, where he speaks of the dancing Wench who cast a Conception out of her Womb the sixth day after it was conceived being covered with a Membrane ; *Galen, 1. de sem. cap. 4.* where he writes that frequently three or four daies after Conception the seed it self comes away covered with a Coat : And *Macrobius, in som. Scipionis, Lib. 1. cap. 6.* and all observations of later Physicians confirm the same. Secondly, he proves the same hereby, because towards the Introduction of the Soul (he speaks according to his own supposition, or else he would have said propagation) there needs no other action then that seeds should be mixed in the womb by the vertue and heat thereof, and be there fermented and actuated. And to such a mixture fermentation and actuation there needs no long delay of time. For Nature (truly) is not idle a moment, but begins to work as soon as the seed is conceived. And when the last dispositions (he speaks again according to his own Hypothesis) are induced to the Introduction of

The membranes are made presently upon the beginning of the conception.

the Soul, there is no further need of any other great alteration or elaboration thereof in the Womb. Which he proves by the example of the Seeds of Plants upon which the ultimate dispositions are so imprinted that often of their own accord they begin to sprout on the boarded floors where they lie.

The Authors judgment concerning the Opinion of Fienus.

Touching which Opinion of that most learned Man that I may give my sense; he writ most diligently and accurately above all others touching this matter; and setting aside Authorities, he freely and ingenuously propounded his own Opinion, and confirmed it with reasons, and for the most part held the truth. For in the first Conclusion he rightly proves, That neither God, nor Intelligences, nor the Soul of the World, were the efficient Causes of Conformation; in the second, That the formative faculty is not in the Womb; in the third, That the conformative faculty is in the Seed, and that it is intrinsecal thereunto; in the fourth, That the Native heat is not the principal efficient cause of Conformation; in the fifth, That the Generative Faculty of the Parents is not the efficient cause of the conformation or changing of the seed in the Womb; in the ninth, That the Rational Soul is the first and only Soul in the Seed, and that no other does precede the same; in the tenth, That the Rational Soul in Man does shape its own body, and give the same its form; in the eleventh, That the Rational Soul is present about the third day after Conception. And thus from the formation of the Child he perceived evidently and clearly, that the whole formation thereof was begun, continued, and perfectly accomplished by one and the same soul about the third day, yea, in the end of the second, or rather (since Nature is not a moment idle) as soon as ever the seeds are mixed in the Womb. Which is a thing so manifest that all who hold the contrary must needs fall into most absurd Opinions.

wherein Fienus comes short.

Fienus his false Conclusion.

But since even before the third day (as we shall shew anon) certain operations and some formation is made, he does not shew what causes that formation, either in Man, or in Brutes. Moreover, his Arguments do only prove, That the Rational Soul of a man is present soon after the beginning of Formation: but they do not prove, That the Soul of a Man is about the third day infused, or rather (as he phrases it) increated by God. For although it be sufficiently demonstrated, That the Rational Soul of a Man is present at the beginning of the shaping of the child; yet another Question does now arise, viz. Whether it be propagated? or whether it be infused by God, and by him created in the seed disposed for it. Where he brings no Arguments nor Reasons for his Opinion, and his other Propositions wherein he differs from my Opinion, viz. The sixth, That the Soul of the Seed is not the efficient Cause of Conformation; the seventh, That in the Seed as it is Seed, and as it is in the Stones, and before it hath received the Soul in the Womb, there is no active vertue of Conformation or Generation; and that the Seed is not an Instrument in Generation, or an efficient, but only a material Cause; and that in neither of the Parents seed there is any active principle of generation, but only passive; the Eighth, That the Efficient of Conformation is the soul which comes into the seed after Conception: all these I say spring from that Hypothesis, viz. That the Rational is infused by God: had it not been for which he would doubtless have acknowledged the presence of the Soul in the Seed. Which Hypothesis nevertheless is built upon Authorities and no sound Reason, as shall hereafter appear; nor do the Patrons thereof bring any substantial proof for it, but only fly to that of *Justus Lipsius*, who when (*Lib. 3. Physiolog. Stoic. cap. 7.*) he had produced the Authority of *Tertullian* and many Latines, who held that the Soul was bred in the seed, and did not enter into the same, and had praised *Gregory Nyssen*, who said none in his wits could think that the original of the Soul was later than the Constitution of the Body, he concludes: *That it was an Opinion which might be maintained, had not the Church the purer sort of Divines agreed to beleieve otherwise: and therefore we must obey.*

And that which moved *Lipsius* to deny the propagation of the Humane soul by the seed, and rather to hold that it was infused, that doubtless hath moved others also, and amongst them the renowned *Marcus Marci*, who if he would have contended only with Physical Reasons, questionless he would have granted the propagation of the Humane Soul by seed. Which appears in that, in *Lib. 1. Idea Idearum operatric. cap. 4.* he writes: And if any one would bring a reason of this diversity (viz. That the souls of Brutes are propagated with the seed, and not of Men) I refer that man to the Omnipotency of the Creator, who gives to all things not only such a faculty as is agreeable to their nature, but also their manner, time, number, order, and certain limits. But the Question is not here what God can do, yea, and what he hath done. But it is only pre-supposed and not proved, that God will not have the Soul of Man propagated by seed; nor if that were held, does it import any absurdity; which does even by that appear which he afterwards adds. But nothing hindered if the Creator had so

so thought fit, but that the Soul of Man might have been so fastened to the seed that it also might be frequently multiplied and born again as it were in particular persons. But the reasons formerly produced do prove, That it so pleased the Creator, nor are there any sufficient reasons to prove, that God would not have it so. *Marcus Marci* endeavors indeed to prove that, when he adds: Yet because it was inconvenient that a Man should be so born, and disagreeable to the end for which he was created, the omnipotent goodness would not have it so. For the souls of Brutes tend only to adorn this world, and because through their corruptible Nature they cannot hold out in one Individual they diffuse themselves into many, that one succeeding another, that variety may be preserved. But the soul of Man does not only adorn this temporary Scene of the World, but is co-heir with the blessed Spirits of the Eternal World to come. Whence of necessity (the act of this life being finished) it is transferred into that same eternal Life which will make it either happy or miserable. And in case there were but one soul in al, the same at the resurrection of the body should be happy and miserable, beloved and hated of God. But I conceive these reasons are not of sufficient weight. Nor does the propagation of the humane Soul by the Seed make it incapable of another life, nor does it thence follow that there should be one soul of al either now or hereafter. For he himself grants that the Creator could have caused the humane soul to be multiplied in the Individuals. But the holy Scriptures shew that God not only could, but would have it so, when they teach that God commanded that not only other Animals but Man also should beget his like, and multiply himself into Individuals; and the actions themselves which appear in the seed, and other reasons fore-alleaged do prove that several Individual persons have their several Souls, which being immortal shal neither be abolished after death, nor shal grow into one, but each at the last day shal be restored to its Body.

And if (as I hinted before) *Fienus* and other learned men who have written of the formation of the yong one had sought the cause of the formation of a living body, not in Man as being too narrow a subject, but in general in al living things, Plants, and Animals, they had more easily found out the truth. For when (Quest. 5.) *Fienus* was necessitated to grant that the seed of Plants is animated he ought in the next place to have enquired how it is with the seed of Brutes whether it is animated or not, and what therein is the cause of the Conformation of an animate body. And since he himself grants that Conformation begins presently after Conception is made (and he solidly proves there is no other cause of Conformation but the soul, and the soul of Brutes is not infused from Heaven) he might thence have easily collected both that the seed of Brutes is animated, and that the soul therein is the Cause of the Conformation of the body. But seeing those things which he objects against the presence of the Humane Soul in the Seed do also oppose that of the seed of Brutes, he ought to have considered how they should be answered. For if he had done this he would easily have seen how those doubts which are objected against the presence of the Humane Soul in the seed might have been answered. One thing only had remained for him to enquire into, viz. Whether in the point of propagation the Humane Soul hath any thing peculiar to it self, which the bruit Animals have not: and since the formation of the members (which himself makes an argument of the presence of the Soul) begins not on the third day, but at the first moment of Conception, he ought to have proved why that formation should not be a sign of the souls presence.

Moreover, neither do the Arguments of *Fienus* prove this, that the soul is not present in the seed before the third day. For seeing as he grants, Nature is not idle a moment, but begins to work as soon as the seed is conceived and the operations begin to be performed in the seed after the first moment of Conception immediately, and as *Galen* hath it *1. de sem. cap. 4.* three or four daies after the Conception the seed is already inclosed in a Membrane, and the Membranes (as *Fienus* proves) are formed by the same soul: it is truly necessarily concluded, that the soul was present before the third day, and had begun the work of her formation of the humane body. The observations of Abortions do conclude the same. *Hippocrates de nat. Pueri*, writes that he saw a Conception retained six daies in the Womb, and then came away, which was thus qualified, as if a man should rake off the outward hard shel from a raw Egg, so that the humor contained within might be discerned through the thin skin. After this manner was that liquor disposed, and it was moreover red and round. Also there were seen white & thin fibres contained in the Membrane, with a red thick bloody water, and the Membrane it self on the outside was died with blood resembling the colour of such as have stained faces. In the midst whereof there was a certain smal extant which seemed to me to be the Navil, and that it first breathed therethrough, and from thence was drawn a Membrane which

The shaping of a living body common to all living things.

*Fienus* does not prove that the Soul is not in the Seed before the third day.

which embraced the whol seed. And the same Hippocrates in his Book *de Carnibus*, saies that the Conception hath upon the seventh day all that it becomes the Body to have; and that an Abortion made at this time being put into water does shew to him that shal diligently view all things the rudiments of all the parts of the Body. In like manner Felix Platerus writes in *Quest. med. quest. 1.* that for many years he had seen many abortions which in the first week were just after that manner: First of all (saies he) that same procreative faculty which lay hid in the seed does rouse it self and disposes those more remarkable portions of the seed which flowed from the three Principal parts of the Parents into three Bladders as it were, swelling with spirits, which are Rudiments of the Brain, Heart, and Liver, shut up in a smal body: and the other portions adhering thereunto it rudely separates into Limbs and Members growing thereto, which are commonly perfected in the first week, so that the Embryon being at that time cast out by abortion, such a shapeless smal lump made up as it were of congealed seed, round and rould together, appears distinguished with the three Bubbles aforesaid. Such as Hippocrates observed to come from that same dancing Wench, who caused a-bortion by her violent Dancing. And I my self saw such a kind of an Abortion like a round white Ball of the bigness of an Hazel Nut, which came from a certain Woman who every year almost did suffer Abortion not many daies after she had conceived: and I took it out of the thin coat *Amnios* wherein it did float, and when I pulled it asunder, I observed three such like Bubbles, the lower of which expressing a rudiment of the Liver was somewhat pale, but not red, also four portions to frame the Arms and Legs, and (which was pleasant to behold) I saw two very little black points marked out for Eyes; which as in others, so I observed the same in a certain Gentlewoman who for two whol years together (which was wonderful and not heard of before) did miscarry every month, and often sent me such an Abortion that I might judg what it was, and I alwaies found them after the same manner.

That the  
shaping of  
the Child  
does begin  
presently  
after the  
first mo-  
ment of  
Concep-  
tion.  
Conception  
when it be-  
gins.

Which things being so, it easily appears that the Conformation of the Child does begin at the first moment of Conception. Whence Macrobius in his 1. Book in *somn. Scipionis* cap. 6. writes: that Seed which after it is cast into the Womb does not come back again in the space of seven hours is held to be a due Conception. And a little after: that Conception which any Woman holds beyond seven hours is created for life. And Ludovicus Mercatus Lib. 3. de morb. *Mulier. cap. 6.* writes; when the seeds abide in the Womb, and seven hours after are not cast forth, if they be conserved and regulated by the heat of the Womb, it is to be believed that a Woman hath conceived. Hence Hippocrates tels us, that the beginning of Conception is to reckoned from that day in which the seed was retained and not from the seventh day, when in his Book *de genitura* he saies, If a Woman be acquainted with Child-bearing, and marks when the Seed does not come away, but abide in her Womb, she may know on what day she conceived.

The Opi-  
nions of  
the Fathers  
concerning  
the forma-  
tion of the  
Child.

With which reasons Terrullian (*Lib. de Anima*) and with him many of the Latin Fathers being moved held, that a man is sowed or planted in himself or by himself, and that the Seed is alive from the very beginning. And among the Greek Fathers Gregory Nyssen, de *anima & resurrectione* writes; no man that is wel in his wits wil imagine that the original of souls is later and newer than that of bodies; since manifest it is, that no inanimate thing hath in it self a power to move it self, and also to grow. But of yong ones conceived in the Womb there is no question made of their growing and encreasing; nor of their motion from Place to Place. It remains therefore for us to hold, that the beginning of the Constitution of the Soul and Body is one and the same. And even as the Earth if it receive a Branch pluckt from the Root, it makes thereof a Tree not contributing thereto the faculty of growing, but only the matter of the growth: so we say, that also which is pluckt from a Man (the Seed) to sow a Man, it also is after a sort an Animal, and of an animate thing an animate thing. And moreover he saies, that all the faculties of the Soul are in the Seed, yet they lie hidden; which in time and order rouze themselves up, and set themselves on work.

### Chap. 11. Whether Like may be said to ingender its like if the Soul be not communicated with the Seed?

AND thus we have proved that it is most agreeable to truth, that the Soul is propagated with the Seed: Secondly it hath been shewed, that the Soul whether it be propagated or infused is present at the first Conception, and is the Builder of its own House. And they that hold the contrary, do two things principally: First, they oppose the reasons brought

brought to prove the tradition of the Soul from Father to Son, and the propagation thereof by the Seed. Secondly, they endeavor to bring reasons to prove the Contrary.

For in the first place, whereas it hath been said, unless the Parent communicate the soul to his Child in the Seed, like should not generate his like, nor should a Man Generate a Man, but an irrational Creature: many have several waies endeavored to answer this Argument but in vain. For in the first place, whereas some say, a Man may be said to beget his like, if he communicate the immediate matter fitted to receive the Soul; that is of no moment. For Matter does not suffice to constitute his like. And he which does not give the form of a Man, he does not beget a Man. For a Man without his form (which is his Soul) is no Man. And therefore if the Parents do not give the form of a man, they do not beget a man. Yea, and if the Father do not confer the Soul, the Child should neither have Body nor Soul from the Parent according to this Opinion. For *Aristotle 1. de gener. animal. cap. 2. 20 & 21. and 4. de gener. animal. cap. 4.* denies that the Seed of the Father contributes any part of the matter to the Body of the Child. Which although Physicians deny: yet this is certain, if from the Seed any part of the Body proceeds, that is very little and only the first lineaments of the Body; and *Aristotle writes that the Body is formed of the Mothers Blood, and that the Father does rather confer the Soul, 1. de Generat. anim. cap. 20. The Male yields the form and the Principle of Motion, but the Female the Body and Matter.* And what we said before in general of the Original of souls, the same must be here repeated, viz. If we hold that the soul is infused into the Body after it is shaped, it follows that they that are dead do generate. For since Generation is the union of the Soul with the Body, and according to their Opinion who hold that the Soul being created is infused by God, it may be infused upon the fortieth day or later, and in the mean while the Father may die: either the Father cannot be said to have begot that Child, or he must be said to have begot it after he was dead.

Again, Some conceit that a Man begets his like in respect of the species or sort, inasmuch as the end of Generation is the perfect nature of Man, and inasmuch as he is not born nor comes into the Light according to the order appointed by God, save with a body and a rational Soul. But this Answer suffices not. For if the rational Soul comes from without, the vital conception is not perfected into a Man, but there is nothing ingendred save an Irrational Animal. Nor is the Question concerning the birth of a Man, but his Generation; which is not performed in the birth, but in the due Conjunction of a Man and Woman according to the Ordination of God. Nor does a man only come into the world, but a Man is also conceived, as it is said of *Cain, Genes. 4. ver. 1. Adam knew his Wife and she conceived and bare Cain.* Nor is their objection more strong but the same with this, who say, that if that which is generated by a man is in its time perfected into a man, a man begets his like. For if he hath not his Form and Rationality from his Parents, but from some other, Like is not ingendred by its like.

Thirdly, Whereas some say that Axiom [Every Animal when it generates gives both the Body and Soul to its Issue] is to be understood only of those souls which are drawn out of the power of the Matter, but the rational soul is not drawn out of the Matter, nor depends upon the Body, as to its Essence; that also is of no great moment. For it is falsely and without all Reason presupposed, that the souls of Brutes are drawn out of the Power of the Matter, and depend upon the matter as to their Essence; seeing by Virtue of the divine benediction they are propagated by the Parents to their young ones. Nor does the nobility of our understanding both in respect of its Essence and Operations shew any other. For so it pleased the Creator to associate a most noble substance to the Body. And therefore if a rational immortal soul can long abide in a mortal Body, Why may it not also be propagated with the Seed? Which if we affirm no absurdity wil follow, as we shall shew hereafter.

Fifthly, Some say, a man does so far beget his like, inasmuch as he generates a sensitive Soul, yea and the inclinations of his Parents to Virtues and Vices, and which is more, Original sin also (they say) is transfused by means of this sensitive soul from the Parents into the Children. But this is only said and not proved, that there is in Man a sensitive Soul existing of it self besides the rational: And if there were, yet a man by communicating the same should not ingender his like. For the Essence of a man is not compleated by a sensitive soul but by a rational. But whether Original sin in our first Parents did stick only in the sensitive soul, and not in the rational also, I leave to the judgment of Divines.

whether, unless a man communicate the Soul in his Seed he can be said to beget his like.

The Birth does not confer the likeness of Sort, but the Generation.

The Souls of Brutes are not drawn out of the power of the Matter. The nobility of mans Soul may stand with the propagation thereof.

Chap. 12. Whether God, or some Formative Faculty does shape the Body of Man.

whether  
God be the  
Cause of  
the forma-  
tion of  
Mans Bo-  
dy.

Moreover, since that which prevails most against those who deny the soul to be in the seed is the Formation of the body of Man, and yet they will not be content to submit to the Truth, several men seek several excuses. For since none can deny that same admirable structure of our bodies, they severally invent several Causes to which to attribute the same rather than to the soul immediately present in the Seed. And here some fly in the first place to God the first Cause of all things. So *Alphonsus Caranza* a Spanish Lawyer, tract. de part. natur. & legit. cap. 1. when he had rejected all the Causes which others produce, at length he determines the first Cause of the Formation of Man to be God, and the Divine Power and Wisdom, and for his Opinion he brings that in *Psalms* 118. verse 73. *Thy Hands have made and fashioned me.* And that of *Job*, chap. 10. *Thy Hands have fashioned me. Hast thou not poured me forth like Milk, and curdled me as Cheese? Thou hast clothed me with skin and flesh, and covered me with Bones and Sinews.* But in very truth the Wisdom and Power of God is sufficiently seen in the shaping of our Bodies: but that is not therefore to be accounted the immediate and sole Cause of our Conformation. For the same power and wisdom is seen in the Formation of Animals, yea, and of Plants too. And concerning the Lillies of the Field our Savior saies *Matthew* 6. 30. That God hath clothed them. As therefore it must not be thence concluded, that God only is the Cause of the Formation of Plants and Animals; so neither may we conclude that he is the immediate Cause of the Body of Man. For God is not the Physical Cause, but the first and universal Cause, not by Natural Motion, but after an eminent and unexpressible manner, as by his presence he conserves all things, cherishes them, and governs them in their actions. Who though at first he created the World and all that is therein; yet he appointed Nature which is the ordinary power of God, according to the Rules whereof the Generation of things is now perfected. That Wisdom (truly) and infinite Power is primarily in the Creator; yet hath he given Power to Second Causes to perform artificial Works, which they also themselves do really accomplish (as was shewed before in chap. 2.) And therefore though it cannot be denied that God concurs in this work as the first and universal Cause (of which Concurrence of God as the first Cause with the second I spake in the foregoing Chapter) yet that he is not the proper Cause does hereby appear, in that Errors do sometimes happen in the Conformation of living Bodies; which would not be if God were the immediate Cause of Conformation. For he never errs in his Actings. Nor could Natural Causes be rendered of those Errors, which nevertheless Physicians do render either from the fault of the Matter, or inconveniency of the Place, or Imagination of the Mother. But the Actions of God cannot be corrupted or marred either through fault of the Matter, or Inconveniency of the Place, or Imagination of the Mother.

whether a  
Formative  
Principle  
be the  
Cause of  
shaping the  
Child in  
the womb.

Others seek the Cause in the Seed it self; amongst whom some hold there is a Formative Principle which shapes the Child, and that the Parents use the seed as an Instrument in producing their yong ones. But this Opinion hath been sufficiently examined before, and refuted, unless by the Formative Principle they understand the Soul it self. And to add this one thing more, a certain late Writer conceits he may avoid all difficulties, if he holds that the Formative Power does not immediately follow the Essence of the Soul, but that by the Divine Benediction it was given to the soul to raise up in the seed a Formative Faculty, which the Seed afterwards being shut up in its place does faithfully retain; and that this faculty does produce a substance, not by its proper vertue, but by that vertue it hath received from the Rational Soul; and that this Faculty when its work is finished does remain joyned to the Soul til the yong one be grown up, and then it puts it self forth again, and infuses into the seed a formative vertue like it self.

whether  
any forma-  
tive facul-  
ty can be  
in the seed  
without  
the soul.

But that which is wont commonly to fall out [that they who hold a false Opinion while they strive to shun one absurdity they fall into many] the same hath happened here. For in the first place, whereas every accident requires its subject, and is in the subject by its form: I demand, By what form (if the seed is not animated) this faculty can be in the seed. Which since there can be none assigned there would be an accident without a substance and subject. Secondly, since proprieties are only in one and their own subject, this Formative power should



should first be in the seed as one subject, and after it should be joyned to the Soul as another subject. Thirdly, Whereas the Formative Faculty (as by the augmentation of the body, and the regeneration of parts lost, and chiefly in Plants and Animals does appear) is a proper power of the Soul, it can be no where save where the Soul is, and where it is we may firmly and demonstratively conclude that there the Soul is. Fourthly, it is said but not proved, that an accident by a vertue communicated may produce a substance. For no accident can so much as act, much less produce a substance unless it be directed by the Form from whence it flows, and from which it hath its power of acting, as hath been sufficiently declared before in Chap. 5. concerning the separate Instrument. But which way soever they explain this formative faculty, unless they hold the soul to be in the seed, they involve themselves into inexplicable difficulties. For if they hold it to be a substance they multiply Entities in vain. And since all things belong thereto which are proper to the Soul, why should it not be the Soul? But if it be an accident it can have no subject, and it wil act beyond its abilities.

Chap. 13. Whether there are more Souls in a Man than one?

But others when they cannot deny the presence of the Soul in the Seed, and are forced to confess that the body of the Child is thereby shaped, and yet wil not grant that the Rational Soul is present at the first Conception, they fancy divers Souls to be in a Man, not building upon solid reasons, but chiefly induced by the Authority of *Aristotle*, whom, in 2. de gener. animal. cap. 3. teaches, That a man first lives with a Vegetative Soul, then with a Sensitive, and at last receives a Rational Soul. The words of *Aristotle* may be seen in the place alleadged. But what the sence of those words of *Aristotle* should be, is as great a question as any amongst the Expositors.

whether  
there are  
divers  
souls in a  
Man?

For in the first place, Some hold that every Soul is a simple substance, and that therefore there does not first come a Vegetative, then a Sensitive, and lastly a Rational Soul; but that one and the same Soul in the Conception does first perform the Operations of growing, then of feeling and moving, and lastly of reasoning. For since the Soul cannot exercise its Faculties unless it be furnished with fitting Instruments, and does first perform the most necessary actions, and to Nutrition few Instruments are required, and that is in the first place most necessary, therefore that is begun in the first place to be practised; but since Sense and Reason does require many Instruments, they teach that the operations thereof are exercised in process of time, when the Organs of the Body are more perfect.

Others on the contrary do reject this Interpretation, and say that it is not agreeing to the words of *Aristotle*, while in the place alleadged he expressly writes that the Vegetative Soul is first had in the Conception; and that the Sensitive Soul whereby he is an Animal is received after that, as also the Rational by which he is a Man, and that this only comes from without.

Since therefore the Expositors themselves of *Aristotle* are doubtful of his meaning, the surest way is to set aside Authority, as is altogether most fit in the search of Truth; and to consider the matter it self, and mannage our business with reasons only. Which doing we shal find that it is most suitable to truth to hold that there is only one Soul in Man, viz. The Rational Soul, yet furnished with the abilities of the inferior Souls, and bequisted with a Vegetative and Sensitive Faculty. And if the words of *Aristotle* admit this sence, of which I dispute not, it is a sence convenient enough. For (which we are to note in the first place) the Soul is a simple Essence, and there is one only Soul in every living thing, but furnished with divers faculties. In every Plant there is a specifick Soul; yet that hath sundry Faculties, it nourishes, augments, ingenders Seed, and also performs the proper actions of its own kind; and the properties and actions of a Rose are of one sort, of Rosemary of another, of Rbubarb of another, of Hellebore of another, of the Eugh-tree of another. Every Animal is nourished, augmented, begets its like, hath sundry Senses, is moved, and finally performs that which is proper to its kind; and a Bee hath one sort of properties and actions, a Pismire another, a Sheep another, a Crow another, an Elephant another, an Ape another: which are not indeed Rational, yet as the Understanding is the specifical propriety of a Man; so those also (besides sence and motion, which are actions common to all Animals) have somewhat specifical. And if it be not absurd in a Plant or Animal for divers Faculties and Actions to proceed from one Soul, why should it be absurd to hold the same in Man?

There is  
one soul in  
a Man.

Divers  
faculties  
and actions  
flow  
from one  
soul.

R

And

Reasons  
to prove  
that there  
is but one  
soul in a  
Man.

And that we should hold that there is but one Soul in every Animal from whence divers faculties and actions do proceed, and not divers souls, many reasons there are that persuade us. For in the first place, If there were divers souls in a man every man should not be one Animal, but should have divers operations from divers forms and acts. Whereof *Julius Caesar Scaliger*, *Exercit. 307. Sect. 5.* hath treated largely. There is no reason (saies he) which can persuade me that our Soul (an immaterial substance, and a certain particle as it were of God) should be any waies compounded, especially of two things actually contrary. For I do not think Water is so contrary to Fire, as that which is Rational is to that which is Irrational. The Soul which is totally in every part of the Body, how can it have at once two parts actually contrary one to another? And a little after: For a Man should be so one as an heap of several things laid together, no true Man but a Geryon, and true Chymera or Monster. Nor can those who hold the contrary avoid the force of this Argument, by saying, That there is in Man only one first specifick form, and that the rest are generical and subordinate to the specifical, and that the rational soul in Man as the chief does only perform the office of a form; but the rest though of their own Nature they are forms, and are actually in the living Creature, yet being compared with the principal they are more like matter than acts. We may indeed grant that there may be divers forms in one Individual, of which only one is specifical, and the rest pertain to the disposition of the matter; yet all those forms as they belong to the matter are passively disposed, and the specifick form as the primary Agent uses them as its subject and primary Instrument; and they do not perform such actions as determine and constitute any Individual to be of such or such a sort. But the Vegetative and Sensitive Faculty (they call it Soul) do not pertain to the disposition of the matter, but are primary faculties; and according to their Opinion, the Sensitive performs the office of a specifick form, before the coming of the Rational. And therefore if before the coming of the sensitive soul the vegetative, and before the coming of the rational soul the sensitive should constitute the same Individual, one numerical Individuum should at divers times be informed with divers specifick forms; which is absurd: and so if an Individual should contain divers perfect beings in it self, it would be one by accident, and an heap of things.

There is  
no vege-  
tative  
thing but  
pertains to  
some sort  
of vegeta-  
bles.

Secondly, If a man should in process of time receive divers souls, this absurdity would follow, That there are divers living Individuals which should belong to no sort of live Creatures. For while a man lives only by the vegetative soul he must be a Plant, nor yet should he belong to any sort of Plants; while he lives with a sensitive soul he must be an Animal, but yet not belonging to any sort of Animals. To which reason although some endeavor to answer; yet they alleadg nothing that is of any moment. *Job. Gallego* allows the answer of *Tolet. 2. de Anima, cap. 3.* who saies, That such an Individual is not essentially a Plant, and therefore is not under any kind or sort of Plants; but that it is contained under the kind of an Embryo, and under some sort of the same kind; and that Nature hath made two distinct sorts of Vegetations, the one of which is a Plant, and the other an Embryo or yong Conception; and that this kind of Embryo's does contain under it so many sorts of Embryo's as there are of perfect Animals, and that the sort of Humane Embryo's hath a Nature by it self, which as the Instrument of the Generator makes an Organization convenient to receive the Humane soul created by God. But one absurdity being granted a thousand follow, and thus one absurdity is heaped upon another. For if this vegetative degree is common to Plants and Animals, how comes it to pass that from that vegetative soul which is in the Embryo an Horse is brought forth, and not a Rose, or a Dog? And since they make so many sorts of Embryo's as there are sorts of perfect Animals, it must needs be that one Embryo; if it be of a different sort from another, it must differ by some specifical form. But that is of no moment which the same *Gallego* saies, that the vegetative form of an Embryo produced by the Womb of a Woman does not make the Organization of a Plant, nor of another Animal, but rather that of a Man; both because it is directed by the soul of the Woman having the same Organization; and also because of it self it hath a natural Inclination to make such an Organization. For in the first place, false it is, and not yet proved, That the soul of the woman directs that Organization, as was shewed before. Moreover, whence hath it that inclination to such an Organization? Certainly it cannot have it from the common and generical form; but every determination is from the specifick form. And what wil it be then when it comes beyond the degree of a vegetative, to the degree of a sensitive Embryo? For since it is then neither a man nor any other Animal (for the sensitive faculty constitutes no particular sort of Animal) what I pray you must it be, since it is constituted in no sort of Animals as wanting a specifick form? Therefore it must needs come

come to this, That the Soul which is in a perfect Child is also in the Embryo, and that which finishes the work is the same which began it: viz. That the Soul of a Lyon forms it self a convenient body, the Soul of an Horse forms a body fit for it self; and that in the Embryo of a Lyon there is no form distinct from other Animals but the Soul of a Lyon; and that the form of an Embryo (as it is described by *Tolet* and *Gallego*) is a meer figment.

And except this be granted, a reason of the formation of an Humane Conception, of its nutrition and augmentation, and of all the operations performed therein cannot be rendered. For the formation of the child in the Womb, and of all its parts and Organs, as also its nutrition and growth, are quite different from other Animals. For no sort is constituted by divers forms, either at the same or a different time, but by one only, which thence also hath its name, and is called specific. It does shape it self such a body as answers the Idea thereof in it self, and by such a body performs such actions as by which it is distinguished from other sorts. Hence a man from his own specific form or soul hath such a body as no other Animal hath, and performs such actions as no other Animal does.

Thirdly, If first the Vegetative soul should inform the body, afterward the sensitive, at last the rational, a Man should be compounded of a Plant, a Brute, and an Animal. And this absurdity would also follow, That if the sensitive and rational did flow from divers forms, it would be no essential axiom or declaration, when we say a man is an Animal or living thing; for the Nature of the Animal should not flow from the form of Man. But if from both souls the same Attribute should flow, a Man should not be one Animal, but two; viz. An irrational Animal in respect, or by vertue of his sensitive Soul, and a rational in respect of his rational soul.

Nor are the Objections made to the contrary of any weight. For in the first place they say, That many and divers beings cannot proceed from the same Form, nor can the same being proceed from divers and distinct Forms since the Form is the adequate Cause of the Essence. And therefore since the same subject is a Man, an Animal, a living thing, he cannot have these divers beings from one form, but from divers. And contrariwise, Because Man, brute Animals, and Plants, are living things, and that distinct in their forms, that which is common to all of them cannot proceed from the forms by which they differ, but from that form which is equally in them all. But we deny that the vegetative, sensitive, and rational, are three distinct Beings proceeding from divers forms; but they are only the powers of one and the same soul. And that which hath deceived many is this, That they hold that in some body there may be the vegetative soul alone, in another the sensitive, and that by it an Individual may be constituted. For the Vegetative soul constitutes no Plant, or other sort of living thing, but nutrition and augmentation are common to all living things, and Plants differ specifically one from another as well as Animals do, and there is one form and specific soul of a Rose, another of Rosemary, another of an Oak, another of a Pear-tree, another of an Apple-tree; whence, though a Rose, and Rosemary, and an Oak, and a Pear-tree, and an Apple-tree are nourished and augmented; yet they are augmented after a different manner, and each draws a different Aliment, and produce leaves, flowers, fruits, after a different manner; some of them grow to a great height, others creep by the ground, or at least grow not very high. After the same manner sense and motion does constitute no Animal, but all sorts of Animals have their specific forms or souls, by reason of which sense and motion are in all sorts of Animals different, and the external senses are in several sorts different, as also motion; some creep, others fly, others walk. Howbeit, besides sense and motion they perform actions proper to their kind; a Dog is quick-scented and faithful; an Horse is courageous, and after his fashion proud; an Elephant is discreet in its way; of which see *Justus Lipsius*, Cent. 1. Epist. 50. the Spider weaves its nets; the Bee makes Honey-combs, &c. For in all living things there is a nourishing, growing, and generating faculty; but these faculties and actions do constitute no sort of Plants; but in each Plant there appear yet other actions which flow from the specific form as such, and by which Plants differ one from another. In all perfect Animals there is sense and motion, but sense and motion do constitute no particular sort of Animal; but besides sense and motion there are in every sort of Animal other powers and actions which proceed from the specific soul as such, and whereby Animals differ one from another. Nor are the vegetative or sensitive, or the vegetative, sensitive, and rational, certain peculiar forms distinctly existing, and three Essences. For although they are really somewhat in Nature: yet they subsist not by themselves apart, nor are they any where, or at any time separately existing save in the mind, just as a Being, a substance, and a body; and therefore they do not multiply the Essence of a thing.

whether  
a Man  
hath three  
Essences?

The Vegetative soul  
constitutes  
no Plant of  
it self.

Sense and  
motion do  
constitute  
no sort of  
Animals.

From one  
soul flow  
all the fa-  
culties of  
the same  
sort of A-  
nimal.

Secondly, They object, that if in a man there be not a vegetative and sensitive Soul, but only their faculties, then there will be a power of a power. But this does not follow, nor does the vegetative faculty flow from the sensitive, nor the sensitive from the rational, but all the three faculties flow immediatly from one soul, as from the same form of Fire Heat and Lightness do proceed.

Thirdly they say: Where there is the operation of any form there is the form it self; but in Man besides his understanding there are the operations proper to other souls, therefore there are in him other souls also. But the answer is the same we gave to the first argument. Nor are the vegetative or sensitive faculties, Powers which proceed from any peculiar and specifick form. A Rose, Violet, Willow, Oak, Dog, Lyon, Ox, are counted so many sorts of living things, but there is no where existent a vegetative faculty which does constitute any species by it self: but the vegetative and sensitive (as was said before) though they may be conceived and considered distinct in our minds, yet they do not any where or at any time exist distinct in nature. And what will they answer concerning Brutes, of which the same question may have place? For when an Horse is formed, that action pertains to the vegetative faculty, and is a work of the formative faculty; but that vegetative faculty is no peculiar soul different from the sensitive and the specifick which Neighs (for by this mark the unknown specifick form of an Horse is commonly described) but these are faculties of the same soul, which in the first place forms the Organs of Nutrition, as being in the first place necessary, and afterwards the rest.

Fourthly, they object: Where there are operations differing in kind, there also are different forms; but in a Man there are operations differing in kind, Vegetation, Sensation, Intellection: Ergo also souls differing in kind. But different operations do only argue divers forms where the subjects are divers. But in one subject different operations may proceed from the same form.

How a  
Man is at  
once a  
Man, an  
Animal, a  
Vegetable.

Fifthly, they object: If the humane soul were a simple Nature not compounded of a rational Essence and of a sensitive and vegetative soul, by the same very soul a Man should be a Man, a Beast, a Plant; and seeing whatever belongs to a man that belongs to him of it self and primarily by virtue of his specifick form, a Man should be primarily and of himself, a Man, an Animal, a Vegetable. But a man can no waies be said to be primarily and of himself a vegetable, or sensitive Creature; both because vegetation is a proper passion of an animate body, which is the remote Genus of a man, common to every sublunary living thing, and Sensation is the property of an Animal common even to Brute Beasts. And therefore the adjunct of a kind does not of it self primarily belong to a sort of that kind. But out of our Answer to the first Argument an Answer may easily be brought to this also. For that which they count absurd is not so, viz. that by the same soul a man should be a man, and an Animal, and a Vegetable; or to say better, should both understand, move, and grow. For neither is an Animal or Vegetable, any thing distinctly subsisting in nature; but as a man by one and the same soul is a Being, and a Substance: so is he also a Living, Sensitive, Moving. Mean while, because these Conceptions are different, some Generical, others Specificical, some most special, we may not attribute the adjuncts of a Being or Substance to the soul of Man as it is rational, and as he differs from all other animals.

Nothing  
corruptible  
in the soul  
of Man.

Sixthly, they say: Corruptible and Incorruptible differ in kind. But the rational soul is incorruptible, the rest corruptible. Therefore they cannot be in one subject. I grant the whol Argument. For neither is the soul of man compounded of a corruptible and incorruptible, either substance or faculty: but the sensitive and vegetative faculty in man are as incorruptible as the rational, since they flow from the same soul.

Seventhly, Whereas Plato and those who follow him, do therefore conceive they ought to hold divers souls in a man, because there is a certain fight betwixt the rational part of the soul and that part which is subject to passions; since nothing fights against it self: that by Christians is easily Refuted, who know, that that same fight betwixt the divers faculties of the soul is not Essential thereunto, but came in by the sin of our first Parents.

Let us therefore constantly retain the Opinion of most learned Men, which is guarded with strong reasons, and against which nothing solid can be alleadged; that the soul in every living thing is only one, but furnished with divers faculties which in every Plant performs the acts of Nutrition, Augmentation and Generation, but in each after a peculiar manner, and moreover performs that which is proper to every Plant; whence a Rose differs from an Oak and a Vine: and that in Animals there is somewhat which besides Nutrition, Motion and Sense, performs that which is proper to every Animal. For no Animal is perfected by  
sense

sense and motion only; but as understanding is proper to a Man, so in every Animal (beside the moving and sensitive faculty) there is a proper faculty, which answers to ratiocination in a man, and by which one Animal differs from another.

Now the Soul does not perform all these operations together at the first Generation of an Animal, but those in the first place which are most necessary, and therefore she does in the first place finish the Organs of the said most necessary actions. For not to speak now of the Child in the Womb, but of the Infant when it is born; that it hath a perfect Soul is out of Question; yet it does not presently Go, it does not Speak, it does not Reason: but in process of time it performs all these things; but it is presently nourished and augmented: but when the Organs necessary for those other actions are finished and perfected it performs all those things. And hence also it happens, that although Generation pertains to the vegetative faculty yet it does not shew it self before the twelfth or fourteenth year; although the operations of the sensitive and rational soul do sooner exercise themselves.

And suppose we should grant that the rational soul hath somewhat peculiar: yet no cause can be assigned, why as in Plants (which cannot be denied) all actions proceed from one soul, they may not do so in all other living things, and why the specific soul of every Animal may not forthwith be present with all its faculties. Nor can they alleadg at least one probable reason whereby to prove that in a Dog, or Lyon, at first there is only a vegetative soul, and that the sensitive and motive faculties do come afterwards. For as it does not follow, that the moving soul is not in a Whelp, because it does not run as soon as it is born, or in a Chicken or Pigeon because it does not fly: so also we cannot conclude that in the seed there is not present the sensitive and motive soul, because those actions are not performed by the Seed.

And verily those who think otherwise do involve themselves into many difficulties; and while they build, now upon Reason, now on Authorities and false suppositions, and endeavor to reconcile Truth and Falsehood, they involve themselves in Labyrinths and Mazes inextricable.

For in the first place, *Aquinas* grants out of *Aristotle*, That first there is only the vegetative soul, and that afterward the sensitive comes, and then follows the rational. But he holds that the vegetative soul perishes when the sensitive comes, and that the sensitive perishes when the rational comes; and that because (5. *Phys. text.* 38.) he finds written, that one numerical thing hath only one numerical Act, and that consequently divers forms cannot be in one subject, and therefore he thought, when the later form comes the former must perish.

*Aquinas* was in the right in judging that one thing hath but one form; and if he had held, that presently upon the first original there is only one soul in every living thing, he might have easily acquitted himself. But while he endeavors to reconcile this true opinion with a false one, viz. that at different times different souls are produced and come into a man, he falls into absurdities. For thus the Child in the Womb wil not remain the same in number, but wil be a different thing; being one kind of thing when in the first daies it is nourished and augmented by the vegetative soul; afterwards another when it is governed by the sensitive soul; and again another when the rational soul comes into it. And if the soul or specific form of another Animal, after it comes, is sufficient for Nutrition, Augmentation, Sense, Motion, and to perform that which is proper and specific to every Animal, Why may not the same also in Man presently upon the first Conception be the Cause of Nutrition? And what great need is there to multiply Beings, since one soul is sufficient to perform all the actions which belong to every Animal?

And the very shaping of our Body does sufficiently shew the absurdity of this Opinion; and that formation is begun and perfected only by one soul there are many things which prove. For in the first place (as was also said before) there is no vegetative or sensitive soul simply existing, which is not determined to some certain species. In Plants indeed there is a vegetative soul, and in the Conceptions of Animals. But the Vegetative in Plants is so ordered by Nature that it draws nourishment out of the Earth and fastens it to the Plant: contrariwise the vegetative of Animals draws it not out of the Earth, but in the Womb from the Mother, and after the Child is born out of its Veins. In like manner the sensitive faculty is in a Dog, in an Ox, in a Man. But in an Ox it delights in Hay, not in a Dog, nor in a Man. Mean while, since according to these mens opinions there are the operations of a vegetative and sensitive soul in the Child in the Womb before the rational soul be present, there should then be operations which should proceed from no soul. For there could not be in the Child in the Womb the soul of any imaginable Plant, nor of any Animal that can be named.

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Secondly, Since presently after Conception Conformation begins, that should be performed by the Vegetative Soul which is first present. But since that according to the Opinion of *Aquinas* it is soon extinguished, and its conformatory faculty is withal abolished (for a faculty cannot pass out of one soul into another) and nevertheless Conformation is continued, it must needs be that the sensitive must finish the same, and when that also is abolished the rational. But it is absurd, that one numerical Conformation should be made by three powers of distinct sorts, or (as they say) specifically different, or the faculties of three souls specifically distinct. And how will they explain the Conformation of Brutes in which (according to their Opinion) there is no such succession nor introduction of divers Souls? And therefore as in brute Animals by the same faculty the young one is nourished, the tenth day, the twentieth, the thirtieth, and all the months of Gestation, or while it is in the Mothers Womb, yea, and all the rest of its life; and all those acts of nutrition do make up one numerical nutrition continued from the beginning to the end of the Creatures life: so also no cause can be given, for which the Child also in a Womans Womb should not be nourished the tenth, twentieth, thirtieth day, all the months of its being in the womb, yea, and all its life time by one Soul.

Thirdly, If the soul which is first introduced is the cause of the Conformation of the parts for the introduction of the following soul it should act beyond its forces. For the vegetative soul hath not the ability to form parts necessary for the following soul being sensitive; nor hath the sensitive soul (I speak according to their imagination of three distinct souls) power to form parts necessary for the rational soul. 'Tis therefore better to hold with *Themistius* that each soul is the builder of her own house.

Secondly, *Alphonsus a Caranza* when he saw that he could not hold divers souls in one Man, he sought another starting-hole, and *de part. nat. et legit. cap. 1. parag. 2. de animatione*, holds a twofold Animation, answering to the double formation of a Man, the imperfect and the perfect; and he teaches, That in the first time of that rude formation the child lives with the life of Plants, and in the second time with a perfect life, or with a sensitive and rational Soul at once. Now he teaches that by the life of a Plant we are to understand a certain vital and nutritive faculty, but not a true life which is not in Plants; since Philosophers in this manner of speaking do not understand a true life, nor do speak properly, but improperly and by way of similitude. Forasmuch as there is only one soul in man, and one life, and that there is no concurrence of souls, following one after another in the same subject, but one soul which is infused after the utmost perfection of the body. And he writes, That *Aristotle* being moved by this reason wrote in *7. Politic. c. 16*. That to avoid over-abundance of Children (according to the Gentiles Custom) it is lawful to endeavor Abortion, provided it be done presently after the Conception, when the Child lives the life of a Plant; but that after the coming of the rational Soul it is wickedness to do it.

But in good deed, these things are thus said without all reason, and do contain many falsities. For in the first place, it is false that the Plants do not truly live. For though others do otherwise define life, yet which way soever it be defined it properly belongs to Plants as their operations do testify. And where there is life there is a Soul, and there is no life without a Soul. Since therefore he acknowledges vital Operations in that former and rude formation (and it cannot also indeed be denied) he must needs acknowledg the soul to have been long since present; or let him shew us that subject to which those faculties belong which perform those Operations of nourishing, augmenting, and forming. And therefore secondly, if the rational Soul is not infused (as he holds) before the perfect Formation of the body, I desire him to shew us what it is which forms the body til the thirtieth or fortieth day.

whether  
Plants do  
truly live?

## CHAP. XIV.

## The Contrary Objections Answered.

**N**OW that some should think the contrary, and neither allow of the Propagation of the Soul from the Parent to the Child, nor of the presence thereof in the Seed, they are moved with divers Reasons, and most do chiefly urge the prerogative of the Humane Soul; and use three Reasons drawn therefrom, which they fetch out of *Aristotle, 2. de generat. animal. cap. 3.* The first is; That cannot be without a body, the action of whose Principles is corporeal, for examples sake to walk without Feet: but the mind alone comes from without, because the corporeal action communicates nothing therewith. But let us indeed grant that the soul separated from the body does communicate no more with the body and bodily actions, and uses no bodily Organ: yet that the soul when it is in the body hath nothing to do with bodily actions, subsists by it self, and therefore is in the generation of a Man created, is false. For the Question is not now concerning the Soul, which hereafter (being separate from the body) shall persist by it self through the singular pleasure of God, as shall hereafter be said; but concerning the work of Generation our Question is, and concerning the Humane Soul as it shapes and informs the body. That this Soul in this life hath no communion with the body cannot be granted. Indeed if the Rational Soul in Man were a peculiar soul distinct from the vegetative and sensitive, this reason would have some probability. But since there is only one Soul in a Man, having a vegetative, sensitive, and rational Faculty, as was proved in the foregoing Chapter, and the Soul of a Man does not only understand and reason, but also informs the body (not of an Hart, or a Lyon, but a Man) nourishes it, augments it, conserves it, and makes it enjoy sense and motion, and that not after the manner of Brutes, but of Men; it is most manifest that it cannot want corporeal Instruments, and that when it informs the body, and performs these Organical actions, it communicates simply with the body. And although in respect of the rational Faculty some of its actions are inorganic, as when it understands the intelligible species without a species, and when it reflects upon it self, and knows that it understands that it is able to know it understands; also when it wills; and indeed the mind does not understand by the body as the means and Organ wherewith; yet because while it is in the body it needs a Phantasm for its object, and as *Aristotle* himself (*3. de Anima, text. 39.*) speaks, the Intellect needs to contemplate the Phantasms; and nothing is in the Understanding which was not in the Sense: certainly the Understanding must needs communicate with the Phancy. Which is sufficiently declared by sundry sorts of mad men, in whom Ratiocination also it self is hurt, by reason of the society it hath with the disposition of the body and bodily Instruments; as also the variety of Wits, while some are excellent for sharpness of wit, and others are blockish, proceeds from the same cause. All which things being so, and though the Understanding do not use the body to understand withal: yet since it is necessary that it should speculate the Phantasms, there is no cause why we should so absolve the Understanding from communicating with the body as long as it is therein. Much less is there any cause why at last when the body is perfectly shaped it should come in from without.

But especially all that have followed this Opinion have been deceived by that false Hypothesis, touching the Eduction of Forms and Souls out of the power of the matter. For since they believed the souls of Brutes were drawn out of the power of the matter; they would not ascribe so ignoble an original to the Humane Soul, and therefore they argue; The Rational Soul is not drawn out of the power of the matter, ergo it is created. Or, Whatsoever is not made of a pre-supposed matter or subject, that is created; but the Rational soul is not made of another matter or subject, ergo it is created. That is the false Hypothesis (I say) which they build upon, That some souls are drawn out of the power of the matter. If (truly) those souls of brute Animals and Plants did spring out of the power of the matter, it were not absurd to ascribe a more noble beginning to the Soul of Man; but since that Hypothesis is false, and no souls of any kind are (to speak properly) drawn out of the power of the matter; but souls were put into all living things, and received from the Divine Benediction a power to multiply and propagate themselves, nor are they made of the seed as of matter, but are propagated with and in the seed: if the same original be attributed

Such things answered as are brought against the propagation of the Humane soul. Whether the humane soul participate with bodily actions.

The souls of Brutes are not drawn out of the power of the matter.

tributed to the Humane Soul, no absurdity wil follow: if namely we shal hold, That being in the first Creation made by the most good and great God, and implanted in the body of Man, by vertue of that Command *Encrease and multiply* it hath received a faculty to propagate and multiply it self in and by the Seed. Nor is the Rational Soul an Essence compleat by it self, as the Angels are, which subsists alone by it self; but it is the one half of a Man which informs the Humane Body, and therefore as its society with the Body derogates nothing from its nobility and immortality, no more does the propagation thereof with the Seed.

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Secondly, Many have been moved to hold that the Humane Soul comes from Heaven and from without into the body, because they conceit that if it were propagated with the seed, it must needs be mortal. And in good deed (to speak ingenuously) this is a very promising Argument, and by many variously urged and aggravated. For since the seed is sundry waies shed so that no Conception follows (as when a man spils it out of wantonness; in the Gonorrhœa; when a man couples with a woman with child, or with a barren woman, and indeed many waies the seed is often so shed that no formation follows) they conceit it should come to pass that so often the soul of Man (which is otherwise counted immortal) should perish, and man-slaughter should be committed. And therefore by this Argument which they count invincible and unanswerable, being moved, many have held the infusion of souls; and seeing they did acknowledg it necessary that the formation of the child should begin presently after the first Conception, and yet they durst not attribute the same to the Rational Soul, some invented one, others another cause of formation, and attributed the same to a formative Faculty, or to the Womb, or absurdly to a certain sensitive soul present before the rational, the vanity whereof hath been shewed before. But the strength of this Argument is not so great as is imagined. For as *Scaliger* rightly teaches, *Exercitat. 61. Sect. 5.* and *Exercit. 307. Sect. 20.* God alone is truly immortal and incorruptible, because he only hath his being from himself, and depends on none; but in respect to God all created things are mortal and corruptible, which at the pleasure of the Creator may be deposed from that being wherein they are constituted. Yet some of them are not corrupted, as Angels and the rational Soul, because the Creator wil not have them corrupted, and hath made nothing contrary to them whereby they might be corrupted, nor hath so plunged them in matter as that they cannot subsist nor operate without the same: and so they are immortal not by Nature, but by Grace and special favor, as *Damascen* speaks, *de Orthodoxa fide, cap. 3.* And questionless (as was said in the answer to the foregoing argument) there is great difference betwixt Angels and Men. They have never had any thing to do with matter, nor shal have. But the Humane Soul (while it is in the body) does necessarily use corporeal organs, and therefore it is not propagated without matter. And therefore that is false which they say, if the Humane Soul exist after death by it self without matter, therefore it is also produced without and free from matter. For as it pleased God that the Humane Soul should not subsist without the body, but should naturally have its subsistence in an Humane body; so it is also his pleasure that it should be propagated in and with the seed. In a word: the manner of Generation makes nothing to the corruptibility or incorruptibility of an Essence, but that depends simply upon the will of the Creator who made all things of nothing when they did not exist, and by his power preserves them so long and after such manner as he pleases from sliding back into nothing again. Without which Divine pleasure and peculiar Grace to Man-kind, the forms of men should have perished as well as those of Brutes. It is therefore no consequence, if the Humane Soul whose natural habitation by the will of the Creator is an humane body, being separated therefrom by death can subsist by the Divine pleasure, therefore of necessity it did subsist out of the body before it was associated thereto. And whereas they who assert the Creation and infusion of the soul do hold that God makes Humane Souls immediately without seed: it is impious to say that God could not also make them immortal by means of the seed. And to those other things that are brought to aggravate this argument, touching the effusion of seed without any conception following: I answer, That the Divine benediction, and those gifts of Grace which God by his free pleasure and ordination hath granted to the seed and soul of both Parents joynd together in Conception, must by no means be attributed to the seed of one Parent alone, nor shed after such a manner as is necessary to Generation. Yea, and since neither in other Animals the seed of one Parent hath such perfection that one alone is sufficient to make a Conception, and those attributes which are rightly attributed to the seeds joynd may not be attributed to the seed of either by it self; that is much more true in Man.

But



But why God made Sexes in Animals must be ascribed to his divine Wisdom and Pleasure. God if he pleased could have created more Worlds, yet he created but one. For God does not alwaies that which is absolutely most perfect, or seems so to us, but that which is best in respect to the End by him aimed at. And therefore though God had created one man more perfect, and who might have had in him the perfection of both sexes, yet had not the World been thereby more perfect, whose perfection consists in the wonderful content of all Essences, and in their coordination and conspiracy to one End. For one sex being wanting, the life and Society of mankind would be less pleasant (which consists in Wedlock) and less firm. And therefore the most good and great God made a double sex that each might have what to love out of it self, and so not only represent the wisdom of God by knowing, but his goodness also by loving.

Thirdly, they object that the seed is an excrement of the third digestion, and therefore not so noble as to be capable of the rational soul; but that only a perfect Body and furnished with all its Instruments is apt to receive the rational soul. Of this Argument we have spoken in the Chapter foregoing, and in Chap. 6. and 7. where I have demonstrated that the seed is not an Instrument properly so called, nor that any unprofitable thing is generated in the Body; yet in that sense it may be called an excrement inasmuch as it is voided forth of the Body. Otherwise and of its own nature it is the most noble substance of the whole Body, and an Epitomy (as it were) and fruit of the whole Man, as hath been said. Much less is it an excrement of the third concoction: but is bred of venous and arterial Blood, and vital spirits in their vessels, that it may be a fit receptacle to receive the soul. And there in all sorts of Animals it is capable of the soul. And if the rational soul may be received by a Body formed of the Seed and menstrual Blood, Why may it not also be received in the seed?

Besides these three Reasons, some do use divers general Arguments against the presence of the soul in the seed propounded before, especially in Chap. 7. as also the 8<sup>th</sup> & 9<sup>th</sup>, which it is needless here to repeat, since they concern not the seed and soul of Man in particular, but the seeds and souls also of Plants and Animals; and *Biennus* himself confesses they are but weak, and also answers them, *de format. fact. quest. 5.* But because he adds two which he counts more strong, I must not let them pass. The first (and so the fourth objection which also we propounded before Chap. 9.) is this: Neither the Blood nor the Spirits are animated, Ergo, consequently not the Seed. He proves the Consequence; because the former are produced in parts much more noble than the Stones, viz. the Heart, Brain, Liver; which if they could not bestow a soul upon the Blood and Spirits, neither can the Stones do it. But it is there also answered, that the seed is the fruit of a living body, and far more noble and excellent than the Blood and Spirit.

His second Argument and so the fifth objection is: if in the seed of a Man there were a soul it should be either Rational, Sensitive, or Vegetative. But it can be none of these. That it cannot be Rational is proved, First, Because if it were rational, the seed of a Man being in his Testicles or Parastare should be a Man. Secondly, The spilling of a Mans Seed upon the ground should be Man-slaughter. Thirdly, The Seed cast upon the ground must be Baptized, lest the soul should be damned eternally. Fourthly, If the seed were animated with a rational soul, the seed of a Woman should be no less animated than the seed of a Man: and if the seed of a Woman were animated she might engender by her self. Fifthly, if the rational soul were in the seed, either it should be the soul of the Parents extended in the seed, and divided and multiplied according to the division of the seed, or it should be some soul bred anew and produced in the seed or infused by God. But all these things he counts to be absurd. First he conceives that the soul of the Parents cannot be multiplied, because then it would follow, that the rational soul is divisible and consequently mortal, and that all Men have one soul, and that our soul should be a particle of our Fathers soul; and the soul of our Father a particle of the soul of our Grandfire; and at last all our souls shall be particles of the first man, and so communicated by Generation. All which things he counts to be false & different from the Catholick Religion. Also he saies the soul cannot be produced afresh from the soul of the Father, for so it should be drawn out of the power of the matter and become mortal: nor that it is infused by God, and Created in the Testicles; because there it could never come to a perfect state, &c. Nor does he conceive the Soul to be in the seed, because since a Man hath two Testicles and a Woman hath also two, if in Copulation animated seed should fall from four Testicles, four souls should be united, or one should be coagulated of four glewed together. Secondly, Because then the seed of Animals should be a Plant; and a Man before

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he should arrive to a rational soul ought to pass through the form of a Plant, and afterward through the Form of a Brute, and be once an Ass or a Dog. Thirdly, Because that Vegetative Soul should be produced by a Rational soul existent in the Testicles, which cannot be, because the Rational Soul cannot have the power to produce a Vegetative Soul, since those souls are species distinct one from another. And many other absurdities he objects in case we shall say that the Vegetative Soul is in the Seed, which for brevities sake I omit.

But I wonder that so renowned a man, and who in the beginning of the foresaid Book writes, that no man had found out the efficient cause of shaping a man in the Womb, or if some few had smelt it out, they had neither clearly opened nor by any reasons maintained the same, but that he would prove his opinion with such firm and evident reasons, that no man should afterwards have occasion to doubt, should use such frivolous and light reasons in so serious a matter. For first of all intending to write accurately of the Efficient cause of the Childs formation, he ought to have remembered that a Physician must borrow many things of the natural Philosopher, that he may attain to the knowledge of the Subject he is to work upon; but because he doth not equal Causes with their Effects, nor adjuncts with their proper subjects, viz. such to which they belong primarily and of themselves, and inasmuch as they are such, his discourse breeds no true knowledge, as *Jacobus Zabarella Lib. 2. de Method. cap. 11.* teaches. For since it is not Man alone that is formed in the Womb, but also other Animals which bring forth live young ones; moreover Animals are hatched out of Eggs, Plants are formed out of their Seeds: he ought to have enquired in general of the Generation of all Animals, yea of all living things, and what Cause did shape both Plants and all Animals; and the Cause being found, to consider whether it belong to a Man also, or whether we are to hold a peculiar Cause of the Conformation in a Man, and to render a Reason why that power which forms other Animals hath not place in a Man, but that another ought to be sought out. Again, he ought to demonstrate and not barely suppose it as a thing granted, that there are three sorts of souls in a man, and not one furnished with divers Faculties. Thirdly, he ought also to have noted this, that not the Seed of the Man or Woman alone does suffice to produce the Child, nor is the seed call'd a Conception while it is in the Testicles, but when both Seeds are joyned in the Womb, which things being observed he might easily have answered all his own Reasons. For in the first place, he might easily have marked that the Seed of a Man while it is in the Testicles does not suffice to Generation, and that therefore when it is shed upon the ground it needs not be Baptized, nor does the Womans Seed alone suffice for Generation. And whereas he conceits that it is false, absurd, and different from the Catholick Religion, that the Soul should be propagated from the Father to the Son; indeed it is not agreeable to the Doctrines of the Schoolmen, but it is nevertheless most true and agrees with the holy Scriptures. For how shall that Precept *Encrease and Multiply* be fulfilled, unless from the first Man and Animals at first Created all the Men and Animals that do live and have ever lived unto this day had received their Souls? And in *Genes. 46. 26.* it is said that Sixty six Souls came out of the Thigh of *Jacob*; and *Exod. 1. 4.* that the Souls that came out of the Thigh of *Jacob* were Seventy, which I nevertheless do leave to the consideration of Divines. Nor does it hence follow that all men have one Soul or that the Soul is mortal. The first Man had one Soul from whence all came. Nor is there any reason that the Soul of Man if it be multiplied should be mortal: for the Creator commanded that it should be multiplied, and nevertheless it was his pleasure it should be immortal. Which things being granted, all the rest falls to the ground, so that there is no need of an Answer. Also it will appear from what shall be said against the sixth and seventh Objection, what is to be answered to the rest; and that though the Soul be communicated from the Father and Mother, that yet it is not compounded.

*with what Soul the Seed is animated.* Sixthly, Some late Writers do thus argue; Either the Seed is animated by the Soul of the Parent, or by its own proper Soul. Not by that of the Parent: for then the Soul of the Parent should become the Soul of the Son; and should go out of the Parents Body with the Seed. Nor with its own Soul; because since both Parents contribute Seed, the Son should then have a double Soul, or one should grow to the other and it should be compounded.

But if this Argument were objected against the Generation of Plants and brute Animals, that which a man should then Answer may here also serve for an Answer. Moreover, I say in general that both in Plants, Brutes, and Mankind, the Seed is animated with the Soul of the Parent, viz. according to the sort; for otherwise like would not beget its like. Also true

true it is, that the Seed hath its own Soul, and that numerically different from the Soul of the Parent. Yet thence it does not follow, that after this manner the Soul passes out of the Parents Body with the Parents Seed. For the Soul of the Parent remains perfect and entire, although it multiplies it self. And as it does not follow, when in augmentation and in the shooting forth of the new Boughs on a Tree the Soul diffuses it self into the new matter and cloaths it self therewith, that it goes out of the former Body: so it does not follow when it communicates it self to the Seed, that it goes out of the Generator. For this is the force of the Divine Benediction, that the same Soul remaining perfect and entire should be able to multiply it self. And whereas it is said that the Soul of the Son should be double, or compounded, this may easily be answered by those who hold, that the Seed of the Father or the Mother only is prolific. Nor do they want an Answer, who say that the Seed of both the Parents is prolific; and before *cap. 9.* we have answered thereto, viz. how that the Souls being of the same sort when they are joyned together do not make a compound; and it hath been said before *Chap. 9.* out of *Scaligers Exercit. 106. sect. 6.* that of three stems of a Palm joyned together one Palm-tree is made, and a flame made of ten Torches or Links is called but one flame, and not a compounded flame. And if it be commonly said without absurdity that the soul is totally in the whol body, and totally in any part; why should it be absurd to hold that the soul is totally in the Mans seed, and totally in the Womans? And moreover, as the whol soul is said to be in the Eye, the Brain, the Heart, nor does it therefore follow that one soul is compounded of many souls; but this continues still a truth, That it is one Soul which informs the whol and all its parts: so although it be said that the seed both of the Man and Woman is animated, it does not therefore follow that one soul is compounded of two souls, or one made up of two.

Another forms the same Objection after this manner: if the Soul of a man be propagated, it is done either by cutting off some part of the soul of the Parents, or by the instrumental efficiency of the seed, or the soul of the child is immediately produced from the soul of the Parents, so that the seed hath no hand in the production of the soul, but only causes the dispositions, or at most is the Vehiculum of the soul by which it is carried from the soul of the Parents into the Child.

*The soul of the Parent in generation remains entire.*

But all these Objections arise from ignorance, because they know not the nature of the soul, nor how that saying is to be understood, that every form and soul does multiply it self, and how that Divine Benediction, *Encrease and multiply*, hath hitherto been effected, and is still effected: but if they did diligently consider, and in the first place search out how souls are multiplied in Plants and Animals, also the manner how the same is done in Mankind, if (I say) they understood these things as far as they may be known in this darkness of our Minds, they would not invent so many absurdities. For the last (if rightly explained) is true, viz. That the seed (understand the body of the seed) is the Vehiculum or carriage, by which the Soul is communicated from the Parents to their issue; which action is called traduction or delivering over, the word being borrowed from Plants. For as in Trees in which the seminal faculty is diffused through their whol bodies, if any part be cut off, and grafted upon another Tree, the soul of that Tree from whence the branch was taken is communicated to the Tree upon which it is ingrafted: so with the Seed the soul of Animals is transplanted into the womb of the Female, and so from that seed endued with its soul a perfect Animal does spring up. But as, when a branch is cut from the Tree with its Soul in it, that Tree neither loses its soul, nor does that soul become less: even so when the soul of the Parent in the seed is delivered over unto the issue, the soul of the Parent remains entire. And as when in augmentation the soul is communicated to the aliment flowing in, the soul which is in the rest of the body does not become lesser; and as when from a root or stem of a Vine, or the root of an Hop, many and long branches grow up in one Summer, all which receive their souls from the root and stem, and yet the soul is totally in the yong branches, and totally remains in the old stock or root, not being made lesser: so also the soul of the Parent is transplanted with the seed into the child, it self nevertheless remaining entire. And this multiplication of souls presents an image of the immense and infinite God, who (as *Julius Caesar Scaliger* speaks) *reigns every where without place, all without all things, and the whol without parts.* I said an Image. For God the Beginning of all things is an infinite fulness, filling all things, whom neither the Heavens nor Earth do contain, totally existing within the World, totally without, and yet restrained within no limits. But our soul indeed is joyned together by dimensions, and its fulness is only so large as the body is, and bodily dimensions: yet though we should suppose a body to grow from the smallest quantity

*The Traduction of the Soul what it is.*

to the greatest bulk, the same soul would fill it all remaining the same without any Addition. Also in like manner, though an Animal generate often, and the soul multiplies it self, and communicates it self to the issue, it is not diminished of any of its parts as having none. Of which we have spoke more largely before, Chap. 9. Which things it were better attently to consider, than to oppose the truth though far out of sight.

Eightly, Neither are those things of any great moment which *Aphonsus Caranza* here objects, and whereby he would prove, That the Rational Soul is infused at the last when the body is perfected. For in the first place, as to that place in *Exodus*, 21. which he cites out of the Septuagint, and proves afterwards from *Philo*, *Lib. de special. leg.* viz. If the Infant were not shaped he that struck the Mother so as to cause Abortion should be fined, but if it were shaped he was to be punished as a Man-slayer. I (truly) will not put my sickle into other mens Corn; yet thus much I say, That which he alleadges is not in the Hebrew text, nor can it be proved thereby that the soul is not present at the beginning of Conception. And let us suppose there was such a difference of penalties, and let the Civil Laws and Lawyers here quoted by *Caranza* retain their Authority: yet thence it no waies follows that the Seed is not animated presently upon the Conception. The Law-givers perhaps, and the Lawyers had their Causes known at home, into which I shall not now enquire, and which I leave to their place, why they would otherwise punish him who destroys a Conception perfectly shaped, than they would do him that destroys one less perfect; and this perhaps amongst the rest was not the least, that before the Child begins to be moved there is no such great certainty of its life, and many things might happen to it in the Womb, although no external cause was added, which might take away its life before it came to full perfection; so that what *Hippocrates* saies of the Child born in the eighth month, *it is not, and it is*, that may much rather be said of such an imperfect Conception; and therefore they would inflict a greater punishment upon him who should destroy a perfect Child, and upon him a less that destroyed an imperfect one of less hope, and subject to more casualties. Mean while I conceive it never entered into the thoughts of the Lawyers, that by their Laws they would derogate from the principles of Nature, and oppose such things as Natural Philosophers and Physicians (to whom in such Questions they alwaies appeal, and whose Authority they reverence) do demonstrate by most firm reasons to be true. Which appears most evidently by *Augustus*, *constitut. quart. part. 4.* whereby it is enacted that he should not be punished by the Sword, but according to the discretion of the Judge, who gave a Medicine to procure Abortion, if the Child were not yet quick, and was cast forth before the middle time, reckoning from the Conception. No man (certainly) will say that a Child is not quick at the end of the fourth month, and at the middle of the time betwixt the Conception and the Birth, since all men count the fortieth day the longest term in the space whereof the child receives the Soul. *Yea*, and before the Nativity the Lawyers count not the child a man, *per text in L. cum inter Veteres, Codice de fidei commiss.* But what Natural Philosopher will say an Infant is not a Man till he is born? And therefore by a vital child the Civil Laws understand such an one in which the manifest signs of life appear, especially from the motion thereof, which first happens about the middle-time of Conception. Concerning which thing *Thomas Fienus* does also well write in *Apolog. advers. Sanctacruz*, That he who kills an animated Conception, however small or imperfectly organized, wanting yet sense and motion, is a murderer no less than if it were perfect; but it does not thence follow that all homicide ought to be punished alike; since though both are alike perfect essentially, yet are they not alike accidentally perfect. Would not (adds he) any man think that a greater injury was done him by him who had hewn him down a very tall and fruitful Pear-tree, than by him that should pluck out of the Earth and break a small branch only, a foot high, newly planted, and that therefore he is worthy of greater correction, and more stripes.

Not is that argument which he brings in the Second place, of any great moment; whereby he concludes, Because God made *Adam* of the slime of the Earth, and when he was formed and fashioned, breathed into his face the breath of Life; that therefore in Generation also the Rational Soul is not infused before the formation of the body. But Creation and Generation are of a different Nature. The Woman was created of the Rib of the Man, yet is she not so generated.

But in the third place, I admire that a Christian should endeavor to prove by that action of *Hippocrates*, *de Nat. pueri*, That the Rational Soul is not in the Child the first daies. For inasmuch as *Hippocrates* advised the Dancing Wench with child, that within the sixth day

day she might cast out the seed by dancing, he conceives that *Hippocrates* thought that the seed retained so long in the Womb had not the rational soul in it; for otherwise he would not have persuaded her to cause Abortion. Moreover he brings for the same the Authority of *Aristotle*, who *Lib. 7. polit. cap. 16.* allows the destruction of a child in the Womb as long as it is not furnished with sense and life, as if he did suppose that the Conception was without life some notable space of time. But *Johannes Baptista Sylvaticus*, because of this very place, does conceive (and that not without cause) that the Book was not written by *Hippocrates*, *Controvers. 32.* and if it were written by him, yet this Counsel of his is by no means to be allowed, but is to be reckoned amongst the foolish Imaginations and Ratiocinations of the Pagans, of which *St. Paul* speaks *Romans 1. 21.* And the like reckoning we are to make of that same destroying of Conceptions used by the Heathen, of which *Aristotle* speaks, *Lib. 7. politic. cap. 16.* And therefore also that Decree of the Canon Law, in *Decreto in cap. sicut ex Literarum, de Homicidio*, where a Monk by whose assistance a woman had procured her self Abortion, is not counted irregular, and is allowed to say Divine Service, because the Child (as was thought) did not live, is by *Franciscus Ranchinus*, a most learned Physician, in his Commentary on *Hippocrates* his Oath, rightly termed unjust, and that distinction faulty.

If yet any further Objections may be made against our Opinion, their Refutation is sufficiently apparent from what hath been said. The sum whereof comprehended in the words of a certain great Divine, is this: An whol Man according to the Primitive Ordination of God begets an whol Man. An whol Man Ical a Male and Female, who are made into one flesh, or become one flesh, *Genes. 2. 24. Matth. 19. 6. Ephes. 5. 31.* Now the Parents generate inasmuch as they are men, that is, according to that which belongs to the whol species or sort of Mans Nature, in vertue of that Divine Word, *Gen. 1. 28. God blessed them, and said, bring forth fruit, and multiply and replenish the Earth.* And they generate by the conjugal conjunction. Nor does the male ingender alone, nor the female ingender alone, nor the Body only, nor the Soul only, but the whol Man, viz. Male and Female coupled according to the Ordination of God, And therefore a Son or a Daughter proceeds not from the Father alone, or from the Mother alone; but the Son and the Daughter is from the whol Father, and the whol Mother, and equally the Son and Daughter of the one as of the other; and as the Generation of the Parents is common, so the work of Child-making or Filiation, is common to both as to Nature.

## THE CONCLUSION.

AND thus I conceive I have delivered the true Opinion concerning the Generation of living things, and the propagation of Souls by the seed from the Parents to the Issue, both in Plants and Animals, yea, and in Man himself; and established the same by firm reasons, and refuted the Objections of those that are contrary minded. In the mean while by the admonition of *Scaliger*, *Exercit. 297.* I see, observe, and remember, how weak the sight of our mind is, to search into the secret Closets of Nature; and I hear all learned men in a manner (especially in the Question of the Original of the Humane Soul) complain of the obscurity and difficulty thereof. - And therefore I also (peradventure) may be deceived and err. Yet this I conceive I have demonstrated by a most firm reason from the Act to the Power, and from the Power to the Act, or Form and Soul, that there is the Soul in the seed both of Plants, and of Animals, and of Man himself (whether it be propagated by the Parents, or sent in by God) as soon as ever the formation of the living body begins. And this Tenet I shal so long maintain til it shal be to me demonstrated how without the souls presence this work of the formation of a living body can be performed. Which unless it can be done it wil be the part of a mind studious of the Truth not to labor how to oppose that most firm demonstration by certain Objections, and so to render it suspected, but rather to be careful how to answer his own doubts. For *Julius Caesar Scaliger*, in *Lib. 1. de Plantis*, writes from *Aristotle*; where the thing it self is apparent, and Opinion opposes the thing, we must seek a Reason, but not be ignorant of the thing. Now that thing is appa-

rent which is demonstrated by most firm Reasons. And here at last I solemnly protest that I acknowledg and confesse the Excellency and Eminency of the Humane Soul, and its difference from the Souls of Bruits; that it alone bears the Image of God, is separable from the Body, and immortal. And therefore, if I have said any thing (as I hope I have not) which may really oppose this Prerogative of the Soul, I wish it were unsaid. But whether the propagation thereof from the Father to the Son, do that, and whether therefore it must necessarily be held to be immediately infused into our Bodies by God; I leave that to the Judgment of every Man. What seems to me most probable I have freely declared.

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THE  
FIFTH DISCOURSE.

*Concerning the Spontaneous Generation of Live Things.*

Chap. 1. *False Opinions concerning the Spontaneous Original of Living Things.*

B

*Elides the Generation of Living Things of which we have hitherto spoken, and which, because like evidently Generates its like, is commonly termed univocal Generation, there is yet another, which because therein like is not thought to generate its like, it is called vulgarly Spontaneous and equivocal. So, of Hors-Dung those flies are Generated which we call Beetles, of Corne a certain Worm called in some places a Wibble, of Beans another sort of Worms, of Wood another, of the foulness of the Skin and Garments Lice and Fleas, as also out of Cheese and Flesh and other putrefying things Worms and Insects commonly so called, of sundry sorts do arise, as shal afterward particularly appear, The consideration of the Generation of which kind of Living Things is necessary and not unworthy the Cognifance of a Natural Philosopher; which very thing Aristotle did hint, when 1 de Part. Animal. Cap. 5. he thus wrote: With a certain Childish scornfulness to despise the disputation and Consideration which may be had concerning the meanest Animals, and to count it tedious, is no way befitting a Philosopher; since there is nothing in Nature in which there is not somewhat to be admired. And as it is reported that Heraclitus said to those that came to speak with him, and because they happened to find him sitting by chance in a Bakers Cottage to Warm him at the Oven, they would not go to him, as abashed at his homly manner of sitting in such a place: for he bid them enter boldly, since even this place (quoth he) is not void of the presence of the immortal Gods: the very same may be said touching the Inquisition into the Nature of Animals. For we ought to contemplate and discuss all things without shame; since in all things the Divinity of Nature and her Honorable and Beautiful contrivance is conspicuous. And that so much the more diligently, inasmuch as few have written any thing that is solid and agreeable to truth, concerning this subject. Above all others the most Renowned Fortunius Licetus Professor at Padua hath written most diligently and largely of this Matter, in his 4. Book of the Spontaneous Original of Live Things. As for me, though I acknowledg the difficulty of the matter, and am well aware that it is dangerous to hold any thing different from the vulgar opinions, and liable to detraction; especially in this subject: yet I had rather freely shew my judgment in an obscure matter and contribute mine assistance, then to cease from the investigation of truth. Let every one follow what Opinion he pleases. I obtrude mine upon no man. And if any man will shewe me better, I shall willingly assent unto him.*

Now this Generation, as hath been said, is by some called Spontaneous (*Aristotle Spontaneous de Generat. Animal. Cap. 1. saies that such Creatures are Generated by Nature working of her own accord, and thence Julius Caesar Scaliger borrows the Phrase of Automatismos, production of it own accord, Exercit. 168.*) the word being transferred

ferred from moral actions to Natural. For *Scaliger* conceives, *Exercitat.* 77. *Seet.* 1. that this Adverbe *Sponte*, (of it own accord) was derived *ex sponsonibus*, from promises. Now all promises are voluntary and free. And the same *Scaliger* conceives *Exercitat.* 140. that it cannot be accurately or properly said, that a Tree grows *Sponte* of its own accord. But the word seems to be more general, and to be opposed to that which is against ones will, or to that which is not done save by an external Agent, and contrary to Natural Inclination. And therefore, as it is attributed to other actions which are performed by an internal Agent, no external Cause concurring, so also it is attributed to Natural Generation. Whence *Virgil*.

*Such Fruit he plucks as the free ground affords,  
And gentle Trees bear of their own accords.*

But in more special manner it is attributed to those Generations, the efficient cause whereof lies concealed in the thing it self, and is not so manifest to the senses, and when that which is Generated breaks out of its own accord as it were without Seed. Of which *Virgil*.

*For some things grow even of their own accord without mans Labor. And,  
Such things as of their own accord do grow.*

**Equivocal generation** It is vulgarly called **Equivocal** Generation, *viz.* Because the cause of such Living things is not thought to be of the same kind with the thing ingendred.  
**what things are Generated of their own accord.** But what things they are which be thus Generated of their own accord is a question. It was an old Opinion, that all Brutes, Yea and Man himself, did at first grow out of the Earth. Which *Plato* teaches in *Menexenus*, as also other Philosophers much Ancienter then *Plato*: after whom followed the Poets in this Opinion. *Lucretius* hath these Verses.

*Hardly smal Creatures now She makes at last  
Who all things made and Beasts with Bodies vast.  
It is not therefore without Reason good  
The Earth should bear the Name of Mother-hood.  
For she mankind out of her Bowels Spun,  
And all the Beasts that on the Mountains Run  
Her teeming Womb did at fit Season Bear,  
And many fashion'd Birds that flie i'th' Air.  
But since 'twas fit that She some end should make  
Of teeming Labors, and her Quiet take;  
She now leaves off like Wife worne out with Age.  
And *Juvenal*, *Satyr* the 6.  
For in th' Earth's Non-Age, under Heav'n's new Frame,  
They stricter liv'd who from th' Oakes Rupture came,  
And Clay-born had no Parents.  
And *Virgil* in the Second Book of his Husbandry.  
When first all Cattle their Beginning had,  
When of the Earth mankind's hard race was made.*

But these Opinions had their Original from the History of the Creation of the World. For having doubtless had somewhat thereof, from the writings of *Moses*, they turned the truth into these Fables; and since in the Creations History it is said, that God commanded the Earth should bring forth the Living Creature in general after its kind, the Beasts and Creeping Things, with Cattle according to their kind, and that God made Man of the Clay of the Earth; (but they in the mean while knew not the Creator :) they thence invented this same Spontaneous Original of things out of the Earth. This Opinion is also by some attributed to *Avicenna*.  
**whether Avicenna held that men could grow out of the Earth.** But it is not credible that *Avicenna* so great a Philosopher should follow so Fabulous an opinion. *Avicen* indeed writes *Lib.* 15. *de Animalib.* *Cap.* 1. *As men might cut themselves off from Generation, either by their own free will, or by Pestilential Air and so come all to die, and then if a man should be made he would Generate, and so the kind*



kind would be renewed: and making and engendring would mutually assist one the other, in preserving the kind. But the sense of those words is this: if all Men should perish, either voluntarily, forbearing to Generate, or Slain by Pestilence, if after the Death of all Men a new man should be made, which way soever, whether by Gods Creation or any other means; he being a new man cannot be thought to want the power of engendring other Men like himself, by which the kind might be maintained.

Now concerning the original and efficient Cause of such living Things, Authors do very much dissent. *Cardanus Lib. 9. de Subtil.* saies that such things as are said to be Generated of their own accord are Generated by Fortune and Chance. But therein he is out. For Chance and Fortune have no hand in Natural things, and whatsoever things are made by Chance and Fortuitously, they are not alwaies engendred of the same principles and after the same manner. But things which grow up of their own accord are alwaies bred of the same Principles, and after the same manner, and have certain efficient Causes, which also act for a certain ends sake, and produce certain effects. So, of Horse-Dung Beetles are bred, and not Ear-wigs; out of Cheese Mites, and other kind of Worms out of flesh, and in general, alwaies things determinate breed of such and such things; Yea, and they are born at a certain Season too; and the kinds of flies, Ear-wigs, Worms, Beetles and Butter-Flies do all spring and perish at their certain Seasons. And although as *Cardanus* Objects, in sundry places on the Earth, in the Waters, in dead Carcasses and elsewhere, we see the same things bred: yet they are Generated of a determinate matter, which may be found in divers places frequently. And although it may happen, that the matter which is fit for the Spontaneous original of things may in some places be collected by Chance: yet that matter is determined, nor are living things made thereof by Chance, but the next efficient is determined, and alwaies acts after the same manner. Nor matters it that such things as arise Spontaneously are less perfect (an Argument whereof they take to be their not Generating) and therefore cannot have the notion of an end, and so seem to be made by chance. For though compared to others they are somewhat imperfect: yet in respect of their own essence they are perfect, are Nourished, Augmented, Moved, and perform operations befitting their species. But that conceit of theirs is false, when as they imagine such things do not Generate; since even the very least and most ignoble of these kind of Creatures do couple and Generate, as *Aristotle* teaches every where, and especially in his *5. de Histor. Animal*: and Experience also it self doth testify as much. And although in comparison of other Creatures they seem ignoble, yet are they necessary for the perfection of the whole Universe, as shall be said anon from the *Exercitation 250. of Jul. Cesar Scaliger*: and that *Avicenna* wrote well when he said it was better Lice should be bred, then that putrid matter should remain in that condition, is the Opinion of Learned men, who acknowledg a rare piece of workmanship even in the structure of a Louse. For if in the first place we consider the prime Work-Master of all things, he that he might discover his infinite Wisdom and Omnipotency, had rather that living Creatures should be multiplied in the world, then corrupt and putrified matter void of Life; and it is his pleasure, that the bodies of more perfect living Creatures, when they are corrupted should not turn simply to putrid matter, but into more ignoble Animals. Hence, from the parts and Excrements of Animals, from Plants and their fruits sundry sorts of living Things do proceed, and from such and such determinate Things such and such determinate Creatures arise and no other. So thought and wrote *Jul. Cesar Scaliger*, who in the forecited place thus writes: Man was made for God, the world for Man. And soon after: Man is the Prince of Animals. Now man should not have been Prince, if he had not been made as he is, viz. in the middle. Nor could he be in the middle, unless betwixt extreams. They were therefore made for the Mediums sake. Now if any of the extreams, or of those things which are seated betwixt the middle and the extreams, were wanting, there would be a vacuum amongst the forms. Which would be a greater fault in Nature, then a Vacuum in Quantity without a Body. For what is more absurd then a middle without Extreams? which *Austin* also taught long ago, *de Civitate Dei Lib. 12. Cap. 4.* It were Ridiculous (saith he) to imagine that the faults of Cattle and Trees, and other Mutable and Mortal things, which want either understanding

The efficient Cause of Living things Generated of themselves

or Sense or Life, should be damnable: since those Creatures have received that manner by the appointment of God, that by giving way and succeeding they might accomplish the lowest pulchritude of times, in their kind, agreeing to those parts of the World. And a little after: the comeliness of which order therefore doth not delight us, because we according to this our mortal condition being Woven in as a part thereof, we are not able to discern the whole, to which those particles which offend us do very aptly and decently agree. *And again:* Nature considered in it self and not with reference to our commodity or discommodity, gives Glory to its Work-Master.

Whether things generated of them are produced only by the common Cause.

Others though they do not hold that such things are bred by Chance or Fortune; yet they conceive they have no other immediate Cause efficient, but only the common and remote one, in which opinion is the *Conciliator*, who *Differ.* 29. doth make this difference betwixt other Living Creatures and those which breed of themselves, because the former besides the Universal agent, *viz.* The Heaven, do also require a particular one, since the Sun and Man Generates a Man; But the latter want an immediate Cause, and are produced without a particular agent. And the Name it self seems to say as much. For since they are said to arise of their own accord, that seems to hint that they have no external immediate efficient Cause distinct from themselves: for else they would not be said to be Generated of themselves. But in very truth, there ought alwaies to be a proportion betwixt Causes and Effects, that Universal Effects may have Universal Causes, and Particular Effects Particular Causes, and General General, and Special Special. And if it were not so, no demonstration could be made; which is not made by the immediate Cause, and so no demonstration nor science can be had of such thing as are generated of themselves. Moreover, the common and remote Causes are all external and manifest. But that such things as grow of themselves do arise from an internal Cause lying hid in the matter; we shall shew anon sufficiently. Moreover, since there is a great variety of things which breed of themselves, and differences, and certain sorts, they verily cannot all proceed alike from one common Cause, but to every sort its next special Causes must be assigned. And that those common Causes do not suffice doth hereby also appear, that which way so ever they turn themselves who defend this Opinion, they cannot disintangle themselves. Whence they are divided into sundry Opinions concerning that remote Cause.

Whether they receive their Soul from God

*Scotus* held that the Souls of these kind of Creatures do proceed from the most high God immediately. But the Generation of all living Things is Natural. And therefore a Natural Cause ought also to be sought out; nor must we presently run to God, who having created and constituted Nature, doth now produce nothing immediately and miraculously. And since the original of Plants and other brute Animal is from their Parents by means of Seed, but not from God, save as a remote and universal Cause, shall God be the immediate Cause of such Ignoble Animals? Not do the two Reasons which *John Duns Scotus* brings for his Opinion any waies prove that God may rather be said to be the Cause of these Spontaneous things than of such as arise from Seed; as *Fortunius Licetus* doth prolixly examine his Opinions, *Lib. 1. de Spont. Vivent. Art. a Cap. 77. ad 84.* Nor do I think fit to spend time in a plain Cause.

A place out of Luther concerning the generation of these kind of Creatures.

*Luther* upon *Genes. Chap. 1. verse 20.* thus writes: If you ask by what virtue this Generation is caused, which they term *Equivocal*, *Aristotle* answers, that the putrified Humor is cherished by the Sun's heat, and so a live Creature is produced. But I doubt whether this be a sufficient Reason. For the Sun heats, but generates nothing, unless God say by his divine power, let a Mouse come out of that putrefaction. A Mouse therefore is also a Creature of Gods making &c. and a little after: therefore we do here also admire the Creature and work of God. And the same may be said of Flies.

From this Opinion *Johannes Gallego de la Serna* the Spaniard dissents not, *de Princip. Generat. Lib. 1. Cap. 3.* who holds God alone to be the principal cause in this kind of Generation, and writes, that though every Univocal cause cannot produce its individuals, unless God as the first cause concur with its action: yet God concurs with each after a different fashion, according as the Generation differs more or less from the *Equivocal* kind, in which God alone operates as the principal Cause.

cause. And in Chap. 4. he adds, that these weak kinds of living Creatures do need a more vehement concurrence of God then those that have a greater ability to beget their like.

But the most good and great God, (after he had made Nature, which is his ordinary power) is not alone the next and immediate efficient cause of any thing, but by his universal Concurrence conserves all Natural things, and regulates their Generation; which concurrence of his to restrain to one thing, (especially being more vile and ignoble) more then to another, and to hold that he is more vehemently and painfully bulied in some imperfect base thing, then in others that are more perfect and noble, is very absurd. Scaliger saies far more rightly and divinely, Exercit. 1. That power (saith he) of God took no more pains in building this universe, then in making the basest tree: nor did it expresse more subtilty when it made that by its Virtue the Load-stone should have a cause in it self restraining the efficiency of attraction, then when he gave to the first matter the form of Air, that it might ascend. For in his works there is the greatest Equality. And in 2. de Plantis. God neither idle nor laboring; neither in nor without worke; but without worke the Head of the work, the beginning, the Middle, the End, the whole; and that in one word I may Expresse all, Compaß all, Transcend all: He himself, by whose most simple and indivisible understanding of himself all the Worlds were made: so that all have their own End and Order.

How God concurs to the generation of things.

Nor doth Franciscus Suarez think any righter, Who, in Disput. 18. de Causis Proxim. Effic. Sect. 2. Num. 33. writes: that the Heaven indeed by its own proper Virtue cannot make Souls; yet that it makes them by the power of God, as the Author and general provisor of Nature, who by his greater assistance can supply whatever virtue is wanting in the immediate Causes. But the answer is the same which was given to the other Opinion. For since God created all things very good, he also furnished them all with necessary forces, and consequently here is no defect, no weakness, which need to be supplied either from Heaven, or by the extraordinary assistance of God.

Others therefore take pains indeed to find out this immediate cause, but all unhappily, while they seek the same out of the matter, and not in the matter, and define Equivocal Generation to be that in which the efficient out of matter which came not from nor out of it self, but is of a quite different Nature, generates a thing specifically unlike it self and its own form. But none of them hath been able without Absurdity to say or shew what that efficient is, and how it could Generate a thing specifically unlike it self, and its own form.

Avicenna held that an Intelligence Subordinate to God, whom he calls Colocoda, doth produce the Souls of these things. But it is not yet proved, that there are such Intelligences from which things Natural proceed. For from God alone as the first cause of all things, and Nature, all Natural things proceed. Nor is Creation to be attributed to any other thing but God Omnipotent. But the immediate efficient Cause of Generation ought to be like, either in sort, or in the next kind, to that which is Generated. And therefore these Spontaneous live Things cannot arise from a Cause of a quite different kind from themselves, since they are Natural Bodies.

whether the forms of these Creatures is made by Intelligences.

Thirdly, Others hold the immediate efficient Cause of these Bodies to be the Heaven. But this Opinion will not hold Water, more then the other. For in the first place, the Heaven is the common cause of all things Sublunary; as Subservient to their Generation: and therefore it cannot be said to be only the immediate cause of these Spontaneous Creatures, for the Heaven after its fashion advances the Generation of these kind of Creatures, and of such as engender one another, all alike; nor can any Reason be assigned, why it should rather advance the Generation of Spontaneous things then of others. For if they will run to Heaven for want of an immediate Cause, we shall declare sufficiently hereafter, that it is not wanting neither, in the Generation of these Spontaneous Creatures. Moreover, although they that hold the Heaven to be the Cause of this Generation do sundry waies endeavor to declare the same: yet none of them do sufficiently explain the matter: For some, as Averroes, do hold that the heat of Heaven is the efficient Cause of these Creatures: or that these Creatures are produced by the Heaven, by help of its heat. Others (as Albertus Magnus) do hold that the light of Heaven is the immediate Cause of the

whether they are generated by the Heaven.

Original

whether  
the Heaven  
be also a  
Particular  
Cause.

Original of things; others, the motion of Heaven, as *Thomas Aquinas*; others, the occult influences, as *Fernelius*. But which way soever they turn themselves, they help themselves not, but are still pressed with the same difficulty. For the Heaven which way so ever it acts, as was said before, is but a remote and universal Cause. But every effect requires an immediate Cause, and a special effect a special Cause. Moreover, Heat, Light, Motion, and occult Influences are accidents. But no substance, such as the Souls of these creatures are, can be produced by an accident. Some indeed do hold, that Heaven is not only an universal Cause, inasmuch as it affects all Sublunary things, but also a Particular, in as much as by a Peculiar Virtue it concurs mediately or immediately to the generation of all things. But neither is the knot thus loosed. Indeed I grant, that after its fashion the Heaven doth also particularly concur to the making of all things Sublunary, and that not one face of Heaven nor posture of the Stars, and influence thence proceeding, and seasons thereon depending, but sundry, are necessary for several Plants, when they grow, when their flowers ripen, when their fruit comes forth; and that some things spring at certain positions of the Heaven, and die away at other positions, and that doubtless there is a Peculiar Sympathy betwixt some certain sorts of things and some Stars. But the question is whether the heaven gives the forms which constitute those species: which we deny, and hold that the Heaven by its influx doth only stir up some first qualities in the Air, and also by an occult influence excite the forms of living Things, and cause them to buckle themselves to their proper operations. And so, as the Heaven in Univocal Generation so called, whiles the Sun and a Man do generate a Man, is not the next and immediate, but the remote and mediate cause: so also, in this Spontaneous original, it is not the immediate and next, but the remote and mediate cause. Which in Plants and Eggs is hereby manifest, in that even the heat also raised from Elementary Fire doth often perform as much. So the heat of a Stove can in the Winter cause, that forms which lie hid in Seeds will begin to rouse themselves up and sprout. After the very same manner Flesh also in the Winter time kept in an hot place will putrify and breed Worms, as well as in Summer. And as the Dugs of Virgins whiles by their heat they hatch the Silk Worms Eggs do not give a form to the Silk-Worms, nor the heat of the fornace doth not give to Eggs the form of Chicken: even so the Heaven doth not either by its heat or hidden influx give the form to these Spontaneous Creatures; but as it cannot ingender a Man without a mans help, so, unless there lie hid in the matter a feminal principle it can engender nothing therefrom. For the Heaven indeed may hold its course without inferior causes: but in the things themselves below it alone can ingender nothing without the concurrence of inferior causes, they being in every Generation the immediate and principal agents.

whether  
these spon-  
taneous  
Creatures  
do spring  
from heat.

*Alexander, Olympiodorus, Cardan 9. de Subtil. Libel. de Animal. quæ ex putred. Oriuntur*, (whom *Cæsalpinus Lib. 6. de Nat. Rerum, Cap. 21.* and others do follow) hold that the Spontaneous Generation of living Things doth proceed from the warmth of the Ambient Air, either as from an instrument of the Subcœlestial Nature, or as from a primary efficient cause. But since heat is an accident, it cannot act beyond its own forces, so as to produce a substance. Moreover, heat is only the instrument of vital actions; and therefore no primary agent.

whether  
they pro-  
ceed from  
the Soul of  
the world.

Others, as *Philoponus, Themistius*, and the *Platonists* most of them, do suppose that the Soul of the World is the efficient cause of these Spontaneous living Things. For so *Themistius 1 de Anima Cap. 24.* That there is (saith he) an only and Universal Soul of the world, which gives to all living Bodies their Soul, or life if you will so call it, which is nothing but a certain vital and generative faculty, passing through all things Natural, those Animals which are Spontaneously bred of putrid matter do most clearly prove. And *Marsilius Ficinus, Lib. 4. Theolog. Platon. Cap. 1.* writes, that the Soul of the World every where through Land and Water contains in it self spiritual and Vivifical Seeds, and generates of it self, wherever Corporeal Seeds are wanting, also it cherishes the Seeds left by Animals, and of a putrid Grape-seed it can generate a various orderly and precious Vine-Tree; and wherever a generator is wanting, and accidental qualiries do only shew themselves, it performs generation, and undergoes the office of a generative substance. But in good deed, we have elsewhere shewed, that there is no Soul of the World. For though in Animals sundry

fundry actions proceed from one Soul: yet it is not proved, that the world is after such a manner one as an Animal is one. And if the world indeed had a Soul, it should be only an universal cause, not an immediate, nor could any Reason be given why Spontaneous things should rather proceed therefrom then non-spontaneous: and of necessity a cause must be which in Spontaneous things should determine the same to this action, as there are specific causes in the Generation of other living Things. Nor was it therefore to be constituted, that it might supply the defect of a next Cause, in things of Spontaneous original. For we shall hereafter shew that such a cause is not wanting in the Generation of those things. And how can so many sorts of things Spontaneously generated proceed from one Soul?

The Opinion of *Cicero* and *Seneca* differs not much from the foresaid opinion, who attribute that which the Platonists ascribe to the Soul of the World, unto the <sup>whether</sup> Soul of the Earth and Water, or of the Terrene Globe especially. For so *Cicero*, <sup>from the</sup> *2. de Natura Deorum* writes: And if so be those things which are contained in Plants <sup>Soul of</sup> of the Earth do live and grow by the Art of Nature, verily the Earth it self is contained and held in by the same force and Art of Nature: forasmuch as she being full of the Seeds of things, engenders all things, and pours plants out of her self, embraces, nourishes and encreases them: and she her self likewise is nourished by the upper and extream Natures. And *Seneca*, *6. Quest. Natural. Cap. 16.* 'Tis evident saith he, that the Earth hath a Soul. I do not mean that Soul only whereby she holds her self, and joyns her parts together, which is even in Stones and Dead Bodies: but I mean a vital vigorous Soul which nourishes all things. If She had not this Soul, how should she infuse Spirit into so many Trees which have their life from nothing else, and into so many Herbs? How should she be able to foster so many Roots, so different, in so various manners buried in her, some creeping in her surface, others growing deep downwards, unless she had plenty of Spirit, which generates so many and various things, and affords nourishment to the same? And *Marsilius Ficinus*, *Lib. 4. de Immortal. Anima Cap. 1.* We know for a certain (saith he) where nutrition and augmentation follows Generation, there is Life and Soul. But we see the Earth by her own Seeds Generate, nourish and cause to grow innumerable Trees and living Creatures. Also she cause Stones to grow, as it were her Teeth, and Herbs as it were her hairs, as long as they stick fast by their Roots, which if they be plucked up and rooted out of the Earth they do not grow. Who will say, the Womb of this Mother is void of Life, which of its own accord brings forth and nourishes so many Children; which sustains its self, whose back brings forth Teeth and Hairs? The same may be said of the Body of the Water. The Water therefore and the Earth hath a Soul, unless perhaps some man will say, that those living Creatures which we (because they seem to have no Seeds of their own) say are generated by the Soul of the Earth, are not bred of the said Soul, but from the influences of Heavenly Spirits.

But as this Opinion differs not much from the former, so after the same manner it is easily refuted. It is truly manifest that much Air and Spirit is contained in the Bowels of the Earth. But that the said Air and Spirit is the Soul of the Earth cannot be proved. Nor are those Spontaneous living Things we speak of Generated only in the Earth and Water, but also in Animals and Plants, as sundry sorts of Worms. And if in the Earth there were such a Soul, she would not be less noble then her effects, but would also be nourished, grow, and exercise Senses. Also no necessity forced them to suppose such a Soul in the Earth. For it is most known that all other living Things have their Seed from whence they are Generated: and we shall hereafter shew that Spontaneous things are not without their immediate cause neither. And if there were indeed such a Soul, since it would be but one, it could not produce so many different sorts of Creatures, but of a determinate specific Effect a determinate Cause is requisite. And though the Earth, as a common Store-House doth afford nourishment to Plants and certain Animals: Yet it follows not, that she gives them their Souls. The Plants are first constituted by their Souls, before they draw nourishment out of the Earth. Nor doth the Earth of Her own substance afford nourishment to Plants, but only as a Store-House, in which are many mixt Bodies, which prove nourishment for Plants.

*whether Plants spring up of their own accord by reason of a faculty implanted in the Earth.* *Erastus* dissents not much from this Opinion, *Part. 2. Disput. Contra Paracels.* who makes the divine power implanted by God in the whole matter at the first Creation the Author of such effects. But he doth not prove that ever God gave to the whole matter such a power. God produced Plants and Animals out of the Earth and Water, and put into all of them their forms, and commanded every sort of Plants and Animals to multiply themselves, and to bring forth Seed and Fruits according to their kind: but that God gave the whole matter out of the sorts and kinds of things a power to produce Living Things, is no where read in Scripture. But whether this Opinion may any way be tolerated shall be expressed in the following Chapter.

*whether from a spirit produced from Heaven?* *Franciscus Piccolhomineus, concerning things springing from putrid matter, Chap. 3.* held that living Things which spring of their own accord without Seed do arise from a spirit produced out of Heaven. For thus he writes, among other things: *Towards the Generation of Animals which arise out of putrid matter, the Sun or Heaven performs after a sort the office not only of a common but also of a proper cause, inasmuch as by its light and motion is constituted the spirit which immediately forms Animals and gives them life, which answers by way of proportion to that Spirit by which Seeds are made Fruitful, and the Child is formed. Which Spirit, although it hath its vitality from the eminent life of Heaven; yet that it may produce this or that life, it hath from Heaven, as it is Heaven, but as it is received in a determinate matter with a determinate measure, suitable to the determinate sorts of living Things.*

But these things are said, not proved, nor do they make appear that the Heaven lives, and that such a vital Spirit is sent from the Heaven into these lower Bodies. And if this same spirit be the immediate Cause, what needs a determinate matter? Which being necessary, we should therein rather seek the Cause of Spontaneous living Things. But the Heaven can be only a common Cause, as it is in those things which are generated of Seed: and because it hath only one uniform faculty, it is no more disposed to breed a Flie, then a Wasp, or Flea, and therefore it cannot be the proper cause whereof we treat in this place.

*The efficient Cause of Spontaneous live things lies hid in the matter.* Others therefore, seeing it was in Vain to search out of the matter for the efficient Cause of such live Things, they have sought the same in the matter and that rightly. Nor could that move them, of which we spake in the foregoing Discourse, that some conceive that the form and matter are internal causes, the efficient and the end external. For it is false, that the efficient Cause should be alwaies reckoned amongst external causes; but the form it self, as *Aristotle* testifies, is many times one and the same with the efficient. But some have sought this Cause one way, some another.

*whether putrefaction be the Cause?* The most do hold putrefaction alone to be the cause of the Generation of Spontaneous live Things. And with what Authorities they endeavor to prove this their Opinion, I regard not, in case I prove it to be False. Which by this only Reason may be proved, in that the whole Nature of putrefaction consists herein, that it is the corruption of a mixt Body, consider'd as such. And if any thing else proceed from putrefaction, it is by accident. Moreover, experience shews that many Plants and other things are generated of their own accord without putrefaction. And of worms fundry flying insects are bred without putrefaction. And in *Cyprus* in the Brass Fornaces *Pyrausta* or Fire-flies are bred without putrefaction. And therefore we must hold concerning other living Things, that they are not bred of putrefied matter, although sometimes in a putrid thing, and out of the part thereof which putrifies.

*Or from Concoction* Others seeing that putrefaction could not be the Cause of these Creatures held that concoction was the Cause. But in good truth, Concoction is only an alteration and perfection of the Temperament, and induces no change save in qualities, and therefore of it self can produce no substance, but tends only to perfect a thing already constituted by its form. Or if any Concoction precede the Spontaneous Generation, it is only a Previous disposition of the matter, which being attained, the Latent form begins to rouse it self, and begins to form its own body. And although *Aristotle 5. de Histor. Animal. Cap. 19.* writes, that it is common to all Worms, and such Animals as spring from Worms, to receive the beginning of their Generation from the Sun or Spirit; yet that is not to be understood of the communication of the Soul, but only of the disposition of the matter to receive the form under the notion of a Soul, which is caused by heat.

Some again, not being likewise able to find a sufficient cause of this kind of Generation in putrefaction do again fly to the power of the Heaven, and write; that this Generation is made out of putrefaction, by force of the Heaven and Stars exciting the putrid heat, and directing that which is unnatural to the Carcass to become Natural and a certain primary efficient, to induce the forms of some peculiar Animals out of the subject matter. But this will not help a bad Cause. For in the first place, not the heat of the Stars only, but any other heat will serve to raise putrefaction in plants and Animals. Moreover 'tis a begging of the Question to affirm that forms are drawn out of the power of the matter. Moreover they must shew, how heat which is a quality can act beyond its abilities, and not only as an Instrument of a more noble agent, but as the chief efficient, produce a substance, and that such an one as the Soul of an Animal.

*whether  
from pu-  
trefaction  
and the  
Heaven?*

Chap. 2. *The true Opinion concerning the Spontaneous Original and Efficient Cause of these Living Things.*

Since therefore the Generation of Spontaneous living Things cannot proceed from the Causes hitherto specified (concerning which thing *Licetus* treats largely and laboriously in his whole 1 Book *de Spon. Vivent. Ortu.*) another cause must be sought after. For the right finding whereof, we must first enquire what is the difference betwixt the Generation of living things which breed of their own accord and of such as arise from Seed, and what living Things are properly said to be Spontaneous. And we must know in General, that those things are said to be generated Spontaneously, which are generated without any evident and manifest cause. So *Hippocrates* in the 1 Book of Aphorismes, Aphorisme 2. calls those fluxes of the Belly and vomiting Spontaneous, which happen without the use of Medicaments, and *Lib. 2. Aphorif. 5.* he calls those wearinesses Spontaneous, which proceed not from motions and exercises, but from some hidden fault of Humors. So also Plants which grow without the care and labor of the Husbandman are cal'd Spontaneous. Of which *Virgil* in his 2 Book of his Husbandry.

*Nature on Trees doth different Births bestow;  
Some of themselves without Mans aide do grow,  
And round the fields, and crooked Rivers come,  
As Limber Osiers, Poplars, tender Broom,  
And Grey-leav'd Willows.*

And Animals which spring from Copulation of their Parents are not cal'd Spontaneous; but such as are generated without the help of Parents are cal'd Spontaneous. Thus *Pliny Lib. 9. Cap. 51.* writes of Frogs: *'Tis wonderful how after six months life they turn to slime, no man discerning; and again in the Spring they are regenerated after the same secret manner, and this happens every year. Also Limpins and Scallops do breed of their own accord in sandy places.* But yet from the premises it is not sufficiently apparent, what those living Things are which be said to spring of their own accord. For although many plants grow without the Care and Labor of Men: yet they do not all grow without Seed; since many sow themselves, and cast their Seeds into the Earth, or Propagate themselves by Roots. We are therefore now to enquire the difference betwixt things that are generated of their own accord and such as are not.

*Fortunius Licetus, Lib. 2. de Spon. Vivent. Ortu, Cap. 2.* holds, that the Spontaneous Original of living Things proceeds from an Occult Principle which lies hid in the matter wherein the Generation is to be made, and therefore from a principle internal to the thing generated, though Latent. But the Spontaneous original of things is not thus sufficiently differenced from the non-Spontaneous; since also in the non-Spontaneous original of living Things the hidden principle of the thing to be generated lies lurking in the matter or Seed. For the principle of generation is equally hidden to the sense, in an head of Garlick, an Onion, or a Corn of Wheat, as in Horse-Dung, whence the beetle arises. This rather ought, I conceive, to be

*The opini-  
on of For-  
tunius Li-  
cetus.*

The *diff. rence* accounted the difference: that such things as are not Spontaneously generated do proceed from a Seed, or Bulb, or some other thing answering to Seed, manifestly produced by a plant of the same kind: but such living things as Spring of their own accord are produced without a manifest generator of the same sort. Truly when generation it self is made, or rather the formation of an organical Body, the generation of a Spontaneous living Thing differs not from that of a non-Spontaneous. For in both the motion and the formation of the Body is made by an agent, which lies concealed in the matter. But here in they differ, in that, before the parts begin to be formed, the Soul in its essence, and as such, and as it performs the office of a Soul, is in the Seed or matter in the non-Spontaneous generation: but in Spontaneous generation, although the Soul be in some sort in the matter of which the living thing is made; yet the Body of a Carcass, or what ever other matter, doth not participate the same under the notion of a Soul; because a Carcass is not properly animated, nor yet under the notion of an efficient cause, because as yet it is dul and Stirs not.

The *diff. rences of Spontaneous living Things.* Howbeit, in this thing, there is stil no small difference. For some things are really engendred of matter specifically different; as the Beetle of Hors-dung, worms of Cheese or flesh; but some things seem only to the sense to be generated without seed, and of a thing specifically different, when as indeed they are made of seed, or of somewhat answering to Seed: as some Plants are said to grow of their own accord, after Rains or Inundations of Water, when as in truth they are made of Seeds mingled with Rains or Waters. So of Swines dung, Carduus, and Sow-Thistle and other Plants do grow, not as Beetles do out of Hors-Dung, or Worms out of Cheese, but because some of the Seed of these plants unchanged by digestion are voided afterwards with the Dung. Which two differences of Spontaneous Generation must needs be observed.

Places of Aristotle where he teaches that all things are Generated by an univocal Agent. And though there be some difference of Spontaneously Generated live Things: yet they all proceed from an univocal agent and not from an Equivocal: which Aristotle teaches in many places (nine of which *Fortunius Licetus* quotes) in all which he tells us, that all substances are generated by an efficient actually of the same Nature univocal. The First is, *1 de Generat. et Cor. Text 30.* The Second, *1 Magnor. Moral. Cap. 10.* The Third, *1 de Part. Animal. Cap. 1.* The Fourth, *7 Metaphysic. Text 22.* The Fifth, *in the same Book, Text 30.* The Sixth, *in the same Book Text 31.* The Seventh, *in the same Book, Text 32.* The Eighth, *in the 12. Metaphys. Cap. 13.* The Ninth, *in the same place, Text 18.* all which may be seen in his works. We shall only produce one or two. For Aristotle in *1 de Generat. & corrupt. Text 30.* *1 Magnorum Moralium, Cap. 10.* *1 de Part. Animal. Cap. 1.* writes, that even those things which are said to breed of their own accord have a like efficient cause preceding, as well as things produced by Art. And *in the 7. Metaphys. Text 22.* and *Text 32.* he writes expressly, that it is proper to a substance for to have necessarily another like substance actually preexisting, whereby it may be Generated. And *in the 12. Metaphys. Text 13.* and *Text 18.* he therefore rejects the Platonical Ideas, because all things both Natural and artificial have like univocal causes by which they are produced.

How Spontaneous living Things are generated by an univocal generator. Although therefore it is to be granted, that even the Spontaneous Generation of living Creatures is after a sort univocal; Yet I shall not deny that Generation is an Analogical kind; and that Univocal Generation is more evident in non-Spontaneous, then in Spontaneous living things. Which Aristotle himself seems to hint, when in the place but now alleadge, *7 Metaphys. Text 30.* saies that all things are made after a sort by an Univocal agent. And indeed the Nature of the Generation of Plants which proceed from Seed properly so called, (such as that is of non-Spontaneous live Things, as also of those things which arise from a latent seed) is different from that of those live things which are most properly said to arise Spontaneously and Equivocally. For in the former, the Seed of which they are Generated, *viz.* Herbs, hath actually a Soul in it already: but in these latter, the matter of which the living thing is Generated hath not actually in it the Soul of the thing generated; suppose a worm. Yet the form lying hid in the matter is apt to be turned into a Soul, so as to communicate it self to the matter, in notion of a Soul; and thereout to frame a living Body. Whence that difference betwixt *Seneca, Scaliger, and Licetus*, concerning the Seed, may easily be compounded. For

Seneca



*Seneca* 3. *de Beneficiis* Ch. 29. and *Scaliger* in *Theophrast. de Plantis* Lib. 1. Ch. 5. teach that all things have their Seeds. But *Licetus*, *de Spont. Vivent. Ortu*, Lib. 4. Cap. 2. denies that all things have their Seeds, and holds that some things are propagated by no Seed properly so called, though they have somewhat answering to seed by way of proportion. For an answer may be made out of the very words of *Licetus*; viz. Seed is taken properly, and improperly. Seed properly so called is a Body, which as the proper subject contains in it self a Soul, in the first formal act; which comes to pass in such things as are not generated of their own accord: but improperly that may be called a Seed, or at least somewhat answering to a Seed, which hath not indeed a Soul actually, yet contains a principle or form, which attaining a fit disposition of matter begins to exercise the Office of a Soul. Whence, the Carcasses of Plants and Animals out of which Worms are Generated do not contain in them the Seed of Worms, yet they have in them a form, which doth afterward advance it self into a Soul. Mean while this also is true, that such things are not altogether Equivocally Generated as is vulgarly imagined: which appears even hereby, that those living things which are thought to be generated of themselves and Equivocally, are of the same sort with those which are not so Generated: which thing is manifest from Generation it self. For although some things Spontaneously bred do not generate, as Toad-stools, and Vine-Worms, and other vile creepers: yet most of them engender a living Thing like themselves, as Experience testifies. *Theophrastus* writes 1. *de Caus. Plant.* Ch. 1. and 5. and *Scaliger* upon him; that a Plant Sprung of its own accord hath by its Seed produced another like it self. So *Laserpitium* which grew up naturally of its own accord, and a whole Wood of Trees, where never were any before, did produce Plants that bare Seed. Bees bred out of a Bul are fruitful. And *Avicen*, 15. *de Animal. Cap.* 1. doth testify; that he had a friend who made Scorpions, either by burying the Juyce of Basil, or by some other means, and they afterward generated other Scorpions. And that in a certain City of the *Saracens*, called *Scealikam*, after a great Rain, Silk-Worms were seen to cover the ground many miles together, and every Worm made Silk, and afterwards they flew away and made Seed.

Seed taken properly & improperly

Now that the univocal Agent by which Spontaneous living Things are bred is a Soul of the same sort with that whereby they are constituted in their being, and vivified, *Fortunius Licetus* teaches Lib. 2. *de Spont. Vivent. Ortu*, Cap. 26. For since, as *Aristotle* both in other places and in 1 *Magn. Moral. Cap.* 10 teaches, Plants and Animals arise from Seed as an univocal principle, but the Seed is not univocal to the Animal or Plant to be generated, save as it participates a Soul of the same sort; it seems from thence apparent, that the Univocal efficient from whence Animals have their original which are Spontaneously generated, is a Soul of the same Nature with that wherewith they are enlivened. And questionless the case is plain. For since it is most Natural and proper to the Soul to generate live things; nothing can Naturally procreate living Things which hath not a Soul in it.

The efficient of spontaneous live Things is the Soul.

Now that the Soul of these living Creatures is in the matter, and that we are not to seek their efficient Cause out of their matter, the Generation of Worms out of Flesh doth shew, in which no external Cause helping, unless the heat of the Ambient Air, Worms break out of the Flesh of their own accord.

Now whence this Soul which is the efficient Cause of these Spontaneous Animals doth come into the matter, of which they arise, is further to be enquired into. And although this be a very difficult point, and one of the obscurest in Nature, and it is also hazardous for a man to propound his opinion herein: yet will I freely propound my mind, which if it shall not please all men, yet such as are studious of the truth will acknowledg thus much, that it comes nearer the truth then that Opinion of the Eduction of forms out of the power of the matter, which is an Opinion that paises a man with words, but hath nothing in it to satisfy a studious mind, as is sufficiently declared in the 4. *Chap. of the foregoing Discourse.* And first of all we must hold (which I conceive to be out of question) that nothing can contribute such a matter nor consequently the Soul, unless it be a Living thing, or proceed from a living Thing; and that therefore Spontaneous living Things do only proceed from living Things or such as have lived: which also experience teaches. For it was never yet known, that of the simple Elements, of Metals, Minerals, Jewels, as such,

whence the soul comes which causes Spontaneous Generation?

Spontaneous live Things grow only out of living Things any

any Animal or living Thing hath been bred, but every thing of which such Animals are Generated is either a living Body, hath lived, or hath proceeded from a living Body.

How many waies the Soul may be in the matter?

A twofold Act of the Soul

Essential

Accidental

A double operation of the soul.

A soul may be in a matter & not inform it.

How all things are full of souls.

What is to live.

The soul is two waies in the matter

Now to find out the manner of this generation, in the first place we must enquire, how many waies the Soul may be in a thing. For in the first place, which no man denies, there is a twofold act of the Soul: one Essential, called the first Act, and is the bare Essence of the Soul: the other accidental, which is called the Second, and is the operation proceeding from the Soul. And therefore the participation of the Soul is also twofold, the first is the Participation of the simple substance of the Soul, as of a form perfecting its matter; the Second is the Participation of the Soul operating. The Second participation is when Organs are provided for the performance of the actions; to the first there needs only a disposition of the matter, that the Soul may thereby be fit to perform the Office of an Efficient Cause and to form the Body.

But besides these two manners, there is yet a Third, and the Soul may yet after another manner be in some kind of matter, so as neither to inform the same and vivify it, nor to perform the proper operations of such a living Thing. So the Seeds of Plants and Animals may be in the Water and in the Earth, and the Soul may be in them, and yet they neither inform nor Vivify the Water nor the Earth. Hence Aristotle said, not without reason, 3. de Gen. Animal. Cap. 11. that all things are full of Souls, while he thus writes: *Now Animals and Plants are bred in the Earth and Water, because there is moisture in the Earth, Spirit in the Water, Animal Heat in the Universe, so that all things are in some sort full of Souls. And therefore they come speedily to a Consistence, when that heat is comprehended or received.* Which very thing manifestly appears from things putrid, out of which sundry kinds of Worms are every where bred, and in Plants which grow in Common Fields and Gardens where no Seed hath been cast. And scarce any place is so barren but that Plants and Animals will breed therein of their own accord. Now this speech of Aristotle is thus to be understood, not that all things do live and are animated; for which cause he did not simply say, that all things are full of Souls, but in some sort, viz. in all things in a manner there is such a like substance, which when all impediments being removed it hath got a fitting matter, it rouses it self and performs the Office of a Soul. For, to live, is not to have and contain a Soul after any fashion; but to participate the same and to be informed by it, and as that which frames and preserves the organical Body. For, as Aristotle teaches, Animal heat, and consequently that which hath the Soul adjoynd thereto, is truly in all the lower part of the world, the Air, Water and Earth: but not as their essential part or attribute; since the Earth and Water are of their own Nature cold, and neither of them are informed by any Soul: but as a thing placed in a place or Vessel, viz. because the Earth, Water and Air, do contain the Carcasses parts and Excrements of Living Things, in which are Atomes and smal Bodies having Souls in them. And so the Generation of things Spontaneous is then caused, when the Souls (as Fort. Licetus speaks) are now by the benefit of heat united and associated to such things in which they were contained only as in a place or Vessel, under the notion of a Cause efficient, forming an organical Body; or as Aristotle speaks, when the matter shall comprehend that same heat of Animals and the Soul with it, and shall make it proper to it self; presently by way of Spontaneous Generation that matter receives the Consistency of a living Nature, putting on the Soul in Nature of a Form, which before it contained distinct from its Nature, like a Vessel.

Concerning which thing Fort. Licetus treats at large, Lib. 2. de Spont. Vivent. Ortu, Cap. 11. 28. et Seq. and endeavors with much labor to prove, that the form and Soul is two waies in the matter, viz. as an act and perfection in its proper subject, and then as a thing contained in a Vessel, not belonging at all thereto, or as an accident in the subject. And this distinction is the foundation of his whole Doctrine of the original of these kind of Creatures. 'Tis not worth while to cite here all that he there alleages. For sure it is, the Fire with its form is in the Iron, is in the hot Water, is in Rain, is in the Earth, and yet doth not inform them. And which is a most clear example, Gold resolved into its smallest Atomes is in Aqua Regia, and Silver in Aqua Fortis; yet so as to retain their forms entire, as appears by their Reduction;

Reduction; yet they do not inform those Waters, but the Form of Gold and Silver is in the Waters, as in a place. The same appears in the Souls of living Things. For the Seed cast into the Earth is therein as in a place, nor is the Earth informed by the form of the Seed. Yea and which is much more wonderful, the Form of a Plant will sometimes remain in dry Wood, as *Virgil* writes of the Wood of an Olive-Tree, in the Second of his *Husbandry*.

*And (Wondrous to be told) an Olive Tree*

*Out from a dry cut drunk oft springs we See.*

Of which we shall speak more at large in *Chap. 7.*

But whether Souls may properly be said to be in a place, and whether all the Souls of Spontaneous Creatures are thus in the things whence they spring, I doubt. Truly if Seed, or a Body answering to Seed consisting of matter and form, may be said to be in a place, as Frogs spawn, or that Seminal Body out of which after Raine Plants do Spring, it is rightly said to be in a place. But whether the Soul it self which is therein, in the Water, or Rain, may properly be said to be in a place, I doubt. But let us thus take the Soul with its proper subject, and let it in this manner be said to be in a place: yet whether after the same manner in a Pine, out of which Ear-wigs, or in other woods whence worms spring, or in Corn whence the Wubbles are Generated, that Soul of the living Creature be present, may be justly doubted. For the Atomes of Gold and Silver consisting of their matter and Form, are in the *Aqua Regia* or *Aqua Fortis*, as in a place: and the Seed of some Plant or Frog, consisting of a Soul and matter, wherein the Soul is as in its proper subject, may be in the Earth or Water, as in a Vessel or place, but by means of the matter or Body wherein it is. But when of Wood or Flesh a live Animal is bred, there the Soul which of it self is in no place, hath no matter wherein it may be as its own proper subject, and in respect of which it may be said to be, in Wood or Flesh, as in a place or Vessel; but the proper subject of that Soul is that same thing or Flesh, wherein nevertheless it is not formally, but only really, nor hath the notion of a Soul, but then begins to be formally, and to be separated from the Wood and Flesh, and to live and exist by it self, and to have the notion of a Soul, and to exercise living operations, when through putrefaction or rather the heat joynted to the putrefaction, that matter is so elaborated that it may become a fit subject wherein the Soul may formally exist.

And therefore as was said before, there is not only one way of Generation of Plants and Animals which are Generated of their own accord. For some are indeed Generated from Seed bred by a living Creature of the same kind, although they seem to be Generated of their own accord. So, after overflowings of water, after Rains and Winds, Plants do sometimes spring of themselves, of Swines dung Thistles and Sow-Thistles are bred. In which there is no other difference betwixt the Spontaneous and non Spontaneous, save that in the former the Seed lies hidden; in the latter it is manifest. And there are Seeds of different Nature. For some unless they be diligently lookt to and manured they lose their Seminal faculty and their Soul. Others although they seem corrupted, yet in a certain Juyce or in some Atomes the Seminal faculty is preserved. Again there are other Spontaneous live Things which are bred without Seed, as when of Cheefe, Flesh or Wood, Worms are bred, in which there is no such Seed found as is in the Waters and in the Earth.

Now concerning the original of the latter kind, the question is very difficult, wherein to determine any thing is very liable to blame. *Fortunius Licetus, Lib. 2. de Spont. Vivent. Ortu, Cap. 36.* holds that the efficient Generating Cause of Spontaneous Animal, is a Soul of the same Nature with that whereby such Animals are constituted in their being, but not quickening nor any waies actuating the subject wherein it is, but lying concealed, as in a vessel, in that Carcass out of which these Animals are Generated: and that the Soul which is in the Carcass is the same with that which did constitute the Animal or other living thing, but impaired, not having the notion of an actuating form, and perfecting that wherein it is, but of privation; since such an impairing deprives the Soul of its Ancient perfection, which was to quicken and perfect its subject Body. For as a sensitive and seeing Soul is an habit in an Animal that is sound; but in one that is blind, it being evervated by the marring of the Organ it degenerates into Privation: so also he holds that after

*Spontaneous Generation born manifold?*

*The opinion of Fortunius Licetus of the original of spontaneous live things properly so called.*

Death;

Death the Soul of an Animal which remains in the Carcass degenerates into Privation, and being weakned it Creates Spontaneous imperfect Animals.

Now how the Soul is cast down from that perfection, he teaches in the same Book Cap. 37. and sets down two waies, by which the matter of the Carcass obtains a non-Quickening Soul. The first is; that when the Live-Creature dies, all the heat necessary to life is not abolished, but so much of it remains as suffices to retain the Soul in the Body, as in a Vessel. In which case, he writes, that as it may happen frequently, that together with the weakning of the heat and Death of the living Thing, the substance of the vegetable and sensitive Soul supported by that heat may suffer an Essential Empairment, whereby it may come to degenerate into a more imperfect nature and a baser kind of Soul; so he conceives it may somtimes come to pass, that retaining its Ancient Essence it may put forth its weakned forces. The other manner he makes to be this: because, saith he, while the old living Creature dies, and while the Excrement is driven out of the Body of the living Creature, its Soul yet remaining may introduce a new Soul into the next matter lately bereft of the same Soul, with a small heat in the first instant of Nature, not yet able to vivifie its subject Body, but may be bred therein as in a Vessel, somtimes of the very same sort with the generating Soul; but most frequently imperfecter and Baser: both because of the imperfection of the matter, which cannot receive so perfect a Soul, as also by Reason of the Infirmitie and Debility of the forces of the Soul Generating, which in the Death of the former Animal either perishes, or is very much weakned, that it cannot engender one like it self, but is able to produce one inferior to it self. Of which he treats at large to the 39. Chapter; wherein at last he concludes his Opinion in these words: the immediate efficient Cause of the original of Spontaneous living Things from which they immediately receive their Soul and all Spontaneous living Things are generated, is nothing else but a vegetable or sensitive Soul, abiding in the Carcass, or in the Excrement proceeding from living Creatures, as in a Vessel, lying hid with a weak heat, not actuating the same, nor any waies perfecting it, somtimes of the same sort, or also Numerically the same with that which was formerly in those living things: yet many times of a different sort and a more base Nature, and imperfecter substance; into which with the decay of the Body and heat, the former Soul is degenerated: which Soul in the Carcass or Excrements, proceeding from the former living Creature not quickning its subject Body, it remains therein, not exercising the actions of life, not as a form in its subject, but as in a place, and in a vessel, as it were by necessity of the matter, or at last by the total vanishing of the heat whereby it is supported, it self perishing; or with the augmentation of the said heat and vigour acquired from the Warmth of the Ambient Air, communicating it self to its subject Body, as a form and quickning Soul, and performing the functions of life, as shaping of a Body and generating of a Spontaneous live thing.

the opinion  
of Licetus  
examined.

But in very good deed, it seems hard to hold, that the former Soul remains in the Carcass; and to affirm it in a man, is most absurd: whereas nevertheless worms are as well bred of the Carcass of a man, as of other Animals. Indeed, Lib. 2. Cap. 39. Licetus excepts the rational Soul, and writes that only the Sensitive and Vegetative Souls remain. But it is only affirmed and not proved, that there are three Souls in a Man, of which the Sensitive and Vegetative may remain after his Death. Yea and in Brutes that same degenerating of nobler forms unto less noble is absurd, and is propounded without Reason. Rather the Constitution of Body and various operations do shew, that Spontaneous Animals which are Generated out of dead Bodies do differ in kind and Form from those Creatures out of which they are bred. Nor doth he shew any Reason, why the Soul of the living Creature should degenerate into the Soul of this creeper rather than another: since we see that every Spontaneous Animal is not bred of every living thing, but certain Animals are bred of certain Bodies. Nor in a blind Man doth the seeing Soul degenerate into a Privation; but in the Eye, because of the disease thereof, Privation of sight is introduced; but the soul it self hath the same perfection it had before, and the disease being removed sees again; nor while a man is blind doth it perform other operations. Yea, and the Soul while it lives informs the blind Eye, although it cannot cause sight therein by reason of its disease. And if the soul should remain in the eye of a blind man, as it doth

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in a Carcas, contributing nothing thereto, the Eye would be mortified and Sphacelated; but we see the contrary. And although it is true that some part of innate heat and Radical moisture remains in the Carcasses of Plants and Animals, which is not destroyed save by Putrefaction and Rottenness which many times happens long after Death; yet that temper and heat of the living Thing doth not remain, and therefore neither can the specifick Soul of the living thing remain; seeing the death of an Animal and of a live Thing is the extinction of that Vital heat, and thereby Souls are separated from their Bodies, but the Soul doth no way suffer any essential impairment (for the Essence of forms is indivisible) whereby it can degenerate into a more imperfect Nature. And when a living Thing is Generated of the Excrements of Animals, it is not credible that the Soul remains in the Excrements; since in the living Body, the Soul was never in the Excrements.

But to me it seems more agreeable to truth, that in living Things there are divers Auxiliary and subordinate forms, yet so that one is principal and Queen, which informs the living Creature, and from which the living thing hath its Name, *viz.* The Soul it self of every living Thing; and the rest are Servants as it were, which as long as that superior and Lady Soul is present, do pertain to the disposition and condition of the matter, and therefore they do after a sort inform the said matter, that it may be a fit subject for the specifick form, and they have also actions of their own; yet they do not animate the same, nor do they give it the Name of a living thing; which is the Office of a specifick Soul only. Nor let any man hatefully traduce this Doctrine of subordinate forms as new. Most learned men have delivered the same, and have taught that these forms do constitute the Seminal matter as it were of live Things. *Jul. Cas. Scalig. Exercit. 59. Sect. 2.* writes: *As in the Earth Plants are changed one into another; so above ground they breed Animals out of themselves. And that not out of putrefaction, but cherishing in themselves certain Seeds for Generation.* The same Scaliger, *Exercitation, 190.* *Animals* (saies he,) *Are not bred of putrid Plants, but are the Offspring of Remaining Vigor which is in them. For it is certain that beans are not putrified, when Animals breed in them.* He also *Lib. 2. de Plantis, p. 389.* rightly teaches, that it is manifest that Fir-Wood and straw or Chaf have in them the Natural rudiments of Wig-Lice. Also he writes in the same place, that it is commonly reported, that of Wig-Lice broken Wig-Lice do also engender. Which he counts unlikely. But that from the same original whence those that are broken did arise, new ones are Generated in the same place. But I see no cause why those rudiments of the Wig-Lice may not remain in those that are rubbed in pieces. *Shegkius* the German, *Aristotle, de Occultis Med. Facult. Lib. 2. Cap. 1. Page 103. in my Edition,* saies, it will be no absurdity, if we shall say that divers forms are in one substance. And afterwards, he proves in Plants, that the specifical form being abolished, there remains not only the temperament, but also the substantial form, and that it is the Author of Occult Faculties. *Zabarella* also, *Lib. de Generat. and Interitu, Cap 4.* writes, that the form of a mixt Body in a living Creature doth not perform the Office of a form, in respect of the whole living Creature, but rather of Matter. But that the Soul being taken away, the same Form of mixture begins to perform the Office of a Form, and to constitute that Body specifically. And this he declares in the same place by an example. Just as, (saith he) if when a King is dead some Servant be made King, he was also before during the Kings Life, but he was not as King; and therefore if any shal ask whether a new King be created or no, answer ought doubtless to be made, that a new King is created, and the King is changed. Even so, at the Death of a living Creature, a new Form is acquired, inasmuch as that which was before as a Condition of the matter, being subject to a more noble Form, doth now begin to be a Form to constitute the compound, and to bear Rule. And that which *Zabarella* speaks only of the forms of mixt bodies, that is to be understood of all Forms excepting the Elements, which are necessary to the Constitution of a living Body. And that there are such Forms, is proved before in the *Second Discourse* of this work. Nor doth it import any absurdity, that besides the specifical Forms there should be other subordinate Forms: but as *Zabarella, Lib. 1. de Generat. & Interit. Cap 2.* writes, if it be not against Reason there should be two, neither is it that there should be four or an hundred together in the same subject.

*The opinion of the Author concerning the original of Spontaneous Live things properly so called.*

*There are subordinate souls.*

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whether  
the subor-  
dinate  
forms are  
specifical.

There is one who argues here, that subordinate Forms are also specifical, But either he understands not what a specifical Form is, or he cavils Maliciously; and in the mean time he grants in the same living thing divers forms. Verily, There is no form, which by it self considered may not be termed specifical. So the form of fire, where ever fire is, is specifical: but when Fire is in a man, it is not the specific form of a Man, but the rational Soul is mans specific Form. He Fights therefore with shadows, and Toies with cavillations, who denies subordinate Forms, and thinks they are not to be distinguished from specific forms, because they also are specific. The Form (saith he) of the Earth is under the command of a specific Form, yet it is in its proper matter, and retains the Nature of a specific Form, although it be under another Specific Form. For it is not the Specific form of that thing to the Form whereof it is subject, but of that matter whose Form it is, with which it abides, comes and goes. But if the form of the Earth be subject to another Form, why shall I not term the same (with *Zabarella*) a subordinate Form? But in a Man to hold both the Form of Earth, and the Humane Form to be specifical, is most absurd. For there is no Natural thing which hath two specific Forms. Yet those specific Forms which whiles they are in the living Thing do belong to the matter, the specific form departing, do become specifical, as the same *Zabarella* teaches, and perform the operations of a specifical Form. So that Form from whence there arises out of a Carcass a Beetle, a Wasp, a Bee, while it is in the Horse, or other living Animal, it cannot be called the form of a Wasp, a Beetle or a Bee; since then it performs not the Office of a Form, but is in place of matter. But when it performs the Office of a Form, it can then multiply it self, and beget its like. And indeed the Nature of a Form is far different when it is subordinate and in the place of matter, from what it is when it becomes specifical. Therefore also subordinate Forms do not give a Name to their subject, nor can I say that in a man there are Worms, in an Heyfer fed with Mulberry Leaves there are Silk-Worms, but at last when the Specifical Form departs, they begin to perform the Office of a specific Form, and give a Name to the thing.

Whence also that is of no moment which some Object, if the Soul of a Worm were in a Plant, the same substance would be a Plant and an Animal; since the Form gives as well the Name as being to a thing. For the species or Forms of Things, truly, are not simply known or defined by us according to their Essence, but so far forth, as being sensibly parts of the World, by their Bodies and actions they fall under our sense; and a Name is given them, not from their essential act, but from their faculties and actions which they exercise in such a subject. For indeed, the Seed of a Dog doth not essentially differ from a Dog: yet because by the term Dog we do not understand simply the Soul of a Dog with any kind of matter, but a four footed barking Beast, the Form of a Dog in the Seed is not called a Dog, before it have shaped a Body fit for it self. After the same manner, in a Silk-Worm and Butter-Fly, there is one and the same Soul, yet is it not termed a Butter-Fly, til it is changed into a Winged Creature. So also, in a Plant, though there is the Soul of a Worm, yet the plant is not termed an Animal, but the Government of the Plants form ceasing, and another Soul receiving and exercising the Sovereignty, 'tis termed an Animal.

How sub-  
ordinate  
forms are  
in thinge.

Nor can it be hence concluded (as some object and think it may) that there are in man and sundry other Animals Worms, or that this or that living Creature hath Worms or other live Things in it. For to the Constitution of such Animals, as of all other Natural Bodies, there is requisite not only a Form, but also a matter, and the Form ought to inform the said matter. But those Forms, though they are really in other living things, yet are they not therein in the Nature of forms, nor do they perform the Office of Forms, nor Animate the matter, nor quicken the Body, nor exercise the operations of life therein, but all these things are performed by the more noble and specific Form, or Soul of the living Thing: but they themselves belong to the disposition and determination of the matter. But when that specific and more noble Form or Soul goes away, they being stirred up by the ambient heat, and having gained a fit disposition are advanced into the quality of Forms, and communicate themselves to the Body as vivifying Souls, and in the first place they set themselves to shape Bodies fit for them, but afterwards they begin to exercise there-

therein the functions of Life. Yea and the same Forms do lie hid under different external Figures, and so pass into the Theatre of Nature. 'Tis a clear case in the Palmer Worms, in which one Soul puts on divers Bodies, and as *Aristotle 5 de Hist. Animal. Cap. 19.* and *Pliny, Lib. 11. Nat. Hist. Cap. 22.* saies, there is a various succession of Forms, viz. external ones. For the internal remains the same. Which though it may seem to some absurd: yet is it no waies absurd, but it is easie for any one to make observation of the truth thereof. For first of all, of the Egg of a kind of Butter-Fly is made a Palmer Worm; this Worm, according as *Libavius* diligently hath observed, *Singular. Part. 2. Bombycior. Lib. 1. Cap. 21.* in a months space changes its Skin four times. And who will say, that here the internal form is changed; unless he will say when Snakes cast their Skin that a new Generation is made. Afterwards, it becomes a Silk-worm; where again there is no essential mutation, for a Silk-Worm is no other then a Palmer Worm grown up. And when afterward it becomes a Nymph, there is again no essential mutation, but the internal form only working it becomes a Butter-Fly. Nor doth this happen only in the Palmer Worm and Silk-Worm, but in all Egg-bearers, as for example in the Chick of an Hen. For look as, while by the heat of a Bird of another kind, or also of the Fire, a Chick is hatched out of the Egg of an Hen, there cannot so much as any thing be imagined which should give the Soul to the Chick, unless it had been before in the Egg: so also when by the Warmth of Womens Dugs the Eggs of Silk-Worms are hatched, and there comes out Silk-Worms, nothing can be assigned which might generate the Soul. And that one Soul can assume various Bodies the degeneration also of Plants doth shew, whiles Rie and Barley do turn to Wheat, and Wheat again into Rye and Barley, the same internal Form remaining, and the external only changed.

One internal form may put on divers external ones

Hitherto also belongs the degeneration of Plants into other Plants; which happens in those Plants whose Seeds are either ambiguous, and contain divers forms in them, yet so as that one Rules and the other serves; unless upon occasion another alteration be made; or whose Soul is disposed to receive divers forms external, as appears in Silk-Worms, yea and Bees too. For as the same essence of a Form doth in them remain under divers external shapes, and first there is a Palmer Worm, then a Silk-Worm, then a Butter-Fly: so also in Plants, there is the same transmutation of the external Form. Which also *Julius Caesar Scaliger* doth grant, when in *1 de Plantis*, (saith he) there are the confused principles of divers things in Seeds, as of Rapes, Cole-worts, and others. *Licetus* indeed *Lib. 2. Spont. Viv. Ort. Cap. 14.* writes, that a Form upon great mutations of the matter is changed into another species, and depressed into a more inferior degree. But this degeneration upon the mutation of the matter is made not only into an inferior degree but also into a Superior: which experience doth testifie. Wheat degenerates into Darnel; Water-Cresses into Mints; Rape into Radish; Basil into running Betony; the white Vine into the black, and the black into the white; Barley into Wheat, and again Wheat into Barley. If in *Hungaria* they sow German Rye it turns into Wheat. If a Field be somewhat barren, our White Oats (as they call them) degenerate into black; if the same Seed be sowed some years together, it grows more base. And therefore after some years the Husband-men are forced to change their Seed. Contrariwise, if black Oates be sowed in a fat Soil, white Oats will Spring up therefrom. Gilly-flowers, Roses, Violets, do oft change their Colours. Whence *Virgil* writes of Seeds.

The degeneration of Plants.

*Choice Seeds and with much Labour culled out  
Do yet degenerate.*

And *Galen* writes of his Father, in *2. de Ele. Facultatibus, Class. 2. Page 30.* that, when in his declining Age he was delighted with Husbandry he sometimes sowed Wheat and Barley, and pickt out al other kinds of Seeds that were mingled with them, that he might certainly know whether Cockle and wild Barley would proceed from the change of the said grains, or whether they had a proper Seed of their own. He therefore found among the Wheat frequent Darnel, and amongst the Barley wild Barley or wild Oates; and made the same experiment in other Seeds. He therefore found in Lentils also, that they were changed into hard and round Vetches.

Vetches and Ax-wort, also Goof-grafs grow therefrom. If some would now adaies use the like diligence, they should merit most worthy commendations. For so they would not so frequently become laughing stocks for Country Clowns. And this experience would tend more to the gaining of the knowledg of Natural Philosophy, then those Vain speculations, and more base then Ditch-Water, so much in request. I shall say more of the degeneration of Plants beneath. *Chap. 7.*

And so much may suffice to have said of the primary efficient cause of the Generation of Spontaneous live Things. Only this one thing is yet to be noted, that these degenerations are not properly Spontaneous Generations, since they are made of Seed and that evidently: although those Forms, according to the divers disposition of the matter, have the power to shape sundry figures of the external Body. Also the Ambient heat, especially that of the Sun and Moon, do concur to their Generation: but that heat is not the primary agent, but only stirs up the Soul which lies secretly hidden, and prepares and affords fitting matter to the same. And therefore that what we have said of the Spontaneous original of living things may be more apparent, we must speak yet somewhat concerning their matter.

### Chap. 3. Of the Matter of Spontaneous living Things.

*The matter of Spontaneous live things.*

AND indeed the chiefest difference betwixt live Things of Spontaneous and non-Spontaneous original, is in their Matter. For both Animals and Plants which are not Spontaneous do so Spring out of their Seeds, that it is manifest to every one whence they proceed. But the principle of Spontaneous live things lies hidden, and so they arise of their own accord, as it were without any Generator. Yet they have also their principle. For every one of these is not bred of every matter, but such and such a sort of such and such a matter, as shall hereafter more particularly appear.

*The various propagation of Plants.*

And whereas we said before, that some things seem to be generated of their own accord, which yet are indeed generated out of a Seminal principle, by a living Creature of the same sort; others proceed from Bodies specifically different; we must know, that the Seminal principle is not in all things tied to the same matter; which also appears from Plants, which do not spring of their own accords. For all Plants do not proceed from Seeds peculiarly so called, but some are propagated without Seed by Roots, others by bulbes, others by branches pluckt from the whole, and others by Leaves pluckt off, as the Indian Fig-Tree. And therefore it is no wonder, if the Seminal principle may be preserved entire even in Waters, in Rains, yea and in the dung of Animals, as shall be hereafter more particularly expressed. Yea, and in more Ignoble Animals, the Seed is after the same manner preserved in the Earth and in the Water, as shall hereafter be declared. So that Aristotle, 3 de Generat. Anim. Cap. 11. said that all things were full of Souls. For there is Scarce any Body from which such Spontaneous Creatures do not arise. Licetus indeed Lib. 2. de Spont. Viv. Ort. Cap. 13. holds that such living Things are not bred of Bodies imperfectly mixed: but that must be rightly explained. For sure it is that of Rains, Mists, Dew, sundry kinds of Worms are bred, and experience doth testify the same. Which though they are imperfectly mixed bodies if they be considered in their own Nature, and in them some Element is predominant, as in Dew and Rain Water: yet among these Bodies other Bodies perfectly mixt are mingled in their smallest Atomes, in which as in Seeds there are the Souls of living Things, and out of which Worms are also Generated afterwards. And therefore Worms are not bred of every Rain, nor of every Dew, but of some only.

*Whether Animals Spring from Bodies imperfectly mixed.*

*The Opinion of Licetus concerning the matter of Spontaneous live things.*

Touching this immediate material cause of Spontaneous live Things, Fortunius Licetus treats, Lib. 2. de Spont. Vivent. Ort. Cap. 13, 14, 15, 16. the Sum whereof is this. He saies the Spontaneous and non-Spontaneous Generation of live Things do herein agree, that each is made of a perfectly mixt Body being very near of a temperate complexion, having in it self the last disposition and immediate aptitude to receive a Soul for its Form; and that the preceding disposition or that same privation both in the non-Spontaneous and the Spontaneous generation is nothing else



but a temperament just under the degree of the Soul, not having the Soul any waies adjoyned thereto, and that it is a certain degree of heat. But that the difference is herein, that the non-Spontaneous Generation of a living thing is caused by an external agent, first preparing the matter for it self by previous alteration, and afterward when it is prepared, by way of Generation furnishing the same with a Soul: but contrariwise, the Spontaneous Generation of living things is caused by an agent lurking within the matter, prepared by virtue of the Ambient Aire. And that consequently the disposition of the matter subservient to the Spontaneous Original of living things is nothing else but Coction by the Ambient Heat. Moreover he laies down two attributes of the immediate matter of Spontaneous live Things. The first is, that no Animal can be Spontaneously generated, save of a matter which was also before in some sort living, and Animated, either in the rank of Plants or of Animals, whether it be the part of a living Thing, or the Fruit, or the Excrement, or somewhat else belonging thereto; which nevertheless hath not now its Soul any longer as a form, but contains it as a Vessel, forasmuch as it belongs not to the essence of the Carcass wherein it is contained. Another is, that it must be immediately collected and prepared by the heat of the Ambient Aire, that it may put on the Soul and Nature of a living Creature, either of the same sort with the former, or of another sort. For when the matter hath comprehended a natural heat and made it its own, presently it attains a living Nature, and puts on a Soul under the notion of a Form, which before it contained only as a Vessel, being distinct from its Nature.

But in good truth, this Opinion needs a convenient Explication and Limitation. For in the first place, we must needs here repeat what we said before, that there is not one manner of Generation of Spontaneous living Things, but some proceed from a concealed seed of the same kind, as when of a secret Seed a Plant is Generated after Rain, even out of Stones; and others do Spring from dead Carcasses. And therefore, the first attribute of the matter of Spontaneous live Things, viz. that it is a Carcass, wherein there is a Soul as in a Vessel, not Animating, doth agree only to the second kind. But if, as he himself holds *Lib. 3. Cap. 117.* some powder or Juyce of a plant, having in it a Seminal principle, shal creep into the Chink of some Stone, being brought thither by Rain, there truly a Plant doth not grow out of a Carcass, but out of a Seed of the same sort. Which also happens out of the Dung and excrements of Animals, in which there is either undigested Seed, or some Seminal Juyce. For, as was said before, the Seminal principle is not in all Plants Seed peculiarly so called, which is Generated in a certain part of the Plant endued with a certain Form external, but in some it is diffused through the whole Plant, as in the Willow, and therefore a Willow may be generated by a bough pluckt off from the Tree and Planted in the ground. When therefore of such a Seed or such a Seminal Juyce a Plant is bred, either in the Earth, or in a Stone, or in another Tree, there the plant is not made of a Carcass, but of Seed. Moreover, this also wants explanation; when he writes, that the matter of which such a Generation is made must be very near temperate. For this indeed is true of the efficient cause. For neither a faint heat nor a burning heat can dispose the matter to receive a soul, but it ought to be moderate and of a digestive Nature. But I think it is not necessary, that the matter which is bred by that digestion should be temperate in all. For there is a great difference in respect of temper in the Bodies Generated. For worms are bred of Cole-worts, Wormwood, Pitch-wood, Flesh, which have most different Temperaments.

But as to the difference betwixt Spontaneous and non-Spontaneous Generation, true indeed it is, that in the non-Spontaneous Generation of living Things, or that which is caused by Seed, the matter is Elaborated by the Soul of the living Thing in the Body thereof, and is so prepared, that that which before was not (for neither is the Blood in Animals nor the Alimentary Juyce in Plants Animated) becomes a fit subject for a Soul, and the Soul communicates it self thereto, and then it is called Seed, out of which afterwards when it is cherished by the heat of the Womb or the Sun, or some other thing, and the Latent Soul stirred up, a living Creature of the same kind springs forth. But after this manner the first kind of Spontaneous live Things doth not differ in manner of their Generation from that lately declared. For since, as *Jul. Cas. Scaliger* saies rightly, *Exercit. 6. Sect. 10.* a Tree or

The opinion  
of Licetus  
examined.

The dif-  
ference be-  
twixt  
Spontane-  
ous and  
non-spont-  
aneous  
generation.

Plant generates when it produces seed, but not when the Tree or Plant Springs up out of the Seed, but then the thing generated which was before imperfect becomes perfect. That Seminal principle, out of which either in the Water or in the Earth or out of Stones, Plants Spring without the culture of man, was Generated in Plants of the same kind, and did for a season lie hid in the Water, Earth, or Stone, til it obtained a fit matter whereof to frame it self a Body. And then if that production of a Plant shall be counted a generation, it is also performed by an internal principle. But in the other kind of Spontaneous living things, when Worms are bred of the Carkasses or Excrements of Plants, the Soul is also present in the Carkass, although not under the notion of a specific Form, yet really notwithstanding. But it cannot proceed into act, and exercise the Office of a Form and Soul, nor can it prepare a matter whereto to communicate it self, which is done in Plants and Animals, but there is need of the Heat either of the Ambient Air, or that which arises from putrefaction, that the matter may be fitly prepared and disposed; which when it hath obtained the said form begins to put it self forth, and to exercise the function of a Soul. Also the influx of the Heaven and especially of the Moon, doth not a little assist towards the introduction of such a disposition. For experience teaches that Wood which is cut a little before the new moon is not easily infested with Worms; contrariwise, such as is cut about the full-Moon is most subject to Worms. So out of mud which is dug up about the New-Moon to make furnaces and Hearths, Crickets are easily bred. Now the Bodies in which these Souls lie hid are either the Carkasses of Living things, or parts of the said Carkasses, or the fruits or Excrements of living Things, of which very things Aristotle 2 de Generat. Animal. Cap. 3. expressly writes, that they have a vital principle; and those Souls did pertain to the disposition of the matter which was the proper subject of that living thing. Hence it is, as Aristotle saies well, that every form requires its proper matter, that as the Souls of living things differ, so also those subordinate Forms which constitute the proper matter for every Soul must differ, and therefore every Animal is not bred of every Carkass, or of every part of a living or dead Body, or of every Excrement, but determinate Animals are bred of determinate matter. Of Flesh one kind of Worms and none else is bred; of Cheese Mites proper thereto and no other: of the Leaves of Herbs Palmer-Worms; of the Pine the *Buprestes* and *Pityocampe*, and no other Worms; of Horse dung a particular sort of Beetles; Long-worms bred in the Guts; Lice and Fleas in the soyl of the Skin; a certain kind of Worms and Beetles under the Shoes, of the filth of the Feet.

The matter of spontaneous live things

whether one Form is changed into another.

*Fortunius Licetus* indeed, *Lib. 2. de Spont. Vivent. Ortu, Cap. 14.* thinks otherwise in this point, (as also hath been said before) and is of opinion that the Soul which he conceives lies hid in the Carkass, as a thing placed in its place, is the same form which was before in the living Creature; and that it remains in the Carkass with some degree of heat, although it belongs not at all to the substance thereof, and that upon a great mutation of the matter it is changed into another sort, and thrust down into a lower degree. But this is a great supposition, that a soul should remain in the Carkass of an Animal after its Death; as also that these Forms should be changed into other species. Nor is it truly credible, that the soul of a Pitch-Tree, or a Pine-Tree should be changed into a worm, or the soul of an Horse into a Wasp. And when Worms are bred of the Excrements of Animals, Whence hath the soul its Original in such a case? Yet we grant, that the soul or seminal principle of such things as have been once generated of their own accord, their body being corrupted, may stick in some matter, and come to live again. So Flies and Frogs may melt in the mud, and of that corrupt matter in the spring time other Flies and Frogs may breed. But all these things shall be hereafter made more manifest, in our Particular Discourse of the Original of Spontaneous live Things, where we shall speake of all the sorts of them.

The matter of spontaneous live things

To conclude therefore this present subject, this I conceive may be most probably held concerning the matter of these kind of Creatures: (since there are two kinds of Spontaneous live Things, as was said before;) that in the former the Seminal matter, as the proper subject of the soul, is communicated from the Generator it self, and that so disposed, that it can retain the soul though it be divided never so small.

Nor

Nor is this absurd; but that forms may be contained in the smallest Atomes and incomprehensible to the senses, even Metals do shew, which are dissolved into their smallest particles by *Aqua Fortis* and *Aqua Regia*, so as they may be strained through a paper, and yet nevertheless they retain their Essence entire in those small particles, as by reduction doth appear. Whereof we have spoke at large in the *Third Discourse, Chap. 1. of this Work*. But in the other kind, as in dead Carcasses, the Soul hath that subject wherein it was in the living Body, while it was in place of an immediate matter to the superior Form. But as the Seeds of non-Spontaneous Live Things although they are cast into the ground do not alwaies put forth their inbred Virtue, but are corrupted, sometimes by cold, sometimes by heat, or through want of fit nutriment, and so come to die, or to rest a long time before they put themselves into action; (as many Seeds rest all the Winter in the ground, until by the heat of the Ambient Air they be cherished, and can draw fit nourishment out of the Earth :) so also in those things which are said to arise Spontaneously, the Seminal virtue rests, til it obtain a fit matter out of which to frame it self a Body, and be roused up by the heat of the Ambient Air, and cherished: whence it comes to pass, that Animals which arise of their own accord are not generated in the Winter, unless sometimes under Dung, where the cold cannot come, but in the Spring, Summer and Autumn, *viz.* When by the heat of the Ambient Air caused chiefly by the Sun and Moon, a fit matter is afforded, out of which the Latent Soul may frame it self a Body, and the Soul it self may be set on work. But sometimes this same Seminal Virtue doth quite perish and die. Nor would I have any Man carp at what I have hitherto said and shall hereafter say concerning Souls, and the Seminal Virtue in Atomes and smallest bodies, and charge me as if I held that such souls, because in so many mutations they remain entire, are immortal. For, as the seeds of non-Spontaneous Plants do many times remain long entire, and yet at last die: the same may also happen in the Spontaneous, *viz.* if they meet with some contrary, or the matter be too much divided. Concerning which thing *Francisc. Aguilonius, Lib. 5. de Optic. Propos. 8.* thus writes: although there is no smallest quantity, yet there is the smallest light Natural, that is, a light so weak and thin, that it cannot be made thinner without perishing. After which manner there are also the smallest parts of Natural Bodies; *viz.* which if they be further divided they lose their Form and Essence. And *Propos. 15.* And this Imbecillity of Subsistency is common not only to these qualities which admit the diversity of greater and lesser, but also to all Bodies which vary their magnitude. For as these without some bulk, so the other without some degree of excellency cannot preserve themselves from perishing. For their forces being further attenuated do perish and come to nothing, not destroyed by any contrary, but only through want of measure, which is a necessary condition by the irrefragable law of Nature required for the proper maintenance of every one. For that which *Aguilonius* speaks here concerning qualities must also be understood of Forms from whence the qualities do flow.

*Forms remain in Atomes.*

*The Seminal virtue sometimes dies.*

Now one there is, who from this Doctrine endeavors to Calumniate me, as if I held that all the Forms of Beasts are separable, and may exist in the first act, out of their matter, and that therefore they are immortal. For this never came into my mind, but I have held with all Philosophers, that no Form saving the Humane is separable from its matter, but doth perish therewith. Yet this we must hold, that all Forms are not of the same kind, but some so coupled to their Bodies and perfect, that the said Bodies perishing, they also perish, such as are the Forms of an Ox, a Lyon, a Goose, a Crow, and of other perfect Animals. Nor can it be that the Body of a Lyon, an Horse, a Goose, a Crow, being destroyed, the Souls of the said Animals should remain alive. But it is otherwise in plants, wherein the Soul may remain in the Root, Seed, branch, Leaf, yea and as shall be shewn hereafter, in the Juyce. And the same holds in Insects, whose Soul may be preserved in base matter unfurnished with Organs. Yet these Forms cannot exist any where, but though they are not in an Organical Body, yet they are in a proper matter, and indeed the very same which was their matter in an Organical Body. Much less are they immortal, but that matter perishing or being corrupted, they also are abolished, as was lately said.

*The souls of Brute Beasts are not immortal.*

## Chap. 4. Of the End of Spontaneous Live Things.

Sundry  
opinions  
concerning  
the end of  
Spontane-  
ous live-  
things.

There remains yet one thing to be explained in General, *viz.* to what end Spontaneous living Things are Generated. For that such Things are not made by Chance or Fortune, was said before. But concerning the end of these things several men are of several minds. Some are of Opinion, that they are therefore generated, that putrid matter might be consumed, and the Air by that means purged. For since out of putrid Bodies many bad exhalations are lifted up, which defile the Air, whereby afterwards more perfect Animals are hurt and become diseased; to prevent this, and to provide for the health of men and other perfect Animals, they hold that Nature produces these petty Creatures, and spends the matter both in their Generation and nutrition. But in good deed, these petty Animals are neither generated of putrid matter as such, nor are they nourished therewith. For although they are made of matter which putrifies, yet are they not made thereof as it is putrid, but rather of the digested and better part thereof being Separated from the putrid. And therefore after the Generation of Worms and such like Animals, putrid matter remains, which pollutes the Air no less then it did before. Nor are these petty Animals which are Generated out of putrifying matter nourished by putrid matter, but seek their food upon other Creatures, as Plants and live Animals. Nor are those Countries or places where these Creatures are plentifully bred, more healthful, but for the most part more unhealthful then other places.

Others are of this Opinion, that as other created things, so these also are made for the sake of Man. But *Julius Caesar Scaliger*, *Exercit. 250. Sect. 1.* doth justly laugh at them who say that Fleas were created for mans sake, to suck out his unprofitable Blood, or that Wig-Lice are sent by Nature to wake us out of our sleep in the nights, that we might pray to God. For are not Dogs also and other brutes full of Fleas and Lice?

Others, as *Avicenna*, do hold that it is better that Lice should be bred, then that the putrid matter should so remain; and they acknowledg rare workmanship in the structure of such petty Animals. Others conceive such Animals were made for the perfection of the Universe, and that not only perfect Animals, but also such imperfect ones as these do make for the Pulchritude and Integrity thereof. Which *Scaliger* seems to have taught, who *in the place forecited* thus writes: Man for God, and the World is made for man. And *a little after*: Man is the Prince of Animals. Now man should not have been Prince, if he had not been such as he is; *viz.* in the middle. He could not be in the middle, save betwixt extremes. Extremes were therefore made, that he might be in the midst. They were therefore made for the sake of the middlemost. Now if any of the extremes, or of those which are betwixt the middle and the extremes were wanting, there would be a Vacuity or Empty space among the forms. Which would be a greater fault in Nature, then an empty space without a Body. For what is more absurd then a middle without extremes?

The true  
Opinion.

Which two last Opinions seem not much different, and are convenient enough, if rightly explained. For God the Work-Master of all things would every where discover his Wisdom and power, and therefore was rather willing that living Creatures should be multiplied in Nature, then corrupt and putrid matter; and that the Bodies of perfect Animals when they are corrupted should rather turn to ignoble Animals, then meer putrid matter. Which kind of Animals are various, yet determinate, and every one according to their kind. For seeing, as *Aristotle* well writes, that as Souls differ one from another in Nobleness and baseness, so also the Nature of that Body wherein they are, and which is the proper subject of every Soul, doth differ: this difference must needs proceed from some Form, which although in the living Body of perfect Animals it is instead of matter; yet afterward, the Soul departing, it rouses it self up, and performs that which is in its power to do. Hence, look how many sorts of perfect Bodies there are, so many sorts there are also of Animals arising from them; of which also *Austin*, *Lib. 12. de Civitate Dei*

Chap. 5. *What hath been said of the Spontaneous Original of living things.* 183

Dei, Cap. 4. to count (saies he) the faults of Beasts, and Trees, and other mutable and mortal things, wanting either understanding, or Sense, or Life, to be damnable, is a ridiculous Thing: since those Creatures have by the will of the Creator received that manner of being, that by going and coming they might perfect the lowest Pulchritude of times, agreeable to the parts of this world, according to their kind. *And a little after*: the beauty of which order therefore delights us not, because in this condition of our mortality being interwoven therein we cannot discern the whole, to which the particles which offend us are decently and aptly fitted. *And Again*: Nature considered in her self and not with reference to our commodity or discommodity Glorifies her Work-Master. For living Things make a nobler degree of Bodies, then things simply mixed. *And Aristotle himself* 1 de Part. Animal. Cap. 5. (which place also we cited before) acknowledges the Wisdom of the most good and great God, in such petty Animals, while he thus writeth: *With a Childish scornfulness to despise and be troubled at the disputation and consideration of the meaner sort of Animals, is an unworthy thing: since there is nothing in Nature which hath not some wonder in it. And that which Heraclitus is reported to have said to those who coming to speak with him, and because they found him sitting in a Bakers Shop Warming him at the Oven, they stept back and would not go to him; come in boldly quoth he, and be not ashamed, for the Immortal Gods are even in this place also. The same must be done in the searching out of the Nature of Animals. For we ought to attempt every thing, without any shame, since the Divinity of Nature is in them all, and her comly and beautiful Artifice. For that is every where chiefly joyned to the works of Nature, where nothing is done rashly and by chance, but all to some end and purpose. Now the end for which any thing is, or was made, hath in it the Notion of goodness and Honesty. But if any man think the contemplation of other Animals to be Base and Vile, he must needs think the same of himself also, for we cannot behold without much loathing those things whereof the Body of man consists, as Blood, Flesh, Bones, Veins, and such like. So far Aristotle. Fortunius Licetus indeed, Lib. 1. de Spont. Vivent. Ort. Cap. 11. opposes their Opinion who hold that such things are Generated for the perfection of the universe, with this reason chiefly, because the universe is before them in Nature, and furnished with its own perfection, which no Generation of Spontaneous things can encrease, and because it many times happens, that some sort of these Spontaneous Creatures is wanting in the world, and yet the world is not therefore imperfect. But although the universe were perfect before some such Spontaneous Animal was bred, and granting (whereas nevertheless if they are not in one place, they are commonly alwaies in another) that some sort of these Creatures is wanting in the world: yet the forms from whence they proceed never have been nor never are wanting. And he himself grants, that Souls may lurke in other Bodies, as in a Vessel, so as neither to have the notion of an efficient, nor of a Soul.*

*The Glory of God shines in the smallest creatures.*

Chap. 5. *The Sum of what hath been said concerning the Spontaneous Original of Living Things.*

AND that we may contract what hitherto hath been said concerning the Spontaneous Original of live Things, into a smal compass; Spontaneous live things are Generated, when either the Seed, or Seminal principle, and the Soul it self of live things, being somewhere secretly hidden, having obtained a fitting matter, and stirred up by the heat of some Ambient Body, doth put it self forth and begins to exercise vital operations: or when the Form which was necessary to the constitution of the subject of some more Noble living thing, the former Soul departing, becomes its own Master, and being excited by the Ambient heat or the heat of putrefaction, and having obtained a new disposition fit to exercise Vital actions, it rouses it self, and becomes an actuating and Vivifying Form to the subject matter, and begins to exercise the actions of a living thing.

*A brief of the opinion concerning the original of spontaneous live things.*

From whence it is apparent, that all matter which is necessary to Spontaneous Generation, and which contains secretly in it self the Form and Cause of a new and Spontaneous Body, proceeds from living Things, and it is either Seed, or something answering to Seed, either the whole Carcass or part of the Carcass of a living Thing,

*Spontaneous live things spring only from live things.*

Thing, or an excrement, or somewhat that some way proceeds from a live thing, and contains in it self a vital principle. For, as was said before, the Seed and Seminal principle, and that which answers to Seed, may long lie hid in Atomes, divers matters, powders, dry things, and in the Earth. Yea and the more Ignoble sort of Animals some of them, although they sometimes seem deprived of life, and to exercise no Second act of the Soul, as it happens in Flies, Frogs and some other Animals, which lie all Winter long as it were dead: yet the Soul lying hid even in vile matter doth vivifie the same, and being in the Spring cherished and awakened by the Ambient heat, it exercises vital actions by the Second act, and is then said to revive again. Moreover there is no living thing, out of whose Carcass Excrements, Urine, Sweat, Vapors, and steams going out of the Body, and filth gathered in the Skin and Garments sundry kinds of Worms are not produced; so that *Aristotle* said rightly, that all things were after a sort full of Souls. Now the Soul which lies hid in such things as proceed from perfect Animals, and afterwards proceeds from them, is alwaies of an inferior degree and sort, but never of the same or an higher, unless they be some imperfect Animals, as was newly said of Flies and Frogs. For the same Soul cannot inform Bodies of divers sorts, nor cannot any thing act beyond its strength. And although as was also said before, *Fortunius Licetus*, *Lib. 2. Chap. 17.* teaches that the same Soul, or of the same sort and condition with the Soul of the former live thing, is in Spontaneous live things: yet that may not be allowed, for the cause aforesaid. And the Nature of Degeneration is far different from that of the Spontaneous Original of living Things. For in degeneration, as also in Silk-Worms and Butter-Flies, it may happen, that the same Soul may be in divers bodies, and so be naturally disposed to put on divers external Forms, as when Rye is turned into Wheat, and of the Egg is made a Palmer-worm, then a Silk-Worm, then a Butter-Fly: but in Spontaneous Generation, properly so called and of the second kind, it is impossible, that a more noble Form should remain in the Carcass or Excrements. But these things will be more clearly understood, now we come to particulars.

### Chap. 6. Of the Spontaneous Original of Plants, and first of the Generation of Mushrooms.

Spontaneous live things how manifold they are. **N**OW all living things Spontaneously generated whether of the first or second order, do belong either to Vegetables or to Animals. And both of these again are twofold: Vegetables are Mushrooms, Puck-Fists, Moss, and perfect Plants; Animals are Plant-Animals, and true Animals.

The Generation of Mushrooms and Puck-fists. In the first place all Puckfists are generated without any tillage or manifest Seed, which as *Scaliger* saies are to themselves Root, Stem and Fruit; also Mushrooms, and Toad-stools, which spring up so swiftly that they are generated in one Night, and attain that greatness which belongs to their Nature. For they neither afford any Seed of which to be generated, nor are they procreated and multiplied by setting any part of them into the ground. Since therefore they are bred of their own accord, they must needs have the common way of generation with other Spontaneous Live things of which we spake before. For whereas *Matthiolus* writes, that the Earth by an hidden faculty doth breed Puck-fists, and Mushrooms in her self, that must be fitly explained. For the Earth is not in it self and by its own Nature the efficient Cause of Puck-fists and Toad-Stools, but a Soul lying hid in the Earth, or in some Juyce mingled with the Earth. But whence that Soul proceeds is not so manifest.

whence Toad-stools have their Soul. *Fortunius Licetus*, *Lib. 3. de Spont. Viv. Ort. Cap. 4.* thus writes thereof: the Spontaneous Original of Puck-fists and all Toad-stools in general, is, when the Soul of a more perfect living thing, Plant or Animal, abiding in the Carcass, as in a Vessel, being much impaired, and having gotten a matter not exactly disposed, and having none of the best instruments for the Organization of the parts, communicates it self for a Form and quickening Soul to the subject matter, first disposed by the moist warmth or heat of the Ambient Air, which works chiefly upon the Earth in the Spring and Autumn, with Thunder and Rain, or rather with the Sun, after

after Rain. The same *Licetus*, *Lib. 3. de Spont. Vivent. Ort. Cap. 5.* conceives that the matter of Toad-stools is an aliment fit to nourish plants, falling upon the ground from the Carcasses either of other Plants or of Animals, which when the neighbouring Plants do not draw to nourish themselves, the Soul of its own accord turns it into Toad-stools and Puck-fists.

But in very deed, there is not only one kind of Toad-stools, as hereafter will appear when we speak of their differences. Some grow to Trees, some Spring out of the Earth. The former proceeds from the Soul in the Body of the Tree, mistaking by reason of the unfitness of the matter it works upon, but not from the Soul weakened. And as in Man certain Toad-stools are bred, sundry sorts of Warts, Wens and other Excrescences, by reason of Vicious Aliment, which Nature changes into the best Form it can, and such as the Nature of the place will bear: so also in Trees, especially those that are aged, when either vicious Aliment flows in, or in a weak part it is not well digested, Nature generates such like Toad-stools. The rest have their nourishment in the Earth, but not all that which *Licetus* would have. For if all that which *Licetus* would have were the immediate matter of Toad-stools, they would grow every where in Fields and Gardens; since there is such matter in all places: which nevertheless doth not come to pass. Nor hath it ever been observed, that Toad-stools and Puck-fists were bred out of Animals; as for those which are said to breed upon men, they are only so called by way of similitude

*The kinds of toad-stools or Mushrooms*

And therefore I conceive it is more probable that Puck-fists do arise and grow only upon and out of Plants. And that in the Earth they are generated out of the Roots and Barks of Trees and Shrubs, either Putrified and Corrupted, or sending some Juice out of themselves, and consequently of such matter which was the proper and immediate subject of the Soul of the Plant, and contains in it a subordinate Form, which being afterwards stirred up by heat, and having got a fitting matter it turns to a Toad-stool to which it is Naturally disposed. For when somewhat is separated and divided from the Tree, and is no longer governed by the Form of a plant, then that concealed Form is stirred up by the moist Heat of the Earth about it, and begins to exercise the Function of a Soul, and of its subject matter being disposed thereto it forms the Body of an imperfect or half Plant. Whence it is that after Thunder and Showers great store of Toad-stools are wont to Spring up. And that which Rains especially coming down with Thunder do perform by their Warm moisture, that also Leaven mixt with Blood-warm water can effect. And *Matthiolus* writes, in *Lib. 1. Dioscorid. Cap. 93.* that a white Poplar Tree cut off close by the ground to the very Root, and Sprinkled with hot Water wherein Leaven is dissolved, within four daies brings forth store of Mushrooms or Toad-stools very pleasant to Eat.

*All toad-stools or Mushrooms arise from Plants.*

And because Toad-stools are speedily Generated and grow up, *Licetus* holds *Lib. 3. de Spont. Viv. Ort. Cap. 10.* that there must needs come together at once many such Atomes as are fit to Generate Toad stools, so as to make up a sensible bulk; because the Soul of one Atome is so weak, that it cannot vivifie nor shape the matter of a Toad-stool, nor perform that which the Souls of many Atomes flowing together into one Body and becoming one, can do. But there is some doubt in this point. For wonderful, truly, is the Nature of Forms and Souls, which of it self hath no quantity, and hath the same force in a smal Body which it hath in a great. Nor doth the bulk of a Toad-stool prove that which he saies; since we see of an exceeding smal Seed a great Plant doth arise, matter being drawn out of the Earth for the formation and Augmentation thereof. The most swift encrease of Toad-stools doth rather seem to perswade what *Licetus* thinks; since it is not credible, that in so short a space of time a Soul lurking in so smal a Body can draw to it so great a quantity of matter. Unless any man will peradventure say, that the matter is prepared by little and little by the Soul of the Toad stool, and afterward it suddenly Springs up.

*Toadstools from a white poplar tree.*

*Why toad-stools are so suddenly Generated*

*The Differences or Sorts of Mushrooms or Toad-stools, and of Puck-fists.*

And although all Toad-stools do arise from plants, and the Roots, Branches, Stocks, and Barks of Trees and shrubs: yet there is great difference amongst them,

*The differences of toadstools, in*

in regard of diversity of their matter. For some grow to Trees and Wood, some grow under Trees and in the ground. Nor is it easie to find a Toad-stool where there is not or hath not been some Tree or Wood. And the matter, truly, of such as grow upon Trees and Wood proceeds in the first place from the substance it self of the Trees, or that matter which is the proper subject of the Soul of the Tree. But a Toad-stool is not made thereof, so long as it is under the dominion of the Soul of the Tree, or Shrub, but when it is deserted thereby, and either the whole Plant, or some part thereof comes to die. And therefore we see that Toad-stools for the most part do not grow upon sound and uncorrupted Trees, but on such as are old, and in some part decayed. Secondly, The vitious Aliment of the Tree or Shrub. Thirdly, some Excrement shed from the Tree or Bark; whence *Pliny, Lib. 22. C. 23.* writes that Toad-stools are bred of the Flegm of Trees. And indeed, it is credible that Toad-stools which grow on living Trees by means of the two last causes and manners are the works of the Soul it self of the Tree. For like as, according to what was formerly said, Toad-stools and Warts are generated on the Body of Man, while Nature, which is never idle, turns and Forms the vitious and superfluous Humor (which breaking through the Membranes and Pores, it cannot change into the substance of the part, by reason of the unfitness of the matter and the weakness of the part) into such a substance; so credible it is, that the same doth happen in trees.

The original of toad stools which grow upon Trees.

The matter of those which Spring out of the Earth is either some part of a Root, or a Bark; or some other part separate from the Tree. And therefore where Toad-stools are bred, there for the most part you shall find the Barks and parts of Trees, which when they are corrupted and Rot, by Rain falling upon them they are covered in the Earth, and being cherished with the Heat thereof are changed into Toad-stools. And that also may be artificially procured. So of the Leaves of Poplar Trees cut in pieces and buried in the ground Toad-stools do arise, as *Scaliger observes Exercit. 104. Sect. 17.* the same happens of a Fig-Tree buried underground, as *Athenaus, Lib. 2. Cites from Nicander,* whose Words are these.

Toad stools Springing out of the Earth.

Out of a poplar tree  
Out of a Fig tree.

Cover a Fig-Tree under store of Dung,  
And Water't well, then store of Mushrooms Yong  
Will Spring apace.

Hitherto also may be referred the Toad-stools which grow out of Tree branches burnt, of which *Cardan, Lib. 13. de Subtil. Page 509.* you shall have Mushrooms when you burn dry sticks, and Rain falls upon them, or (in case it Rain not) if you sprinkle Water upon the remainders. And that this is so, not only when the sticks are burnt, but also when they are not burnt, any one may easily try. For when I had used to manure my Garden with Earth that had smal fragments of sticks mingled therewith, the second year there grew up store of smal Mushrooms or Toad-stools all about.

Out of tree branches withered.

Again though no part of the Tree or Shrub be found evidently corrupted in the ground: yet of them Toad-stools are bred, when the Juyces or Excrements of Trees lie hid in the ground. For such is the Nature of these more Ignoble Forms, that even in the smallest Atomes and Juyces they can remain intire, which afterwards gaining a convenient place, and being stirred up by the heat of some Ambient Body, they rouze themselves, and Form and shape the Body of a Toad-stool. For since a Soul can abide in the smallest Seeds of Plants, and when it gets place and matter it can Form a great Plant: why may not these Forms much more Ignoble be preserved entire in the smal Bodies or Atomes of Plants?

The variety of Toad stools.

Now the chief cause of the variety of Toad-stools is the diversity of Trees and Shrubs from whence they arise; for some sorts grow upon or under some kind of Trees or Shrubs, and some upon or under others. So, those great and very white Toad-stools like a mans Skul, which Chirurgeons use to stop Blood, and are called *Crepitus Lupi*, do hardly grow any where but in Vineyards, and they grow out of Vine Branches dead and corrupted. Also the variety of the Parts themselves of the Trees.

Howbeit, I am apt to believe that the variety of Toad-stools doth not only depend upon the diversity of the matter which Trees afford them, but also upon the



the variety of matter which is otherwise found in the Earth. For seeing certain it is that all this great bulk of some Toad-stools doth not come from the Tree; doubtless the form or Soul communicated by the Tree doth in the Earth associate such matter as it meets with, and thereof frames to it self a convenient Body; as also we see that smal Seeds do draw matter and aliment out of the Earth, and that thence great Plants grow up. And that the Soul of the Toad-stool doth snatch any Obvious matter, and thereof shape a Toad-stool, appears even hereby, that *Pliny Lib. 19. Chap. 2.* writes: We know what hapned to *Laertius Licinius* a Pretorian, being Judg at *Carthage* in *Spain*, a few years since; who biting a Mushroom had his fore Teeth loosned by a Brass Farthing that was therein.

Of the Harts Toad-stool or *Boletus Cervinus* so called.

And since among other Toad-stools, both in regard of the shape and strong smel, the *Fungus Cervinus* or Harts Toad-stool is remarkable, Now *Matthiolus* writes thereof, as of a thing by himself lately found out, *Lib. 3. Epist. Ult. ad Julium Moderatum* in these words: seeing I know that you are much delighted with novelties, I have sent you with these my Letters a certain Subterranean Puck-fist, which the Bohemians cal Harts Mushroom. For I conceive it is a thing you never heard of before, because no Ancient nor late writers make any mention thereof; and because it is not to be found, save in those Woods where there are many Harts and Hunters, who know these secrets of Nature: but because these things are unheard of in your parts, I will not have you any longer unacquainted with the History and Virtue of this Toad-stool. Now Hunters relate that this Toad-stool after the manner of ordinary puck-fists grows under the ground, where the Earth is infected with the Harts Sperm falling thereupon. Which many times happens when the Male draws his Yard out of the Genitals of the Female containing Seed in the passage, by reason of the Females withdrawing her self from the Violence of the Male. And perhaps no man could ever find this Toad-stool, did not the Harts themselves at a certain season of the year discover the place where they grow. For led by a Natural Instinct they scrape with their fore Feet upon the ground whereunder the said Toad stool grows which they are said to discern by the smel. For the Toad-stool hath a very strong smel, especially when it is first dug up. Hunters and Country-men which are acquainted with the Secret and frequent the Woods diligently observe the places, being drawn by the Harts Feet, and digging the pit they take out the Toad-stools and sel them to the Apothecaries; who cut them in pieces, draw them upon Threds, and dry them afterwards in the shadow, and keep them for Medicinal uses. They are of the same shape (for the most part) which we see in other Puck-fists, yet all are round like Globes and uneven. The outmost thin Rind is swarthy somewhat, but the fleshy *Fungus* substance is white. Some say there is a certain kind of these Puck-fists resembling a mans Yard Erected, with the Nut uncovered, and at the other end certain Knobs resembling Testicles. But that vulgar Opinion of the Hunts-Men touching the Original of these Toad-stools sounds like a Fable, into which perhaps the strong smel, and in the latter sort the shape, might bring them. Whereof *Thomas Jordanus, de Pest. Phæn. Tract. 3. P. 605.* They exceedingly commend the Harts Toad-stool so called, bred of the Sperm of that Beast, and found by the Goates Scraping up of the Earth. They are found truly in such places where in the Memory of Man there was never any Hart seen. At *Trenzine* a Famous town of *Hungary* about the Clifts of *Carpathus* they are very plentiful; in Mountainous places, and dark Woods, where though you may find Harts; yet is there not so great plenty, as to suffice for the Generation of Wain-Loads of these Puck-fists, if that were to be thought true which is related of their Generation. Also I have as touching the latter kind been brought into a suspition by what I observed here at *Wittenberge*, in the year 1626. For the Trench being to be repaired and the City to be fortified, the Captain of the Garrison walking accidentally in the Ditch, drawn by the smel, he found one of these Puck-fists having the form of a Mans Yard, and wondering (for he had from Hunters drunk in the foresaid Opinion concerning the Original thereof) how in a place where no Hart had been this Toad-stool could be Generated, he brought me to the place; and being some spaces distant I also perceived that same exceeding strong smel proper to this kind, and under an

The Harts  
Toad-stool  
is not bred  
of Hart  
Seed.

Elder Shrub I found ten such Puck-fists. But seeing it is certain, that there never came any Hart into that place, probable it is, that such Puck-fists are not Generated of the Harts Sperm, but of the Juyce or corruption of some Plant, and matter determined to this kind of Toad-stool, arising from some certain Plant.

Toad-stools growing out of Stones.

Toadstools  
out of  
Stones.

Moreover this is also worthy of consideration whether Toad-stools or Puck-fists grow out of Stones. Many learned men affirm the same, and hold that there are Mushrooms fit to Eat growing out of Stones. *Jul. Cesar Scal. Exercit. 173. Sect. 2.* writes: *The Particular Nature of a certain Stone is to be reckoned amongst the most wonderful. This Stone is highly esteemed by the Romans. I saw one at Naples, in which Kingdom they say they are found. It hath a thick crust. Which being covered with Earth nine inches deep, and sprinkled with warm Water, the fourth day after it sends forth Mushrooms. And Cardan, Lib. 13. de Subtilitate, saies: Mushrooms grow from certain broad Stones buried underground, after the manner of measures, four inches underground within four daies Water being sprinkled thereupon. They abound in groves and grow speedily: for they require a dry heat, and therefore those stones must have some adustion, for the Generation of Mushrooms is speedy, and as it were without a Root, for nothing grows without a Root indeed. For if it draw aliment, if it live, or grow though it live not, it draws out of the Earth; now that which draws must be Joyned to that whereout it draws; and the part whereby it is Joyned is the Root.* And *Matthiolus upon Dioscorides, Lib. 4. Cap. 78.* hath these Words: *Mushrooms are at this day in so great request at the Tables of Italy, (where they are most frequently Eaten) that at Naples stones are found, which being Dug up and carried into Wine Cellars, covered a litle with Earth, and now and then sprinkled with Blood-Warm Water, within four daies they produce pleasant Mushrooms. These Stones I have seen at Rome and Naples; where they are kept with great diligence, because by help of them they can Eat Mushrooms when they please. Which is confirmed by Johannes Baptista Porta the Neapolitan in Sua Villa Lib. 10. Cap. 70.* The last kind of Mushrooms (quoth he) are Bred out of Stones. They are cropt off to be Eaten, and fresh ones grow up, by a continual fruitfulness, They grow to their perfection in seven daies; sixtimes a year they cut them off; the Stone is covered with nine inches depth of Earth. The Stones are brought to Naples from the Mountain *Vesuvius*; to *Surrentum* from *Fagetus* the highest Mountain of that Tract; to *Abellinum* from the *Parthenian Mount*; in *Apulia*, from *Garganus* and the highest part of the Mountains; for when they once perceive the stones have born Mushrooms, they dig them up, and expose them to sale. Somtimes they do not grow in the fashion of Caps, but like Tendrels or in the shape of *Asparagus*, and divided into branches. And *Fortunius Licetus Lib. 3. de Spont. Viv. Ort. Cap. 11.* relates, that *Jacobus Antonius Marta* a Neapolitan told him, that the *Parthenian Mount* aforelaid, the highest of all the Mounts in the Territory of Naples, in the top thereof hath store of Stones of a wonderful Nature, which being put under the droppings of the Wine Spiggots, and drinking in the drops of Wine do in the morning afford Mushrooms, sprung up the night before, delightful to the tast, and not prejudicial to Health.

What kind  
of Stones  
they are out  
of which  
Mushrooms  
grow.

But, forasmuch as the said *Licetus*, in the place cited, relates, that he saw at *Padua*, in the Garden of *Benedictus Sylvaticus* a Famous Physitian, three such Mushrooms bearing Stones, sent him from the Country of *Naples*, and that he did Eat Mushrooms which grew upon them; and adds, that those Stones were very soft, yielding to the touch, so that they seemed rather pieces of Wood then Stones; we may justly conclude, that Mushrooms never grow out of true Stones, but that these Neapolitan Stones so accounted are pieces of wood, by a Stone-making Juyce hardned into the Similitude of Stones; or as *Licetus* would have it, that these Stones had their original from Earth, which being full of the parts and Juyces of Plants was by a stone-making juyce hardned. Which Woods or parts of Plants containing in them the Form of a Mushroom, when by the pouring on of Wine or warm Water they come to be softned, and to be mingled with the juyce of the Earth about them, and by the heat of wine or warm water to be digested, the Form lying hid within breaks into act, and Forms the Body of a Mushroom. But those Mushrooms which are bred

bred by Wine dropping upon the stone do owe their original chiefly to the Wine. *Mushrooms*  
 Yet the Clay which is there found, or is Generated by the continual dropping of *growing*  
 the Wine upon the Stone may be mingled therewith. *from Wine*  
*dropping*  
*upon the*  
*Stone.*

Chap. 7. Of Plants which grow up of themselves.

**N**OW several Men are of several minds as concerning the manner how Plants *Plants,*  
 come to grow of their own accord. Some follow the Opinion of *Erastus* pro- *how they*  
 pounded *Chap. 1.* and hold, that every Earth is endued with a peculiar faculty of *grow up of*  
 producing Peculiar Plants, or that it hath a Seminal power communicated by the *themselves*  
 blessing of God at the first Creation, which is brought into act by the Sun and influx  
 of the Stars. And they are induced so to think, because, if Earth digged out of the  
 deepest Pit or Well be placed upon the highest turret, it produces Plants. And  
*Johannes Baptist. Porta.* writes *Lib. 2. Phytognom. Cap. 1.* That when he had gotten  
 Earth out of the deepest Cellars of certain Houses, that there might be no suspicion  
 of Seed, and had set it in the open Air on the top of his House, lest the wind  
 should bring seeds into it from elsewhere, not many daies after out of the several  
 sorts of Earth in so many baskets several kinds of Plants Sprung up, but such as  
 usually grow in the Neapolitan Soil. For clayish ground did bring forth one sort,  
 the *Puteolan* Mould another, gravelly Earth another. And *Porta* adds that in the  
 Island of *Crete*, whithersoever a man carry the Earth, unless somewhat else be sowed  
 therein, it presently brings forth *Cypress*. And most certain it is, that in Fields  
 and Meadows some Plants are Natural to one Field or Meadow, some to another.  
 Which Opinion if any man will follow, I shall not quarrel with him. Yet these  
 doubts occur in this Opinion: first, that God did once command the Earth, at the  
 Creation, to produce Plants, and it was accordingly done: And he blessed the Plants,  
 and commanded them to produce their Seeds, whereby they might multiply them-  
 selves, but he did not bless the Earth. Which doubt whether it can be answered  
 by saying, that it is not to be understood of simple Earth, but of the kinds of Earth,  
 of which Questionless there are many, and they mixt Bodies, and that these mixt  
 Earths have a Seminal faculty put into them by the Creator whereby they produce  
 Plants; I leave to the Judgment of the Reader. *St. Ambrose* seems to incline to  
 this Opinion, who in *Lib. 4. Hexamer.* Writes thus concerning this matter: *That*  
*first word of God whereby he created all Creatures, is the Law of Nature, which hath*  
*continued ever since in the Earth, giving a rule to Future succession.* Another doubt  
 is, that this Earth doth not bring forth Plants before it is moistened with Rain. So  
 that the Seminal Virtue may seem rather to be communicated thereto by Showers  
 of Rain, then to be Naturally implanted therein.

But suppose, indeed, that this is one manner of the Spontaneous Generation of *The man-*  
 Plants; Yet is it not the only manner: but that oftentimes Seed is communicated *ner of the*  
 from elsewhere to an Earth of it self barren, appears even hereby, in that it hath *Spontane-*  
 been observed that after Rains and inundations of Water new Plants have sprung *ous gener-*  
 up in certain places. But how this comes to pass, is not very apparent. I con- *ation of*  
 ceive that all this Spontaneous Generation of Plants, may be reduced to those two *Plants.*  
 manners, which I formerly propounded in General. For some plants although  
 they are not Generated of Seed manifest to our senses, nor spring from branches set  
 in the Earth, yet they really proceed from another Plant of the same sort, and  
 from the Seed thereof; which although it be not in a visible Body, yet is it in the  
 smallest Particles or Atomes containing the Soul of the same sort, which Particles  
 may lie concealed in Rain or in the ground; whose Soul having afterwards gained a  
 fit place, and being provoked by the heat of the Ambient Air, it displaies it self.  
*Licetus* indeed, *Lib. 3. de Spont. Vivent. Ort. Cap. 13.* doth grant that these Atomes *whether*  
 perform the Office of Seed, and answer to Seed by way of proportion, but he denies *Atomes*  
 that they are really seed: but I see no cause why he should do so, unless peradventure *containing*  
 inasmuch as this Seed hath no external Figure as other Seeds have; meanwhile it *the Soul*  
 may wel be called a Seminal Principle. For an external Figure and a certain man- *may be cal-*  
 ner of Formation doth not primarily constitute Seed, but the Soul lying hid in the *led Seed.*  
 same with that same implanted Spirit which is said to answer to the Element of  
 the

the Stars, and makes the Seeds fruitful: which because they with their subject may be in the smallest Atomes, there is no cause why they may not be called a peculiar sort of Seeds, or a Seminal Principle. And although the Soul which lies hid in such smal Bodies or Atomes doth not inform the Earth or Water wherein it is contained, but lies therein concealed as in a Vessel; yet those little Bodies it informs wherein it is as its proper subject, and is in them according to its first Act, and it then comes to its Second Act when it hath got a convenient place.

But other Plants are more properly said to be Spontaneously Generated, when they proceed not from a Seed or Soul of the same sort, but from that Form which in a more noble Plant was instead of the next matter, and the subject of its specific Soul, just as Toad-stools (whereof we treated in the former Chapter) and moss do grow upon Trees.

The generation of Moss.

Now Moss grows upon sundry Trees, as on the Cedar, Poplar, Oak, and Pitch-tree, from which in the Mountains of the Valley of *Anania* above Trent, *Matthiolum* saies he had frequently gathered very long Hairy moss, much sweeter and fairer then that which grows upon the Poplar and Oak, in *1 Dioscorid. C. 20.* Yea, and there is hardly any Tree but when it is old it bears Moss, and it is a token of a Trees being Old, when it begins to be covered with Moss. Also *Fab. Columna* hath described sundry sorts of Moss, *Minus Cognitar. Stirp. Lib. 10. Cap. 158, 159, 160.*

To Mosses belong the kinds of Liver-wort, which although, as *Dioscorides Lib 4. Cap. 48.* writes, it grows familiarly on Stones, as on Rocks, the Stones of Wells, the Tiles of Houses: yet the same *Fabius Columna* tells us they grow also upon the stumps of Trees, in moist and Champian Countries especially, in the foresaid Book, *Cap. 154.* Yea in our Countries also that same kind of Moss which they call Tree-lung-wort doth grow upon Trees.

The Generation of Plants out of dried Plants.

Nor must we here pass over that singular Opinion of *Fortunius Licetus*, which will seem a Paradox to some, touching the Generation of Plants out of dried Plants, which are commonly thought to be dead and void of all Soul. We have in General, indeed, spoken somewhat hereof before: yet I think fit more Particularly in this place to repeat the said Question, and more clearly to explain the same. Now *Fortunius Licetus* is of this Opinion, that the same Soul which did constitute the Living Creature doth remain in the dead Carcass, but doth not inform the same: Yet that it doth again rouze it self, and is able again to perform the Office of a Form; and that two manner of Waies. For sometimes the same Soul (he saies) being decayed and weakned doth procreate imperfect things: and sometimes again, as he shews *Lib. 3. de his qui diu sine Alimentis Vivunt, Cap. 7.* out of the Body which is accounted for dead a new plant is produced. Forasmuch as Plants pluckt up out of the Earth, or broken off from their Roots or trunks, do not presently die, only being destitute of a fit place out of which they may draw Aliment they cannot grow, and they cease bearing branches, leaves, and Fruits; yet in the mean time the self same Soul doth Vegetate that Body: as seeds that are kept in the Winter time shew no other sign of a Soul in them, but that their Body is thereby kept alive; whence it is, that the said seed is fit to be sown and to be used in Physick: but when it is no more animated but corrupted, it becomes both unfit to be sown, and loses all its vertue in Physick: If the Wood of an Olive (saies he) be simply dry, it will live no longer; since life consists in moisture, and dryness according to *Aristotle* is the Death of Plants; but there wil be the Carcass of an Olive-tree, wherein with some degree of Heat, and some Foot-steps of the former temper, (if the Soul be yet contained in it as in a Vessel; not quickening the Wood) when it is digged up and hath gained a fitting heat for life from the Ambient Air, and like its former temperament, then it becomes fit for the Soul again therein as the constituting Form of an Olive Tree to shew it self: but if the Olive Wood were not exactly dry, but still had life in it, it would sprout of it self, and produce an Olive Tree, by a non-Spontaneous Generation. Now this chiefly brought him into that Opinion, in that Woods do last many Years and preserve their strength. Yea, and which is strange, it hath been observed that they have sprouted the Second time and performed the operations of the Soul. Of Which *Virgil, 2 Georgic.*

A dry olive stock wil sprout againe.

Some

Some need no Roots; the Pruner Young Slips cuts,  
 And them into the Earth securely Puts.  
 And (wondrous to be told) an Olive Tree  
 Out from a dry cut Trunk oft Springs we see.

Which Verse although some interpret concerning ingrafting: yet, they do it contrary to the mind of *Virgil*, who treats of ingrafting in the verse following. And why should that be counted a wonder? But *Servius* hath rightly interpreted this Verse. That (saith he) which is here said is true of the Olive and Myrtle, whose dry stocks are cut to the middle or pith, and so put under ground, and from them Trees do shoot forth, which is strange indeed. *Theophrastus* taught the same thing *Lib. 5. de Caus. Plant. Cap. 4.* who writes, that in an ordinary course of Nature the dry wood of an Olive Tree will sprout again. For those Woods also, saith he, which sprout of their own accord, as the Olive-Tree-Wood, and all such like, which they reckon for Miracles and Wonders, have their Reason in Nature. For they are Naturally long lived and apt to sprout, because of their thickness and moisture, and therefore as soon as they are sensible of any Liquor from without, presently they send forth branches. In very deed, for the most part Wood covered with Earth and laid in moist places doth Sprout; besides that, a bough cut off hath been seen to shoot forth Twigs soon after, because it had in it moisture enough, and the Spring was at Hand, the like whereof happens to the Squil or Sea Onion, and such other Plants as Sprout after they are hanged up in the House. And the said *Theophrastus* in *Lib. 5. de Hist. Plant. Cap. 10.* writes, that the Wood of the Olive Tree doth above all other Woods Sprout and send forth Twigs, both rude, or rough and when it is wrought into some work, if it be sensible of any moisture and have attained a moist place, so that a part of a folding door hath been said to Sprout, and a wooden Cup which fell into the Dirt. So, credible Authors relate that *Hercules* his Club which was made of Olive-Tree-Wood did Sprout. And *Fortunius Licetus*, in the place fore alleadged *Lib. 3. de his qui diu vivunt sine Alimento, Cap. 7.* writes that he saw at *Rechum* in the Garden of his Uncle *Bartholomew Licetus*, the stock of an Olive Tree which had been Planted, and was now near dried up and had been Naked ten years together, and of it self separated from the Trunk, and never after that Planted in the Earth; which being thrust into the ground near a Wel to prop up some other Wood, and Nailed to the Wood which it bore up with Iron Nails, it budded and branched many Olive branches laden with Leaves and Fruit, and afterwards bare in like manner, many years. *Johannes Ludovicus de la Cerda* confirms the same, who, upon that Verse of *Virgil* aforesaid, commenting, thus writes: the Eyes of many most skilful Husband-men have been witnesses, of whom I made enquiry: the Art it self is a Witness, which is now much in request in *Spain*, where at present I live. The Husbandmen cut the stock of an Olive Tree (whose Root and branches are taken away) into many parcels, and so they bury it in the ground, which forms first a Root and then a Tree, which *Virgil* wonders at; for it is really a wonderful thing.

Other Trees also besides the Olive have been observed to do as much. Yea *Aristotle* himself grants, *2. Phys. Cap. 1.* that a Wooden Bed-sted buried in the ground may Sprout. They report as much of the Male wild Ash, of which *Romulus* his Spear was made, which *Plutarch* in the Life of *Romulus* writes that it took Root again, and sprouted. Which *Ovid* confirms *Lib. 1. Metamorph.*

And as Astonish: *Romulus* of Old  
 Did on Mount Palatine his Lance behold  
 To flourish with green Leaves: the fixed Foot  
 Stood not on Steel, but on a living Root.  
 Which now no weapon, spreading Arms displaid;  
 And gave Admirers unexpected shade.

And *J. Julius Caesar Scaliger*, in *Theophrast. de Caus. Plant. Lib. 5. Cap. 1.* Writes, that he hath seen Willow Rods carelessly thrown away, and not so much as stuck into the Earth, to sprout, yea and a great Trunk of a Poplar long after it was cut off.

The

*Hercules  
 his Club  
 did sprout.*

*The spear  
 of Romu-  
 lus being  
 made of  
 ash sprout-  
 ed.*

The premises therefore being such, and confirmed by the Testimony of most learned men, Yea, by experience it self, upon which the Judgment of *Licetus* is founded, although his Opinion seem Paradoxical, yet it is not simply to be rejected, but to be dextrously explained and limited. This in the first place is certain; that all Plants pluckt up out of the ground do not presently die, as may be seen in the Squil and the American *Sempervivum*. But that all Plants pluckt up out of the Earth and dried should retain their Souls and live, and that only nutrition in some sort ceases in them; this cannot easily be granted, especially if the Root being cut off, and the bark taken away, they be cut in pieces. Much less can it be granted, that the Carcasses of Animals do retain their former Soul. For every Soul requites its proper subject, *viz.* Innate Heat, consisting of the implanted and influent heat, in Animals; but in Plants, likewise, a temperament so and so disposed, which because in dried Plants it is changed, so they come also to lose their Life.

All Plants do not die as soon as they are pluckt out of the Earth.

But because the former experience cannot be denied, we are now to enquire how it hath and may come to pass, that the Wood of a dry Olive Tree should Sprout again. Which though it be hard to find out, yet because it is not Miraculous but Natural, I will propound my Opinion: let every man follow what Opinion he likes best. And in the first place, this must be remembered, as hath been many times said before, that there is not one manner of the Propagation of Plants. For all

which way a dry Olive tree may come to sprout again.

Sundry waies of the Propagation of Plants.

Plants are not propagated by Seed formed after a certain fashion, and included in one part, but that same juyce containing in it the Seminal principle is in many diffused through the whole Plant; so that those Plants may be propagated by a slip or branch puld off, or by their Roots, and so multiply themselves; and after this manner the Seminal faculty communicated either from Seed properly so called, or from a Root, or any other way from a Plant of the same sort, may many times lie long hidden. *Jul. Caesar Scaliger* relates, that the Seed of Bears-Foot hath thus lain hid in the Earth eight years together, *Exercitat.* 140. In my little Garden (saith he) which is next my study, I planted Bears-Foot, I kept it a long time diligently. Some Thievish Herb gatherers, from whom nothing can be kept, had to my thinking pluckt it all away by the Roots. For above eight years there was no appearance therof. A Berberry was set near that place. The place it self was digged and rak't, and sowed with patience Seed, which they here falsly count to be *Raved*. The Patience grew and filld the bed and was gathered. I falling sick, that plat lay wast and was not stirred for three years together. This present year I find the remainder of my Bears-Foot, *viz.* two Plants with most beautiful neat leaves, a large stalk and fairly flowred. And therefore as in Wheat, Barley, Oates, and other dead Plants, the Seed may remain in the straw shut up in its Chaffie cases: so also, that same juyce containing the Seminal Principle, diffused through the whole Plant, may in some Plants dead and dried last for a season. And as (nevertheless) he should not say truly who should say that dried Oats or dried Wheat in the barn doth live, although in the dried straw a living Seed is contained: so also it must not be said that the foresaid wood doth live, but only that it contains in it self a Seminal principle. Yet few Plants once dried do recover that same Ancient Seminal disposition which was necessary to the exercise of the Second Act. That it sometimes so happens in the Olive Tree hath been observed, since it above all others abounds with that same Fat Balsamick juyce. That the same hath hapned in an Ash and Poplar hath been said before. But that Herbs after they are rotten and corrupted may revive again, daily experience shews, while in Fields and Gardens manured with Dung those Plants which have putrified in the Dung are Generated, the juyce which contains the Seminal principle having remained unhurt. And al Husband-men know, that of Hogs-Dung Sow-Thistle is bred, in Vine-yards, Gardens and Fields. This Thistle is a Familiar food to Swine, and therefore the Germans call it *Sæw-Diestel*, Sow-Thistle. And al these things although they seem wonderful and almost incredible: yet that they are true appears even hereby, in that also of the Tears and Gums of Plants Plants are generated, as shall be said hereafter.

Herbs that Root, revive again

Of Hogs-dung Sow-Thistles are bred.

The Souls of Brutes Mortal.

But although these things are true of Plants: yet the Souls of perfect brute Animals cannot survive after Death. And whereas out of the Carcasses of Animals such Ignoble petty Animals are bred as aforesaid, that doth not happen because the Soul

Soul of the Animal remaining the same being reduced to a more Ignoble degree does produce worms (for the Soul of a Man, a Lyon, an Ox, doth not go into such Animals) but because the subordinate Form lying hid doth then rowze it self up, as was said before.

Moreover, after both the manners before propounded fundry Plants do Spontaneously arise. For in the first place, out of the Ground although never sowed with any Seed some Plants do spring up of themselves, as *Virgil* said of Trees.

*Some Plants without Mans labor freely come.*

Now this doth not only happen when (which belongs not to this place) the Seeds themselves intire are carried by force of Winds or overflowings of Waters into some other place; but also when those little Bodies containing seed in them are carried thither either by Winds, Rain, or inundations of Water, or when some Plant of the same kind hath putrified in that place, and yet hath there left its Seminal rudiments. And thus *Pliny* writes concerning the Spontaneous Original of the herb *Laserpitium*, *Liv. 19. Cap. 3.* We find, (saith he) in most credible Greek Authors, that this Herb suddenly sprung up after the Earth had been moistened with a Pitchy shower, about the Gardens of the *Hesperides*, and the greater *Syrtis*, seven years before the building of *Cyrena*, which was built 143. years after our City. And the force of the shower reached four thousand *African* furlongs. Doubtless that same shower, so thick, black, and Pitchy as it were, did contain many smal Seminal Atomes of *Laserpitium*, containing in them the rudiments of that Plant, which being forced into the ground produced that Herb all along that tract of Land aforesaid. And after this manner, *v. z.* those little particles containing in them the Seed, being brought from elsewhere by showers, Winds, inundation of Waters, whole Woods have sometimes sprung up of themselves, as *Theophrastus* doth witness, *Lib. 1. de Causis Plant. Cap. 5.* Also after this manner, in Earth digged deep out of the ground, and containing no Seeds in it, being exposed to the Air and Rain, Plants do Spring up. Unless any man will follow their Opinion which we mentioned at the beginning of this Chapter, who hold, that the Earth by Virtue of the divine Benediction given at the Creation hath a peculiar faculty to produce certain peculiar Plants.

Moreover, Another manner of the Spontaneous Generation of Plants is, when a plant is generated out of another Plant of a several sort, in the Earth. The Generation of which plants is the same with that of Mushrooms, *viz.* When an inferior form which was formerly under the superior Form in the notion of matter, now the superior Form is lost, is set at liberty, and shapes a convenient House for it self. Thus Moss grows upon Trees. Unless any man will here also hold, that when the Soul through fault of its Organs (which happens in aged Trees) or badness of the Aliment, cannot change it into such parts as it ought to do, that it may not be idle it Generates Moss and such like Things.

Hither may be referred the degeneration of Plants, of which we spake also before *Cap. 2.* when a Plant springs indeed from Seed, but of a different kind from it self; when Water-Mint turns to mint; Wheat to Darnel; Barley to Oates, Basil into running Betony; a rape into a redish; a white Vine into a black; a black into a white; Barley in Wheat; Wheat into Barly, and other Plants degenerate into others, Whereof *Scaliger* hath a rare example, *Exercit. 140.* I sowed with mine own Hand the Seed of the Vulgar Smallage, which they commonly but falsely call Peisley, by a Wall which would defend it from the Summers heat; that growing up and preserved by the shadow it might serve for the Kitchens use. But it never sprung up according to the usual manner: but another Plant quite different therefrom, to my admiration. It was that which the more learned call *Scorodotis* and hath been hitherto falsely taken to be *Scordium* by many. Its leaves when it is yong (if you look on it at a distance) are like Violet Leaves, it hath a white flower, with the Smel and Tast of Garlick. [This should be that we call Jack by the Hedg, or sawce alone, and our Herbals *Allaria*.] In which case nevertheless a man must take heed that he be not deceived, and think that Plant which springs up from some secretly hidden Seed to arise from the degeneration of another. We spake before of Bears-Foot from *Scaliger*, in the place lately cited, how that when he thought it

was Rooted al up, and had not appeared for about eleven years, at length it sprung up again.

How it  
comes to  
pass.

Now how this degeneration comes to pass is doubtful: *Fortunius Licetus*, indeed, *Lib. 4. de Spont. Viv. Ort. Cap. 35.* and elsewhere, holds that Forms do also degenerate while they are weakned, and through weaknes come to degenerate into weaker Forms. Now he writes that they are weakned, either by a contrary agent working upon them by it self; or upon the mutation of the subject upon which they depend as to their Essence; or from both causes together. So the Soul of a Calf when it dies degenerates into the Souls of Worms and bees, which Spontaneously breed out of the Carcass thereof; so the Essence of Wheat is changed into the substance of Darnel and Oates; so heat Fainting away degenerates into Luke-warmness, so that not only the Forms of the substances but of the accidents also are changed, as he writes. But as was said before, this degeneration of forms, so that the form of a calf should degenerate into the form of worms, is not agreeable to Reason. Rather there is a certain kindred of Forms, as *Matthiolus* speaks in his preface upon *Dioscorides*, and some Seeds are Equivocal, that is, common as it were to divers sorts. And as the same internal Form Bears one while the Form of a Palmer Worm, another while of a Butter Fly, another while of another Worm, and then of a Silk Worm: so also in Plants, some Souls are so constituted, that, according to the disposition of the matter they may form now this, now that shape of Body; or they are so subordinate that one is Lady and the other a Servant, and the Lady exercises her Sovereignty so long as the matter of which the Plant is formed and nourished is well disposed; but when there is any deficiency therein, the Hand-Maid takes the Sovereignty.

The Deger-  
neration of  
plants  
where  
caused.

*Theophrastus* disputes whether Plants degenerate in the Seed or in the Root, *4 de Caus. Plant. Cap. 6.* and denies that it is made in the Root, because the Nature of the stalk, Leaves and Seed, do alwaies follow the Nature of the Root; and he concludes that it is made in the Seed, and that it grows fruitless either through penury or superfluity of nourishment. *Johan. Gallego de la Serna de Princ. Generat. Lib. 2. Cap. 7.* conceives that these degenerations of plants may happen two manner of waies, either because the Soul of the Seed weakned by faultiness of the matter could not produce its proper issue, and bred a monster, as happens in Animals; or because the form of Wheat, for example, is quite corrupted, and upon the corruption the matter remains so disposed, that by the universal cause the form of Darnel or Spelt may forthwith be produced in it. But neither of these waies may be simply allowed. For, as to the first, this is true, that through fault of the matter the Soul cannot produce that which it is ordinarily accustomed to do, otherwise. Yet that Body which it produces is not alwaies a monster. And the generation of Monsters is tied to no certain Rules. But the degeneration of Plants is made certain waies, and such Plants degenerate into such and no other, or not into any at least. But the second manner is absolutely false, *viz.* That the Soul is corrupted, and from the disposition of the matter remaining the universal Cause produces another. For the Universal cause doth not produce any specificall effect. And he acknowledges, that the said effect is not indefinite and indeterminate, and that of Wheat Turnep or Cole-wort is never made, but only Darnel or Spelt. As also of the Carcasses of Animals only some sorts of Animals arise, and not any whatsoever. This therefore is more likely, that the Creator hath given to those forms the faculty to shape themselves sundry Bodies; so that when the matter is rightly disposed it makes some kind of Bodies; and so of Wheat grows commonly Wheat, but when the matter is ill disposed, yet that Nature may not be idle it hath the power to produce another Body; for examples sake, when the Soul of Wheat hath matter indisposed, it makes the Body of Darnel or Spelt. And it is here much after the same manner as was said before concerning Palmer Worms and Butter-flies, where the same form at sundry times makes sundry Bodies. And that the Soul doth not perish appears even hereby, in that after Spelt is sprung from Wheat, black Oates from white, if it find again a convenient soil it will return to Wheat and white Oates again.

And although all Spontaneous Generation of Plants may be reduced to these two manners, whether it be properly or improperly so called: yet that the thing may be more Plain, I think fit to explain this business according to the matter and subjects in which these Plants Spontaneously arise.

Secondly



Secondly therefore, what hath been newly said of the Earth is much more true of Dung; since therein lie hid and jumbled together the Seeds, parts and juyces of sundry Plants, and other things, and al the causes of Spontaneous Generation in the Earth may be found much more in Dung. *Plants arising from dung.*

Thirdly, That many Plants Spring up in the Waters, Duck-weeds, Water-Lilies, Water Caltrops, and many others, is most notoriously known. Now such Plants are not all of them Spontaneously Generated (to speak properly) but the Roots of some are divided out of which new ones spring up, others shed the Seed which they generate into the Waters, whereof Plants of the same sort are bred, and the Seeds of Plants by the Wind and Inundations of Waters are brought in from other places. But those which are so Spontaneously bred, that they spring not from intire Seed, are Generated either from Plants putrefying in the Waters, or from Atomes or smal Bodies having Souls in them, falling into the Water in Rain showers; which may also be caused by the Winds, when they blow into the Water amongst the Dust such petty smal Bodies containing the Souls of Plants in them; or because from the Roots of Trees some Juyce or Excrement containing in it a Seminal principle is shed into the Water. For by all these manner of waies those petty Bodies, containing the Souls of Plants, or at least their forms which will turn to Souls when they meet with fit matter in the Water, (which chiefly comes to pass in standing Waters) and are cherished by the ambient heat; they are rouzed up, and generate such a plant as they are Naturally fitted for. *Plants breeding in the waters*

Fourthly, Some hold that Plants are also bred out of the Snow. But more credible it is, they grow under the Snow. For although it may come to pass, though seldom, (for that cannot easily happen in Snow which happens in Rain) that petty Bodies (with the rudiments of Plants in them) may descend with the Snow: yet the heat by which they might be brought into act is wanting therein, and therefore very seldom or never, if by chance the Snow begin to be warmed and Melt with the heat of the Sun, or if that part of the Snow especially being deep which is next the Earth do begin to be warm through hot Exhalations Springing out of the Earth, and the Soul lurking there be rouzed up and brought into act, Plants are bred out of the Snow. *Plants out of Snow.*

Fifthly, 'Tis also found that some Plants grow upon other plants. So, many times, upon Willows great Celandine, Bitter-sweet and somtimes Elder doth grow, yea and Services and other Plants. Which happens, either because whole Seeds are brought thither by the Winds (which yet is not Spontaneous Generation properly so called) or smal Bodies containing in them the Seed of Plants are brought by the Rain or Wind. Now this happens chiefly in those Trees in which part of the Tree begins to Rot, and turn to dust as it were: which often happens in old Willows cut off about the Head as they call it. For since there is found matter fit to Form and Augment a Plant, the Soul of a Plant can easily display it self therein. And therefore in such Generations the Tree which grows in the Earth affords only a place to the Plant which grows upon it. *Plants growing upon other plants.*

Sixtly, 'Tis also very wel known that Plants do grow upon Rocks and Stones, as a kind of Mofs doth every where grow upon Stones, and Coral grows out of Sticks upon Rocks in the Sea, and Sea-Mofs grows upon Rocks and upon Shell-Fishes. But I doubt whether Corals do grow of their own accord. For although no Body Plants it in the Sea: yet because it is a certain sort of Natural thing, which is nowhere else Found save on the Rocks of the Sea, (nor can it be said to grow from the Corruption of any other Plant or Animal;) this doubtless is its Natural place, and it was doubtless created upon these Rocks at the first Creation, on which it is propagated, either by Roots or by some juyce containing in it the principles of this Plant. But as to other plants, they grow upon stones, when showers fal upon them, which contain either petty Bodies with the Forms of plants in them, or smal Bodies separated by the corruption of other plants, yet fit to produce plants. And this happens more easily, if upon the Rains any Clay or Earth stick upon the said Stones. For then those Seeds find a more convenient place to display themselves. The same also may happen by the Excrements of Birds falling upon the Stones; since also in those very Excrements the Forms of plants may remain unchanged. But it oft fals out, that not perfect Plants, but only some Mofs grows on Stones. For since by Reason of defect of Aliment that same Soul cannot make what it *Plants growing on Rocks. whether Corals grow spontaneously.*

would, it makes what it can, and rather then be out of employment it frames Moss.

And whereas Plants seem to grow sometimes, not only on the surface of Stones, but also to spring out of the depth of them; the cause (doubtless) is, that those Stones have Clifts not discernable by our Eye-sight, into which those petty Bodies or Atomes, containing in them the form of a Plant do insinuate themselves with the Rain, which Form being wakened by the Heat of the Ambient Aire doth at last rouse it self up and fall to work.

And whereas Plants do sometimes grow out of Brick or Stone Walls Joyned with Mortar, Yea, and Shrubs and Trees; it is no wonder. For their Original is the same with Plants that grow out of the Earth, when as either in the Sand which is mixed in the Mortar the Seed of some Plant is mixed, or is brought thither by Birds, or by the force of Winds, and insinuates it self into the chinks of the Walls (which nevertheless is not Spontaneous Generation properly so called) or when with the Excrements of Birds or Rain petty Bodies containing in them the form of Plants are brought thither, and creep into the Chinks, and so in time Sprout forth.

Plants from the tears of plants. Also *Theophrastus* teaches, *Lib. 1. de Causis Plant. Cap. 4.* that Plants do also grow out of the Tears and Gums of Plants. Which Generation although *Licetus* saies it is Spontaneous, *Lib. 3. Spont. Viv. Ort. Cap. 25.* yet I had rather hold that this is no Spontaneous Original; since they are produced in a manner of Seeds, and that of the same sort; and *Theophrastus* himself saies, that the Generation from Tears doth plainly answer to that which proceeds from stalks; which questionless is not Spontaneous. And he teaches that there is a fruitful principle in the Tears, when he writes: But that is a most peculiar way of Generation which proceeds from Tears, as that of Horse-smallage, Lillies and some other Plants. Nor is a Reason wanting, but this plainly answers to Stalks. For the tears have in them a fruitful principle, and that is all the cause. And whereas *Licetus* holds a threefold fruitful principle, viz. Seed, a bodily part of the plant, as a Root, or stalk, and the Soul, he is out. For he doth ill to ad the Soul, as a different manner of propagation from the others; since all propagation is made by the Soul, and the soul is never propagated without the Body. And whereas he propounds the subjects or Bodies wherein the Soul is, and by which it is propagated, to be the Seed, and Root, and Stalk, he errs therein also. For the Soul may also be in the Tears themselves, which *Julius Caesar Scaliger* causelessly opposes, when upon the forecited place of *Theophrastus*, he writes, if of a Gum sowed a plant is bred, the Gum cannot be the excrement but must be a part of the plant, wherein there is a vigorous generative principle. For all know that the word Excrement is taken equivocally when it is attributed to the Dung of the Belly, Urin, and other Excrements properly so called, and afterwards to the Seed. But as *Theophrastus* hints, all plants will not spring from Tears, but only some certain kinds.

Plants from plants of a several sort. But those plants which spring from plants of a different sort are properly said to grow of themselves. So sundry sorts of Moss do grow upon trees. So *Mistletoe* grows upon the Oake, the Hazel, the Apple-Tree, Pear-Tree, plum-tree, Birch-tree, but grows no where by it self. That other Herbs and Shrubs grow upon trees, as hath been said, is not unknown. But that is not Spontaneous Generation; since they grow not out of the Trees, but only upon the Trees, from their own Seeds, and the Tree which sticks in the Earth doth only afford the place; which chiefly comes to pass when some part thereof is putrified and turned to Earth as it were, whereof we have already spoken.

The four manners of Licetus. Now *Licetus* propounds four manner of waies whereby plants of a different sort are bred of other plants, *de Spont. Viv. Ort. Lib. 3. Cap. 27.* two Spontaneous and two non-Spontaneous. The first he makes to be, when the Soul of an old plant in a matter some waies within it self procreates a new Soul different from it self, which constitutes a new plant of a different sort, and less perfect then it self. The second is, when the seed of any plant doth any waies fall upon another plant. Of which second manner there is no doubt, but the first can hardly be allowed. Nor is it credible that a Soul should procreate another Soul different from it self. More likely it is that the generation of a new and different plant doth proceed from a subordinate

subordinate form; as hath been said concerning Worms bred out of plants. But that manner is properly Spontaneous.

The Third manner, and that not Spontaneous, he makes to be; when in the chinks and passages of an old Plant the powder of Animals and Plants containing in it the Soul, as in a Vessel, are by the heat of the Ambient Air disposed to life. But, since those powders do contain in them a Seminal principle, we have formerly shewed in what sense this generation caused by them is Spontaneous. For Moss doth not belong to this manner of Generation, as he imagines with *Costeus*. For Moss is not made of the poudery matter of Moss cast upon the Trees from elsewhere, but out of the barks themselves of Trees when they now begin to be corrupted, as was said before.

The fourth manner is, when sundry Excrements of an old Plant, (the former Soul that had Animated the same being put off by Death, but yet contained in them as in a Vessel) when they come by the heat of the Ambient Air to be digested they are disposed to a new life, and take to themselves again the weakned Soul, degenerating from its old species or sort, so as to become a new vivifying Form, constituting a new Plant.

Peculiarly, as to what concerns the Generation of Mistleto, *Julius Cas. Scaliger* The generation of Bird-lime treats largely thereof *Exercit.* 168. where first he relates the Opinion of the Ancients, imagining, that the Berries of Mistleto being Eaten by Thrushes, the pulp thereof is concocted; but the Seed comes away indigested with the dung, and falls on the boughs of those Trees whereon the Thrushes are wont to settle. But he conceives this Opinion is therefore to be rejected, because it is not any where planted or sowed, nor grows upon every sort of Tree, nor is it credible the Seed can enter into the hardest boughs so as to cleave the Bark, and become one with them without any Roots; that it proceeds out of some branches where no dung could ever rest nor no Seed stick; nor could he ever find any grains of Mistleto in the Crops or Guts of Thrushes, having nourished them with the berries thereof on purpose, and afterward cut them up. But he holds, that as horns (as it were) grow out of the Bones of Animals, so Mistleto grows out of Trees, and that the unshaped principles of Mistleto being cherished by the inward heat, assisted by the outward, in a Juyce con-natural thereto, it grows into this Plant. And therefore there is one Wood of both, nor is the Mistleto inserted into the bough of the Tree like a Pant thrust into the Earth. Which Opinion is so far true, as it holds that the principle of the Mistleto is in the Trees on which it grows, and doth not come from without, but is Generated within the same, and proceeds from superfluous matter, as horns in Animals. Yet herein is a difference, in that Mistleto is not bred on all such Trees, as all Animals of the same sort bear horns, but on some Particular Trees only. There must therefore, doubtless, some peculiar disposition concur in some sorts of Trees, and in some Individual Trees of those sorts, by reason of which this superfluous Humor may be generated, which the Soul of the Tree doth afterwards drive into the outward parts, and thereof Generates Mistleto. And whereas it may be objected, that because it grows upon Trees of several sorts it cannot proceed from one and the same principle but if it came from the inward Nature of the Tree the Leaves of the Mistleto should differ according to the difference of the Tree: to that *Scaliger* answers, that it is not necessary that the Excrements of different Bodies should differ in outward appearance, but it suffices if they be rationally or respectively different, as we see in the Tears of Plants. And although the external face is one and the same, yet the Nature it self is different, and the Mistleto of the Oak hath far other Virtues than that of the Apple-Tree. As also Galls are bred on sundry Plants, as shall be anon declared. And this Juyce hath one peculiar property, that though the leaves of the Tree fall off, yet the Mistleto keeps his Leaves all the year. *Theophrastus* indeed, in 2. *de Causs. Plant.* writes that Mistleto holds its Leaves all the year, upon such Trees as hold their Leaves, but loses them if it grow on Trees that shed their Leaves. But *Scaliger* rightly accuses this of falsity. For every where in the Woods we see Mistleto at all times green, upon the Oak, the Apple-Tree, the Birch-Tree, the Bullas-Tree, when those Trees have lost their Leayes. Yet is not this Humor simply superfluous, but either part of the Alimentary or Seminal Juyce of the Tree, which the tree wantonizing (as it were) doth thrust out:

out: and therefore those Trees on which Mistletoes do grow do for the most part die.

*Galls.* After the same manner as Mistletoe doth grow on divers Trees, so also Galls do grow upon the Oak, the Holme, the Beech; yea and *Scaliger* writes in the forealleged place that he saw Galls grow upon Sage, of an Ashy colour; and he relates also that Italian Merchants trading to *Aleppo* and other parts of *Asia* informed him, that there is such Apple-bearing Sage to be seen in many parts of *Asia*.

*whether plants breed of Animals.* Whether Plants breed of Animals is doubtful. *Licetus* indeed every where affirms that Plants are bred of corrupted Animals. But I scarce think there are any examples to be found of such a thing, and that of the substance of Animals and their Excrements Plants should be generated, as Worms are; unless peradventure the Seeds of Plants, or a Juyce containing in it the Seminal principle of Plants be contained in the Excrements of Animals. And the examples which are brought of Plants bred out of Animals do hardly prove any thing else, then that the Seeds or rudiments of Plants may stick outwardly to the Bodies of Animals, and grow out of them and be augmented. Now Plants are bred either in living Animals or dead ones. As for live Animals, *Aristotle*, in 9. de *Hist. Animal. Cap. 5.* And *Theophrastus*, 2. de *Caus. Plant. Cap. 23.* do relate, that an Hart was caught, with green Ivy growing in his Horns, which (as *Aristotle* wel adds) being accidentally thrust into the tender horn, as it were into a green Tree, became incorporated therewith. Which both *Pliny* confirms, *Lib. 5. Cap. 32.* as also *Julius Casar Scaliger*, who in his Comment upon that place of *Theophrastus*, writes, that in the budding of his Horns the Hart rubbing them against some Ivy had broken a branch with a Root at it, which fastned it self into some tender part. *Licetus* indeed adds also two other manners, *Lib. 3. de Spont. Vivent. Ort. Cap. 28.* The former whereof is, that a dusty matter being blown into the Roots of the Horns near the Hair, and mixt with a various Humor, either proceeding from the Body of the Hart, (in form of sweat or some other Excrement, or from the Air in form of dew or some other matter) did stick unto the Horns, to which poudery matter the form which had long lain therein as in a Vessel being stirred up by the Heat of the Ambient Body doth now adjoyn it self as a quickning and Jvy-making form. The other is this. He holds, that out of the Body it self of the Hart an Excrementitious substance, bred chiefly by eating of Ivy, by the concoctive and expulsive faculty separated and expelled with other Excrements of the third digestion to the Roots of the Horns, and by reason of its own clamminess or some other glutinous matter sticking there fast, it is by the ambient heat digested into a new living Plant. But neither of these waies is probable. For as to the former, if so great a quantity of dusty matter might be collected at the Roots of Horns in the Hairs, that therein as in the Earth Ivy might grow, other plants might also grow there. Nor can any reason be shewed, why that poudery Humor gathered at the Roots of the Harts-Horns should be collected only from Ivy. Again, it cannot easily be shewed, how the Soul of the Ivy through so many digestions can arrive safely to the Horns of the Hart; nor can any reason be shewed, why other Plants also should not grow on the Harts-Horns.

*Moss growing on Shel fish and on the Backs of Whales.* But on the back of Shell-fish and Whales mossie Herbs grow out of the Mud and Scum of the Sea, sticking to the Backs of these Fishes, which contain in them the Seeds or Seminal rudiments of Moss and other Plants. But that other manner added by *Licetus* of Excrements driven from the inner parts of the Beast into the surface is less probable then the former. For it is not credible, that Whales feed upon Moss and Plants. And if this manner were true, other Fishes which are known to feed upon Grass, Moss and Plants, should have mossie Plants growing upon their Backs.

*whether plants grow out of the dead Bodies of Animals.* Now it is worthy our consideration to examin, whether Plants do grow also out of the Carkasses of Animals. *Licetus* saith they do, and that it is no news, *Lib. 3. de Spont. Vivent. Ort. Cap. 32.* But this must be fitly explained. For I cannot believe, that as Worms are bred of the very substance of dead Carkasses, so also Plants are Generated of the same substance; nor doth experience confirm the same. Upon the Skuls and Bones of Men Moss is bred. But since it grows not upon such bones as lie under a roof or covering, but on such only as lie in the open Air and

and are wet by the Rain, the original thereof is rather to be attributed to the Rain, like that which grows upon Stones. For since, as was said before, the principles of the Seeds of Plants are mixt with Rain, if they fall upon bones, especially such as are Rotten and begin to turn to dust, the said Seminal principle sticking in them and finding matter to work on, and cherished by the Ambient heat, if it do not make other Plants, it will at least generate Moss.

Some also relate that Coral hath grown in the Sea upon a dead mans Skul. Yet it is impossible that it should grow out of the substance of the Skul: But, question-<sup>Coral grow-  
ing on a  
mans skul.</sup> less, in the Sea some matter having the Rudiments of Coral in it stuck fast to the Skul, out of which afterward the Coral grew.

It is an old Story that Asparagus grows on Rams-Horns, but Fabulous without doubt; nor doth experience confirm the same. *Fortunius Licetus* indeed, in the place fore alleadged, endeavors to defend it by four Reasons, but all in Vain. For First he saies Plants grow out of Stones, much more may they grow out of Horns. <sup>whether  
Asparagus  
do grow  
upon the  
horns of a  
Ram.</sup> But as was said before Plants grow not out of the very substance of Stones, but of feed or a Seminal matter which sticks to them.

The other is, because Animals are bred of the Carcasses of Plants, Namely worms out of Wood, whereas nevertheless the Carcasses of Plants are more imperfect then the Carcasses of Animal. And seeing that it is much easier for a thing to procreate that which is more imperfect then it self, then to act beyond its forces by breeding that which is more perfect: credible therefore it is, that Asparagus may grow upon the Horns of a Ram. But Carcasses do not as the efficient causes breed any thing of themselves, but we must look to the disposition of the matter, and consult with experience, what may be made out of those subordinate forms. Moreover, although Worms are Animals, yet it is a question whether they are more perfect then perfect Plants. Nor doth any reason enforce, that as out of an Animal another Animal though of a different sort may be generated, so also a Plant may be bred thereby.

His Third Reason is, because it hath been observed that in the Sea Coral hath grown out of a dead-mans Skul. If therefore Coral were bred out of a Skul, Asparagus may also grow out of horns. But how Coral may grow upon a Skull, (which notwithstanding is very rare) hath been lately shewed.

Fourthly, Since Ivy hath been found to grow upon the Horns of an Hart; Asparagus may in like manner grow upon a Rams horns. But the case is different. That Ivy did not grow out of the substance of the horns, but the Root of Ivy stuck thereupon, as was said before. And therefore, warily, *Lib. 1. Cap. 18.* he recites indeed the Ancient Opinion, but he makes it not his own, where he writes; 'tis also reported, that Asparagus hath grown upon the horns of Beasts being bruised, and buried in the ground.

Much less are Plants generated out of Metals, for there is in them no disposition towards the Generation of Plants. And if plants have grown upon Brazen Statues, as *Pliny* reports *Lib. 17. Cap. 25.* And *Lib. 24. Cap. 19.* that was not cau-<sup>whether  
plants  
grow out  
of Metals:</sup> sed by the Metal, but the Seminal principle of some plant was by the Rain, or Winds, or birds, or by some other means cast thereupon.

*Julius Cas. Scal. Exercit. 307. Sect. 29.* doth wel complain of the shallowness of Human understanding, as being unable to comprehend the Effences and Forms of substances. And he concludes at last: that it is a part of Mans Wisdom to be contentedly ignorant of some things. Which difficulty and obscurity hath deterred many from making any further search into the Nature of Forms. Whence it comes to pass, that little is to be found (and that of smal solidity) in the writings of Naturalists concerning the Nature of Forms and Souls. But because beautiful things are alwaies difficult; the hardness ought not to discourage us from searching into so noble a subject. And having spoken somewhat in the former part of this Treatise of the Original and Nature of Souls, I shall here undertake the explication of one question of sufficient difficulty and explained by few: *viz.* whether the Souls of plants and brutes when they die do perish and turn to nothing. <sup>whether  
the souls of  
plants and  
brutes do  
perish by  
Death and  
come to  
nothing.</sup>

Some deny it, and hold it for an axiom and principle, that Naturally nothing is made of nothing, and again, that something doth not turn simply to nothing. And to beleeve it they are perswaded by these Arguments, propounded also by *Scaliger, Exercit. 307. Sect. 14.* If saies he, any substance can be so corrupted as to be-  
come

1. come nothing, then on the other side some substance may naturally be made of nothing; First of all because, whatever is created by God that can no Creature Annihilate, nor can the Creator be compelled, or hindered from that action whereby it is preserved, the withdrawing of which action is Annihilation. Secondly,
2. Because God did not repent him of his works, but saw that all was good which he had made. Thirdly, Because those Souls and Forms do pertain to the perfection
3. of the universe. Fourthly, Because *Ecclesiast* Cap. 3. v. 14. the Preacher saies, I know
4. that all the works which God hath made do endure for ever. Fifthly, Because many things
5. which are said to have perished did not indeed perish, as Serpents and Frogs turned to slime are in the spring time regenerated, and live again.

But since these men acknowledg the difference betwixt the rational Soul and the Souls of Plants and Brutes; and do grant that every form besides the rational Soul cannot subsist of it self and by its own power, out of and without the help of the matter; and that they depend upon the matter in their making, being and operation; I cannot see, how they can so simply deny this. Especially since they themselves cannot tel us where these Souls remain after Death. Some say they turn to somwhat which was before and simpler then themselves. But they cannot make out what that former and simpler thing is, nor prove that those Souls were compounded of any thing existing before them; since they are Naturally most simple essence. For if, as *Jul. Cas. Scaliger* rightly saies *Exercit. 207. Sect. 20.* every Soul is the perfection of the Body, and the Act of the matter, and the matter nothing but the four Elements; the Soul must needs be a first Essence, and that most simple, having nothing before it whereof it could be compounded.

The opinion  
of the  
Chymists.

Some of the later Chymists, and amongst them *Severinus*, do hold that they go into the *Chaoe, Orcus, or Abyssus, or Night*, (which *Hippocrates* terms *Hades, Orpheus* calls *Night*; *Hermes Trismistus, to adanes*, the invisible Region; as also *Dionysius* the *Ar opagite*, in *Eccl. siastica Hierarchia, Cap. 2.* *Apollonius Thyaneus, Ousian*, the substance; *Seneca Cap. 36.* Nature; *Servius* upon the 8. of the *Eneids* the Generality) and to their Fountains, from whence at their appointed times taking new bodies they enter again upon the stage of the World. For which opinion they cite a place of *Hippocrates, Lib. 1. de Dieta*; Whereof we have spoken in our *Book of the Consent and Dissent of the Chymists with Galen and Aristotle*. But the Heathens could not explaine what that same *Orcus*, (or Generality of things) is, or where it is; and all these opinions have arose from the Ignorance of the Creation of the World, and of the Conservation thereof.

John Mar-  
cus Marci.

*Johannes Marcus Marci*, in *Defen. Idearum suarum, Prefat. Loco Tractat. Pre-*  
*missa*, teaches, that such Forms divided from the society of matter, because they are impassible do need no place. Yet because a finite Essence is necessarily defined to be in some part of an imaginary place, he holds, that it abides in that part of a place where it is separated from its subject, and is neither by it self nor by accident Locally moved. And in Chap. 4 of the same Treatise, he writes that such Souls, the Corporeal number failing, (into which they had degenerated by the fellowship of matter) being freed from Corporeal Laws they return to the unity of the simple essence in which they were at first created. Yea, he conceives that they are not to perish at the last day, but that the form of this world being passed, they shall not at all be subject to those vicissitudes, nor reassume any Bodies, but passing the time in eternal silence they shall as well as the Elements distinguish and adorne the world with a wonderful variety of Essences, without sensible Figures, the world being no less absolute and perfect then now it is. But these things are only said and not proved, nor do the Reasons before alleadged for this opinion sufficiently prove the same. To which before we make answer, that is to be noted in the first place which *Scaliger* hath, *Exercitat 207. Sect. 20.* All that is (saies he) is either the first principle or proceeding from the first. There is but one first, therefore the rest depend thereupon. Therefore all things, but one, are in their own Nature corruptible. For although beings are free from subject and Term; yet are they not free from cause. They are therefore by another and from another. But every thing dependent may be changed by that on which it depends if it be voluntary. And therefore the immaterial minds themselves as they depend upon the first Principle, at the Pleasure of the first they may be deposed from that Essence wherein they

they are placed by him. For if they could not, they must have in them another principle resisting his infinite power. And then he should not be the first principle. But they are not corrupted, because it is not his pleasure.

And *Johannes Serranus* upon the *Timæus* of *Plato*, writes according to *Plato's* opinion: God only truly is, and therefore he only is truly eternal, and the Foundation of all created things, all which have this common adjunct, that they had a beginning; yet the Nature of things created is not one, but various and manifold. For some by the pleasure and power of the Work-master have a more firm and constant essence, and therefore compared with other things they have a kind of eternity, given them by favour of the Creator: yet are they not truly eternal; since they did proceed from a certain beginning, and when the Work-master shall please may have an End. For the glorious God is only independent and simply immutable. But all the parts of the World being created by God, as by a voluntary Principle, do depend upon him in their Essence and conservation; or they have their Essence in God, and are preserved by him. But Angels and the Human Soul, inasmuch as they are immortal, they have not their immortality of themselves and their own Nature, but by the Favor of God, by whose power they are preserved. God only hath immortality and immutability communicated from no other: but the Human Soul and Angels have immortality indeed, but communicated from God, by whose Favor and grace it is, that they have in themselves no inclination to non-being, but may also be conserved and subsist without matter. Whereof *Damasceus, Orthodox. Fid. Lib. 2. Cap. 3. Angelos Athanatos, ou Phusei, alla Chariti: an Angel is immortal not by Nature but by Grace.* Now God hath afforded this Grace and Favor, not to all Creatures, but only to Angels and the Human Soul; but all other forms and Souls are so subject to the will of the Creator, or so immersed into this matter, that out of it they cannot be preserved, but their subject perishing they have a natural inclination to not being, and being destitute of their subject they are annihilated.

Out of which it is easie to answer to the Arguments for their opinion who hold, <sup>The former</sup> that the Souls of Brutes and Plants cannot be Annihilated. For First, whereas they <sup>arguments,</sup> say, that what ever is created by God cannot by any creature be Annihilated, nor <sup>answered,</sup> the Creator be hindered from the action of conservation; all that, truly, we grant, but we say withal, that such was the free pleasure of God, that some forms should be immortal, others corruptible; and therefore he is not by any Creature hindered from the act of Conservation, but by his own most free will withdraws the said act, since he would have such to be liable to perpetual Generation and corruption, and would not have individuals perpetual, but that the kinds of things should be perpetuated by reparation of new Individuals. And if it were not so, what difference would there be betwixt the Soul of a man and the Souls of Beasts? And thus not only the Human Soul; but the Souls of brutes and Plants should be immortal.

Secondly, Although the Souls of Plants and Brutes do perish as soon as an Individual dies: yet God doth not therefore repent of his works. For as God of his own most free Good will created them of nothing, as an Essential being, so he most freely withdrawing his conservation suffers them to return to nothing.

Thirdly, All sorts indeed of things tend to the perfection of the world, and no sort is abolished; but all Individuals are not necessary for the perfection of the world, but there is in them a various Intercourse of Generations and Corruptions. Now the sorts necessary to the worlds perfection may be as well maintained in a few Individuals as in many. And when after the flood there were but a few individual Animals, the world was not more imperfect then now it is.

Fourthly, That Place therefore of *Ecclesiastes* must be understood of the sorts and not of the Individuals of Animals and Plants.

Fifthly, We grant that the forms of Plants and imperfect Animals do not alwaies perish when they are thought so to do, but those that were thought to be abolished do lie hid for a time, and afterwards return to life again, either in their former or in a new shape.

Now this therefore happens, because those forms do not requite for their simple being a matter so noble, variously elaborated, and furnished with so many Organs, but can many times lie hid for a Season in some place. But this is not al-

waies, for they also are at last abolished. But in more perfect Animals, where the Seeds if they must be preserved must of necessity be forthwith received into the Womb, the Soul cannot be preserved out of its Body and out of its Seed. And let them shew us but the least sign or token, whereby it may appear that the Soul of a Lyon, an Ox, an Horse, a Dog, did ever live after the Death of the said Animals.

### Chap. 8. Of the Spontaneous Original of Animals.

Animals  
which  
breed of  
themselves

**N**OW of Animals that breed of themselves there are sundry kinds. The Wee-  
zel lives upon Corn; the Worm *Midas* feeds upon Beans, Trox a Worm so cal-  
led Eates Pease; There is a Worm which feeds upon the Vine, which *Pliny* calls  
*Volvox*, *Columella* calls it *Volucra*; the Worm *Cossus* and *Teredo* Eates Wood, especi-  
ally that of the Pitch-Tree; the Moath Eates Garments, the Worm cal'd *Termes*  
breeds in Dogs. And there are almost innumerable more of this kind of Worms,  
whose differences we shal explain by and by, being drawn from the Bodies where-  
in they breed. Now touching the Generation of little Animals and Insects, I could  
wish more were extant written by others then there is; and I wonder that *Vlysses*  
*Aldrovandus* a most Learned man (in that most laborious work concerning Insects)  
relates many other petty matters concerning them, but mentions very little about  
their Generation. For although most Insects do couple, and bring forth somewhat  
resembling Eggs; of which see *Aristotle*, *de Histor. Animal. Lib. 5. Cap. 8. and 19.*  
yet since it is certain that such Insects are also Spontaneously Generated; the first  
question is, which were first, those that are Spontaneously Generated, or those  
which spring from Copulation and Seed. *Austin* toucht this question *Lib. 1. de*  
*Genesis*, when he wrote: it is a question, whether any of these petty Animals were  
made at the first Creation, or whether they were a consequent to Creation, or bred  
of the corruption of Carcasses, and some of the Corruption of Woods and Herbs,  
and some of the Corruption of fruites. Now this question *Eucherius* answers,  
*Lib. 1. de Genesis*, where he determines that the forms of all things were extant at the  
beginning, but some Actually, others Potentially. Touching the smallest sorts of Ani-  
mals (saith he) we must beleve, that whatever of them are bred out of the Waters  
and the Earth, were made at the first Creation, but the rest that are bred of the  
corruption and putrefaction of Bodies, Woods or Carcasses, were not then crea-  
red in *Specie*, but there was present in their Bodies a Seminary original, that in pro-  
cess of time out of their corruptions severall kinds might arise. So far *Eucherius*.  
Wherein he is in the right and thinks the same with us, so that there is no  
reason that I should be accounted the first Innovator and Broacher of Paradoxes.  
For we are indeed to beleve that all petty Animals how smal soever, which are  
not bred of the corruption of other things, were created and had actual existency  
at the beginning of the world; but such as now proceed from the corruption of o-  
thers, they were not made at the first Creation so as actually to exist, but their  
form was already present in other bodies, although not actually, nor performing the  
office of a form, but subordinate to the other more noble forms, and affording to  
them a matter and fit subject. And thus what was before said of the original of live  
things in general is true also in the original of Spontaneous Animals; and the most  
Famous Philosophers and Physitians, who have diligently weighed the matter  
Have acknowledged that such Animals, can by no means proceed from putrefacti-  
on, nor yet from that Heat which is joynd to putrefaction. Amongst the Anci-  
ents is *Theophrastus*, who *de Causis Plant. Cap. 13.* writes, as in other things pu-  
treifying a certain kind of Animal is generated: so in these also (among the rest he  
speaks of the wild Fig-Tree) there is a certain Animal-making Nature. Which  
*Fil. Caf. Scalig.* in *Comment.* approves, and *Vlysses Aldrovandus Lib. 3. de Insect.*  
*Cap. 5.* confesses, that he likes wel of this Opinion, which holds that there is in Herbs  
certain principles tending to the Generation of Animals, and that it is fit to explain  
the mind of many of the ancients. *Eustachius Rudius* consents also with them, who  
in *Lib. 2. Pract. Cap. 27.* concerning the Generation of Worms thus writes: be-  
cause, (saith he) simple heat being an accident cannot by its own power make a  
substance and that a living one (for heat in living Creatures nourishes by Virtue of  
the

Whether  
Spontane-  
ous Ani-  
mals were  
made at  
the first  
Creation.

The origi-  
nal of spon-  
taneous  
live things



the Soul and of the Aliment begets a substance) hence it is that this Heat was to be lively and strong, and endued with a vital faculty. Nor ought we to refer this force to the simple Intention of heat, as *Galen* did, 3. *Aphorism.* 20. who propounds no faculty above heat. For although heat concurs to the production of living things; yet unless a superior vital cause doth concur, it cannot of it self produce an Animal. And whereas afterward he makes that Cause to be the Coelestial Bodies, therein he is out; since he doth not propound an univocal and proper Cause, as was said before in *Chap.* 1. The Opinion of *Thomas Minadous* long since a renowned professor in the Univerity of *Padua* was more true and accurate, who in his Treatise *De humani Corporis Tumoribus*, *Lib.* 2. *Cap.* 9. Treating of the Generation of Lice (and the case is the same with such like petty Animals) thus writes: Here (saith he) the understanding of man is dimighted, and dazled at the knowledg of this and such like things, as the Eyes of an Owl at the Sun-light. And a little after when he had related their Opinion who held heat to be the efficient Cause, he adds: but on the other side, since it seems impossible, that the introduction of a Form and shaping of an whole Animal should be the effect of bare heat, but that it depends upon some provident action of a certain Artificer working with discourse and prudence; the mind is forced to seek out another agent besides heat, which can moderate all things in the forming of an Animal with Council and Choice. For heat alone hath never learnt to shape an Arm, a Leg, an Eye, with its own shape, nor hath it been accustomed to use the Discipline of some Master; but acting alwaies after the same manner converts it self to sundry things, sets it self about sundry formations, according as the builder and Architect of all the parts directs and moves the same. Nor doth *Minadous* attribute the generation of perfect Animals alone to a superior power, but of Lice also. For although *Galen* considering the Generation of Wig-Lice, Lice, Fleas, and the like petty Animals, durst not ascribe their Generation to this divine formative faculty, not being able to understand, how so excellent and noble an agent is able to abase himself to so mean employment, without diminution of his Majesty: yet he counts it better to conclude, that the same mind moderates the generation of these petty Animals and those more perfect; and to hold that it is by a common providence the orderer of the smallest matters, rather then to say it is like a stepdame, making difference of her Children, so as to contemne some and leave them only to Fortune and Chance, but to regard others as her own; when as nevertheless none of them can be finished and duly accomplished without the Providence and Counsel of the Work-Master.

Also what hath been said before *Chap.* 4. concerning the final End or use of Spontaneous live things, doth belong to this place.

This also is to be observed in General, of which we spake also before in *Chap.* 2. although these petty Animals and insects are generated of the corruption of Plants and Animals: yet most of them do afterwards lay Eggs or things resembling Eggs, whence more of the kind do afterwards spring, as shall hereafter be shewed particularly.

Now, I think fit to propound the differences of these Animals, according to the variety of things from whence they spring. In the first place, which is to be admired, in the very fire, in the Isle of *Cyprus*, in the Copper Furnaces, winged petty Animals are generated, a little bigger then our largest flies, which fly and leap through the Fire, and die when they are removed therefrom, as *Aristotle* 5. *de Histor. Animal.* *Cap.* 19. *Pliny* B. 11. *Cap.* 36. *Seneca* *Lib.* 5. *Quest. Nat.* *cap.* 6. *Jul. Cas. Scaliger*, *Exercit.* 23. and other credible witnesses, yea and such as have seen them with their own Eyes do testifie. Yet are they not generated in the Fire nor by the Fire. For a pure and simple Element cannot produce an Animal. *Fortunus Licetus*, *Lib.* 3. *de Spontan. Vivent. Ort.* *cap.* 38. imagines these *Pyrausta* or Fire-flies aforesaid are bred of the Smoak of Wood, especially green Wood, which ascends from the burning. But seeing Wood is burnt every where, and no such Animals are bred, save in the Copper furnaces of *Cyprus*, the cause must needs be proper and peculiar to those furnaces. Now *Aristotle* seems to point at it, when he writes, that in Copper Furnaces Fire-flies are bred, where the Stone *Chalcitis* is thrown in and burnt many daies together. Now Copper is molten in *Cyprus* out of its proper Vein or Oare, which *Aristotle* here calls a Stone; *Galen* names it sometimes a Stone, sometimes Earth, viz. because it is hard as a Stone, but crumbly, and

Spontaneously bred Animals degenerate

The difference of Spontaneous Animals. Flies that live in the Fire.

Not generated in the Fire.

when bred.

when it is burning it rises into bubbles. And therefore without doubt that same stone contains in it some kind of Earth tempered with moisture, in which moisture doubtless the form is, which is afterward actuated by the force of Heat, and being rouzed ingenders this Animal; as in other furnaces and about Bakers Ovens Crickets are engendred of the Morter. And these Fire-flies have a different matter from all other Spontaneous Animals; viz. a most dry footy vapour raised from adust matter and cleaving to the sides of the Furnaces, wherein the form lies hid, which is by the strongest Heat disposed to formation, but dies with cold.

That Animals are also bred in the Snow *Aristotle* teaches, 5. *de Hist. Anim. Cap. 19.* Yea also, saith he, in those things which can suffer no corruption, we have known Animals to breed, as reddish hairy Worms in old Snow. But in the Snow of *Media* greater and Whiter are found; they are all sluggish and move very hardly. He relates also the same thing in 2. *de Plantis, Cap. 1.* And *Pliny Lib. 11. Cap. 35.* writes. In old white Snow Worms are found; in the midst of the Snows thickness reddish (for the Snow it self looks red with Age) hairy, large, and Lazy. And *Olaus Magnus, Lib. 2. de Hist. Septentr. reg. cap. 8.* saith thus: in the most vast deserts of *Iseland*, especially under Juniper Trees, and great heaps of Chaff or Straws, although the Sun be in the Scorching sign of *Leo*, there is snow lying, wherein in the Summer time they keep Wine and Beer who desire to drink Luxuriously; but no Body mingles the Snow with his Wine or Beer, because of its Clamminess and Impurity. For Worms and Moths are found in it, just as in Cloaths ill laid up.

*Mercurialis* indeed, *Lib. 3. Variar. Lest cap. 4.* doth altogether question the truth hereof, because Heat is required for the Generation of Animals which is not in Snow, and because the Snow is wont to kill such petty Animals in the Earth as are wont to hurt the fruits thereof. And if any Worms are seen in Snow, he conceives they came out of the Earth, and so entred into the Snow. But these Reasons are not sufficient to make us reject the testimonies of so many Learned Men. For there is some heat in Snow. Although Snow of its own Nature is exceeding cold, yet it may receive Warmth from the Sun and from the Earth; especially out of the Earth many hot exhalations do arise, which the Snow retains within it Self. And therefore husband men do in the Winter wish for Snow to cover their sowed Lands; because experience hath taught them, that the Corn is sooner hurt by the coldness of the Winter Air if it be not covered with Snow, then when it is so covered; not that the Snow it self doth warm the Corn, but because it keeps in and retains the exhalations which spring out of the Earth, and hinders the coldness of the Air from piercing to the Corn.

How worms are bred in the snow. Now these Worms are bred in the Snow, not as it is simply Snow or Rain congealed with cold, but inasmuch as Pouders, Juyces, or Excrements of Plants or Animals are disposed to the production of such Worms are mixed therewith; and then Worms are bred of Snow after the same manner as of Rain, of which we shall speak hereafter. Again the same Exhalations and Atomes may ascend out of the Earth, being full of them, when it is covered with Snow, and may so be mingled with the Snow. Yea and dust containing in it the Rudiments of such Animals may by the winds be brought from elsewhere, and mixed with the Snow; which chiefly happens in Snow that hath lain long. Now this matter which way soever it comes to be mingled with the Snow, when after it comes to be cherished by the Ambient heat, raised partly by the Sun, partly from hot Vapors exhaling out of the Ground, the concealed form displaies it self and produces Worms. Now, this seldom happens in the upper part of the Snow, since the heat exhaling out of the Earth, necessary to excite the Form, doth hardly rise so high, nor can long continue there, seeing it is easily dissipated by the cold Winds.

From Rain, Dew, Mists. It is also well known to Husband-men, that out of Rain, Dew, and Mists, sundry petty Animals are bred in those Plants which they fall upon; as they often find to their great dammage. For by the Heat of the Sun Vapors out of all kinds of Sublunary Bodies are carried from the Earth up into the Air: wherein there being Atomes containing in them forms disposed to breed such petty Animals, or an Animal-making Nature, as *Theophrastus* calls it; when they are cherished by the Ambient heat, and gain that disposition of matter which is necessary to the performance of operations sundry sorts of Worms are generated. And these Worms are either generated

generated in the Plants themselves, *viz.* Trees and Herbs wherefore sometimes after Rains, especially those small showers which fall the Sky being clear, and are termed heat drops, and after Mists and Dew a great quantity of Palmer Worms Caterpillars and such like Creepers are found: or as some think, they are found in the Air it self.

For it hath been also observed that petty Animals have fallen down with Rain. So *Olaus Magnus, de Histor. Septentr. Lib. 18. Cap. 16.* writes: Not only in Norway, *falling down with Rain.* *saith he,* but also in *Helsingia,* and in many other Provinces of the Diocess of *Upsal* certain small four-footed Creatures called *Lemmars,* of the bigness of Mice, with a party coloured Skin, do fall down with the Rain; and it is yet unknown whence they come, whether brought by the Winds from the neighbouring or other remoter Islands, or bred rather in the clouds. Yet this is well known, that some of them having been cut open as soon as they fell down were found to have raw Herbs in their stomach, as yet undigested. These falling down like Locusts in Huge quantities destroy all green things, and infect whatever they touch with their mouths, and they live till they taste the Second sprouting of the Herbs and go away all together, like swallows taking their flight; but at a certain set time they die in great multitudes, exceedingly infecting the Earth and Air, which becomes pestilential; whereby men are taken with dizziness in their Heads and with the Yellow Jaundize. So far *Olaus Magnus.* But it is scarce credible that Animals can be bred in the Air. For suppose it, that Animals have fallen out of the Air: Yet, it is doubtful whether they were bred there; seeing Winds and whirle Winds carry many things from the Earth into the Air which owe their original not to the Air but to the Earth. And since there are sundry winged Animals in the Summer time flying in the Air, if they should be surprized with a sudden thick shower, or beaten down with the weight of great drops of Rain, or should be hindered from flying by the wetness of their Wings, they might well fall down with the Rain, though they were not Generated in the Air. Nor is it probable that they could be bred in the Air. For, since all Animals are heavy, and rise not up into the Air, unless by Leaping or Flying, or except they are detained therein some other way; they do by their weight all tend unto the Earth, and rest themselves upon the surface thereof, and consequently cannot be generated in the Air. For the shaping of parts which accompanies generation since it cannot be done in an instant, but in process of time, the Animal not yet perfectly shaped so as to be able to sustain it self by flight cannot be held in the Air, and therefore must needs fall down rude and imperfect. And as to that greater Animal called *Lemmar,* *Fortunius Licetus* indeed conceives *Lib. 3. de Spont. Vivent. Ortu, Cap. 40.* that it is generated of putrid Clouds, or rather of the Vapors of putrid Carcasses carried aloft, and brought into Norway by force of Winds. But that Clouds being rare Bodies should so putrifie as for Animals to be bred of them; or that vapors from Carcasses, (few being drawn up in those cold Countries) should be carried aloft and putrifie in a cold place, and be turned into Animals, is not probable; but likely it is, that in some Isle, or other neighbouring place unknown (as there are many unknown places in those Regions) those Animals were bred, and by force of Winds like Locusts were brought into Norway. Which may be known hereby, that when the said Animals were cut up presently upon their falling raw Herbs were found in their Stomachs undigested, which doubtless they had eaten in some other place, and not in the Clouds.

Experience teaches that sundry Animals are bred in the Waters, especially in standing Waters. Concerning the *Tipulæ* or Water-spiders that run upon the top of the Water *Aristotle* writes, *Lib. 5. Histor. Animal. Cap. 19.* Water-Spiders are commonly bred in Wells and Pits, wherever the Water stands, and there is an Earthy Muddiness settled in the bottom. First of all the Mud it self putrifying becomes whitish, afterwards blackish, then Bloody-colored. Whereupon little reddish things come out, which for a time cleaving to their original are moved, then they become perfect and move through the Water, being called *Tipulæ*; then a few daies after they rear themselves on the top of the Water, being hard and immovable; a while after the Shell being broken, a gnat arises and sits thereon, til being moved by the Sun or Wind it falls a flying. Also Spiders, and sundry other petty Animals are found in the Waters in the Summer time.

Now,

Animals  
bred in the  
water sun-  
dry waies.

Now, Animals are bred in the Waters sundry waies. For some though they seem to be ingendred Spontaneously: yet properly they are not Spontaneous, but are bred of Seed, and by Animals of the same sort, as Frogs. For as Fishes cast their Eggs into the Water, which afterwards become Fishes of the same sort; so Frogs and other like petty Ignoble Animals do shed their Seeds into the Water, which afterwards by the heat of the Sun are cherished and awakened. Moreover of the Juyces and Excrements of Animals and Plants, being corrupted, sundry sorts of Animals are bred in the Waters; which being not of the same sort with those things out of which they are Generated are rightly said to be of Spontaneous original; and they are generated after the same manner as Animals which breed of dead Bodies corrupted, and of Plants.

Animals  
bred out of  
the Earth

Many Animals are also bred out of the Earth. But not out of pure Earth, but that which is slimy, and Muddy. That Frogs are bred of the Dust of the Earth moistned by Summer showers, is very well known. And in some places also Frogs grow out of the Earth it self, whereof Ovid hath a verse:

*The Earth hath Seeds which Generate green Frogs.*

Also certain kinds of Fleas are bred out of the Earth in the Summer time, when there is want of Rain, which Eat yong plants, and the Buds of Hops, which the Germans cal *Erdflöhe*, Earth-Flea. Also that Worms are bred in the Earth, especially under dung, is commonly known. But especially after the overflowings of the River Nilus sundry sorts of Animals are bred out of the ground, whereof Ovid in the 1. of his *Metamorphosis* thus writes:

*So, when seven Channeld Nile forsakes the Plain,  
When ancient Bounds retiring Streams contain,  
And late-left Slime at heral Fervors burn,  
Men Various Creatures with the Gleab up turn:  
Of those some in their very time of Birth;  
Some Lame, and others half alive, half Earth.*

Which passage of Ovid is rarely imitated by the Prince of English Poets and Glory of London his Native City, Edmund Spenser, in the 1. Canto of his *Faery Queen* and the 21. Stanza, where our Thames-Swan thus Chaunts it:

*As when old Father Nilus gins to swell  
With timely pride above th' Egyptian Vale,  
His fatty Waves do fertil Slime out well,  
And over flows each Plain and lowly Dale:  
But when his later Ebb gins to a Vale,  
Huge beapes of Mud he leaves, wherein there breed  
Ten thousand kinds of Creatures, partly Male,  
And partly Female, of his fruitful Seed;  
Such Ugly Monstrous shapes elsewhere may no man read.*

Earth  
Fishes.

That Fishes are dug out of the Earth, even where no Waters are, Aristotle tels us, *de admirand. Auscult. cap. 69, 70, 71.* Strabo in *Lib. 4.* Pliny *Lib. 9. cap. 57.* also Theophrastus in *Lib. de Piscibus*, where he writes: but besides these, there is another thing of a peculiar Nature, and needs to be examined, *viz.* how they are said in *Paphlagonia* to dig Fishes out of the ground in great quantity and very good; which they dig deep out of the Earth where there is no standing water, nor doth any River run through the place, by which (as we said before) Eggs and principles of generation might be brought and left; so that they must needs breed of themselves, and that frequently, for they cannot couple: and if it be true, we must conclude also that that ground is moist and fruitful and fit to engender such Animals; or else that some moisture is brought thither from elsewhere, containing in it the principles of Generation; and that the place is fit to receive and nourish the same. For we can hardly think of any other way besides. Also those Fishes are known which our Country-men cal *Peissker*, and some Earth-Weazels, which George Agricola describes in his Book of underground Animals Chap. 16. Which are really Earth-Fishes. For in puddlish and Muddy places, where the Summer hath dried up the Water which had been there collected in the Winter, they are dug up out of the Mud.

**Mud.** And concerning Eeles it is reported, as we read in *Aristotle, Lib. 6. de Histor. Animal. Cap. 16.* that they are neither bred by Copulation, nor do breed any Eggs, nor was there ever any Eele caught having any row, Eggs or Seed, or any passage for Seed to come out at; and that in some Muddy Ponds all the Water being let out, and the mud cast away, Eeles have bred again after Rain had fallen. But I cannot beleve that Eeles have no Seminal principles; seeing they are caught in Rivers, as well as in Muddy Ponds, 'tis credible those that are taken do leave some Seminal principle behind them, out of which afterwards others are generated; and some conceive that Eeles do grow of the slime, which the former Eeles cast from their outides, as the Snake casts his Skin. Of which *Scaliger* also writes *Exercit. 15.* Eeles are thought to generate nothing within themselves, but by their mutual twining and twistings one about another they are thought to make a kind of Slime, of which yong ones are generated without.

Oysters also and all Shel-Fish are bred of Slime, concerning which *Opianns*, in his Poem of Fishes, *Lib. 1.* thus writes:

*They couple not nor bring forth any young,  
But of themselves they breed the Mud among,  
As Oysters do, Glib Oysters that no Male  
Nor Female have.*

Yet some aver that Snailles do also couple, and that they have seen them Joyn together, and sticking one to another, so as to send forth a slimy froth, which after a day or two was changed into the shape of a Snail. Nor is it absurd, that they may be bred both waies, so that when many have been generated Spontaneously, those may afterwrads generate more by Copulation of Male and Female.

Moreover the *Urtice*, *Purpura*, *Ungues* (Plant Animals so called) and all such as stick fast in the Earth, seem to be of Spontaneous Original, and are so accounted by *Licetus Lib. 3. de Spont. Vivent. Ort. Cap. 35.* For since they remain fastned to their places, they exercise no Copulation, nor do they seem like Plants to shed any Seed. But this may be doubted of. For although they have no sex, yet they may have Seed, since they are Plant-Animals, and belong partly to Plants, wherein also there is not properly any Sex; and therefore it is not absurd to think they may send forth Seed, which sticking to the Rocks may be formed into a Body like the Generator; which way soever this emission of Seed is caused; whether by Seed properly so called, or by some other thing Analogical to Seed.

And inasmuch as so many Animals are bred out of the Earth, *Aristotle* said very wel, that all things are after a sort full of Souls. For every where almost smallest Bodies or Petty Atomes are found, severed from the Bodies of Animals, wherein there is a Soul but Latent, and not exercising the second Act or Functions of a Soul. For those more Ignoble Animals do not send forth seed as the perfect Animals do, but a Seminal principle dispersed through their whole Body, as it is in some Plants. And therefore it is no wonder, that the Bodies of such Animals being turned to Dust should be like Seed, and having afterward attained a fitting place should again produce Animals. *Pliny* knew thus much, who *Lib. 9. Cap. 51.* writes thus of Frogs: 'Tis strange (saith he) how after six Months time of Life they are turned into Slime and no man perceives it, and in the Spring they are again regenerated in the Water, after the same secret manner, and this happens every year.

Also sundry Animals are bred of Plants, and some of Plants that are yet living, and others of dead Plants: yet every Worm is not bred of every Plant, but certain Worms of certain Plants; as also the same worms do not breed out of all Carkasses of Animals, but some out of one sort, some out of another, and the forms of such insects seem to be subordinate to the forms of Animals and of Plants. Which *Scaliger* also teaches, *Exercit. 59. Sect. 2.* and *Exercit. 190.* But which are generated from which, we shall hereafter shew when we come to speak more particularly. Concerning which *Aristotle* hath many excellent things, well worth the reading in *5. Hist. Animal.* especially in the 19. Chap. Where he teaches in general, that Worms and Caterpillars are bred of Plants, and of them *Chrysalides* Golden-Worms, and of them butter-flies and other Winged Animals are bred. For not only

Plant-  
Animals

only Butter-flies, but other winged Animals also are bred of Plants, as Flies, Beetles and such like. Concerning the Spontaneous Original of Flies *Ulysses Aldrovandus* writes, *Lib. 3. de Insectis, Cap. 1.* some do suppose, that they spring partly from corrupted fruits, and rotten Carcasses of Animals, and partly from the Corruption of the Air, as *Ovid* shews *Lib. 5. Metamorphos.* but that their chief matter is Earth. I, as I will not deny but Flies may be generated out of any putrid matter, and out of the Carcasses of Animals, (and I have shewed before that out of the putrifying flesh of other Animals as well as of Bulls Bees are generated as from the most fitting matter) yet I conceive they are bred for the most part of Plants; and I have observed an example thereof. For when, some years ago, in the Winter time, when no other green Herbs were to be had, I did beat red Cole-worts, and kept them in a stove til they bred Worms, the Worms generated thereof turned into Golden Caterpillars, which when I had kept shut in a Box, and after ward came to open the same, a troop of smal Flies made their escape, which were bred of the Caterpillars, and broke out of their Crackt Skins.

Animals  
bred of  
Mushrooms

But to come to Particular sorts; in the first place, truly, 'tis very well known that of Mushrooms which are the lowest sort of Plants, Worms are bred. Of the Generation whereof *Fortunius Licetus* disputes *Lib. 3. de Spont. Viv. Ort. cap. 44.* and conceives that they cannot be produced by the Soul of the Toad-stool or Mushroom, because it is in the lowest ranke of vegetables and cannot act beyond its power, so as to procreate a sensible Soul more noble then the vegetable. And that also for the same reason the Soul of a Mushroom cannot be changed into a sensitive Soul. But he himself holds that Worms are bred of Mushrooms, because in the substance of a Puck-fist, a Toad-stool or Mushroom, many petty Bodies or Atomes are contained, which came from the Bodies of Animals either living or dead, in which Bodies a Portion of the old sensitive Soul doth remain as in a vessel, which the Toad-stool coming to wither, and it having by the heat of the ambient Air attained dispositions necessary to life, it is Spontaneously animated and turns to little Worms. But this opinion of *Licetus* hath been often propounded and examined. In this place, we shall first observe this doubt therein, whether or no those little Worms which are of the kind of Animals are simply more noble then Plants: of which there seems no necessity. For the Creator did not in the first place intend and create those Worms, but the Plants as we shewed before, *cap. 4.* speaking of the final end of these kind of Creatures. Again it hath been often said, that that Hypothesis of *Licetus* will hardly be granted, that the form of nobler Animals should be changed into the form of Ignoble Worms. Moreover Toad-stools are often bred upon Trees, and under Trees in Woods, where it is scarce credible that there hath been any Carcass of an Animal. Yea and they are bred every year. And although peradventure Animals have discharged their Excrements in those places, yet the Soul of an Animal was not in them.

Worms bred  
of living  
Plants.

Moreover worms are bred out of sundry perfect plants, whiles are they living. *Pliny Lib. 13. cap. 6.* writes, The Turpentine Tree bears certain Bladderkies, out of which certain gnats or other Animals do spring. And *Ful. Cas. Scalig. Exercit. 59 Sect. 2.* nor are these petty Animals bred only in fruites alone, such as Wivels or Wibbles which breed in Wheat, Maggots in Nuts, and other petty Animals in others, of which see *Theophrastus*; but also of the bladders of a Lentisch Tree, which it bears besides its berries, like Cods: so that they seem contrived on purpose by Nature, to be first the Wombs and soon after the Cottages of these smal winged Animals. As in the Cods of Elmes there are bred much such like. And therefore the Arabians are wont to call the Elme the Tree of Wig-Lice, or lowsic Tree. So out of the pith of the Fullers Thistle when it is ripe a smal Worm grows: which *Dioscorides* truly reports to be good against the Quartan Ague. Such Bladders also the Turpentine Tree bears, wherein are a certain Liquor and Gnats. It is exceeding well known that Worms are bred in Hasel-Nuts, Cherries, Apples, and Plums. Upon the Leaves of Oakes little Apples grow like Galls, in which about the beginning of *Autumne*, either a little Worm, or a Fly, or a Spider is found: each of which are thought to be Prognostications of the year following, and that the Worm signifies Plenty, the Fly scarcity, and the Spider Pestilence. On wild Rose bushes hairy Apples grow, called Spunges of Roses, which have a Worm within them.

In a word, as *Julius Cas. Scaliger* upon *Theophrastus* rightly saies, every Worm grows in his own Tree or Plant.

But especially of living plants sundry sorts of Caterpillars and Palmer Worms, and out of them divers kinds of Butter-flies are bred. And *Ulysses Aldrovandus* describes near an hundred sorts of Caterpillars or Palmer Worms, *Lib. 2. de Insectis Cap. 4.* and more then an hundred sorts of Butter-flies, in the same Book Chap. 1. And that which was said before in general is also true of Caterpillars, that every sort grows out of its own Plant. Which also *Fabius Columna* confirms by his own experience, *in observat. Lib. Minus Cognit. & Rarior. Stirpium addit. Pag. 87.* where he saies, that Caterpillars and other petty Animals do not only breed of certain plants, but that a Caterpillar bred of one Plant doth not feed upon another, but only upon its own out of which it was generated: as for example, if a Caterpillar were bred out of a Plant of Rue, it will feed upon other the like Plants of Rue, but not on all that bear the Name of Rue, as Goates Rue and Dogs Rue, by late Authors so called, nor on the Leaves of any other Plant unless it be of the same Nature, and quality. And those that are bred upon the Radish will Eat the Leaves of Radish, but of no other plant, unless peradventure it be a Plant of the same kind, as Cole-worts, Rapes, Navews and such like. From which observation of the feeding of Caterpillars I conceive a man may know the qualities of the Plants they feed upon. For Silk-worms we know eat the Leaves of Brambles and Mulberries, our People when the Worms are little lay Bramble Leaves upon them for their food, and when they are greater the Leaves of the black Mulberry Tree, which are questionless of the same Nature with the bramble leaves, for they do doth bind and color, as *Dioscorides* testifies: so that from the food of these Caterpillars and Butter-flies we may know what Plants are of like Nature. For if Caterpillars or Butter-flies feed upon divers Plants of the same kind, 'tis Credible they have like Vertues and qualities. So far *Fabius Columna*.

But touching the Generation of Caterpillars and Butter-Flies Authors agree not. *Aristotle, Lib. 9. de Histor. Animal. cap. 19.* thus writes thereof: Butter-Flies (saith he) are bred of Caterpillars; Caterpillars of living Leaves of Plants, especially of the Cole-wort. First of all a smal Seed less then Millet lies upon the leaf, soon after of that Seed smal Worms are bred and grow, then within three daies they become smal Caterpillars; which being augmented cease moving, and change their shape, and are for a smal time called *Chrysalides*, as if you would say Golden Worms. They are covered with an hard Shel, stirring when you touch them, and full of little pores. They have no mouth, nor other member discernable. A long time after the Shel being broken, out Flies a parcel of winged Creatures which we call Butter Flies. And therefore at first whiles they are Caterpillars they are nourished by food, and void Excrements. But when they are turned into those *Aurelia* or Golden-worms, they neither Eat nor void any thing. And concerning the Generation of the Silk-worm, in the same place; It is made of a certain large worm, which thrusts out two horns as it were, and is of a kind by it self, which is first wholly changed into a Caterpillar, then it becomes a Fly like a Butter-Fly, and afterward it is called *Necydalus*. Which various succession of Forms is accomplished in the space of six Months.

But *Ulysses Aldrovandus* in the place fore alleadged dissents from *Aristotle*, and thus he describes the Generation of these Creatures: every Butter-fly is bred of the Worm called *Chrysalis* the *Chrysalis* of a Caterpillar, the Caterpillar of the Eggs of Butter-flies; whose end is not to breed Caterpillars or Gold-Worms, but other Butter-flies. But he blames *Aristotle* for not having observed that the seed on the leaf was the seed of a Butter-fly; and for not understanding, that those little Worms which first break out of the Eggs are smal Caterpillars. But in good deed, although it cannot be denied, that some Caterpillars are bred of the Seed of Butter-flies (which I doubt whether *Aristotle* were ignorant of) and that the Seed on the Leaves of Plants, less then that of Millet, is the Seed of Butter-flies: yet the question now is, whether Butterflies are only bred of Seed, or whether they are not also Spontaneously generated: since certain it is that many Animals Spontaneously generated do send forth Seed. And experience shews that such Worms and Caterpillars are bred out of Dew and Rains falling down upon Plants. For in the spring time for the most part Caterpillars are thus bred before

The gener-  
ation of  
Caterpil-  
lars and  
Butterflies

How Ca-  
terpillars  
and Butter-  
flies are  
Generated

Butterflies are seen; and therefore since these Caterpillars come before Butterflies, it is a sign that they are not bred of the Seed of Butterflies, but of corrupted Plants. Which *Aldrovandus* himself was forced to confess, when he relates afterwards, that those Caterpillars which are turned into Butterflies are not all bred of Butterflies Eggs, but some of them of the corruption of Plants. Which experience also doth Testifie, whence it is manifest, that frequently Caterpillars are bred of the corruption of Plants, and of the Caterpillars Butterflies are bred, which bring forth Eggs, out of which again Caterpillars are bred, and of them again Butterflies. In the same place *Aldrovandus* denies that all Butterflies are bred of Caterpillars, but some, he saies, are generated of Worms; and he writes that if Corn be over moist it breeds Worms, which turn to Gold-Worms, and they to Butterflies. He writes also, that he hath seen Butterflies come out of hollow Trees especially Willows, with their Skins wherein they were bred scarce off. But here it is to be inquired, whether or no those Worms were not Caterpillars, which were afterward changed into Gold-worms, and they into Butterflies. Nor are Caterpillars all of one kind, but some are bred of Living Plants, others of Corn, others out of Wood. And those Caterpillars of which Silk-worms are engendred do not retain the same Figure, but change their Coats four several times. Whereof see *Libavius Lib. 1. Bombycior.* who hath written most diligently concerning this matter. This is general, that all those little worms which hide themselves in down, or wrap themselves in the Leaves of Trees, after some changes of their outward shapes are changed into a flying Creature, like to that by which the Eggs were laid.

This I have also observed in Caterpillars bred of Indian Water-creffles, which they frequently feed upon, being kept in a Glass; that out of their Bellies live Creatures did come forth, which died soon after, and would questionless revive again the next Spring, and the Caterpillars themselves also died, no Butterflies being of them generated. Wherein I was confirmed by that which *Aldrovandus* relates *Lib. 4. de Insectis, Cap. 1.* how that such as have written of the wonders of the new World do report concerning Pismires, how that out of the Body of the dead Parent innumerable little Worms arise, which live after a wonderful manner, until being winged they fly out of their underground Habitations; although the Parents do sometimes bring forth during their Life.

*The generation of Gnats.* We conceive that Gnats also are bred of the corruption of living, or withered Plants. For although Gnats are generated out of Water and Vinegar: yet that happens, because they contain in them either the parts or Juyces of Plants. For although, as *Aristotle* relates, *de Histor. Animal. Lib. 5. Cap. 19.* they are also bred of Water, especially standing Water: yet there is no question but many things are bred therein by the corruption of Plants. And those which are Generated of a fowre Humor *Aristotle* calls *Conopos*; and of them *Pliny* relates, *Lib. 9. Cap. 51.* that they are generated of a tart Humor; and *Lib. 10. Cap. 70.* that they fly to and feed on fowr things, but care not for what is sweet. Yet they are not immediately Generated of the acid Humor, but of a Worm which is first bred of the said Humor. So that the Original of all these petty flying Animals is from some peculiar kind of Worm.

*Gnats generated of a wild fig-tree.* More Particularly, Gnats are bred of the wild Fig-Tree, whereof *Aristotle*, *2. Histor. Animal. Cap. 32.* The wild Fig-Tree generates certain Fig-Gnats out of its Apples; first there is a Worm, soon after the Skin breaks and out Flies a Gnat, and changing its place it goes to the unripe Figs, whereinto insinuating it self it keeps them from falling. *Theophrastus*, *2 de Causis Plantarum*, adds that they are bred of the Seeds, a sign whereof is, that after they are fled away there are scarce any Seeds in the Figs. For they fly away maimed, leaving a Feather or a Foot in the Apple. Which *Pliny* confirms, *Lib. 17. Cap. 27.*

*A fourfold original of Animals that breed of living Plants. The First* *Fortunius Licetus* holds a fourfold Original of such as spring from living Plants, *Lib. 3. de Spont. Vivent. Ortu, Cap. 46.* The first he saies is of the Excrements of Plants. For seeing Plants are nourished by an Earthy Juyce, with which a great quantity of dung and mixt matter is mingled proceeding from the Bodies of Animals living or dead, he holds that there is therein remaining some portion of the former sensitive Soul, and that the said matter



ter is carried for the more abundant nourishment of the Plant to the flours, or Fruites, leaves, or Barks, or elsewhere, which when it is digested by the heat of the Ambient Air, and acquires dispositions necessary to life, presently the Soul which lay hid therein doth display it self, and sometimes a Caterpillar, sometimes a Wivel, otherwhiles a Moth; otherwhiles a Worm, somwhiles a Goose, other whiles a Duck is bred, and sometimes another Animal. But this manner is scarce agreeable to reason; especially that Geese and Ducks should be thus bred. For it is not credible that the Souls of such perfect Animals should be able to remain perfect and intire under so many Mutations. Nor doth the sensitive Soul constitute any Animal in its kind; and every Animal, as for example a Lion, an Ox, a Goose, an Hare, hath not only a sensitive Soul but a specifical Soul of its own, differing from the Souls of all other Animals.

The Second manner he makes to be of Atomes, which have flowed from the Bodies of Animals, flying in the Air, and driven into the substance of Plants and sticking thereto by the clamminess of Dew, and being driven within the Porous matter, or the Downy corpulency; which in fit season being digested by the concoctive faculty of the ambient Air, and prepared for another life, they become living Creatures, viz. Caterpillars, Spiders, *Cantharides*, Geese and such like Animals. But neither is this manner probable unless it be limited. For that Geese should be generated of Atomes flying in the Air, and sticking to Plants, as it is a thing unheard of, so any one may easily understand that it is impossible. But this we grant, that with the Rain and Dew a matter falls upon Plants, and cleaves to them, out of which Caterpillars are generated, and other such like Insects. Nor do we deny, that Atomes in which the Seeds of such living Creatures do stick may descend with Rain or Dew upon Plants: Yet we do not think that this is alwaies necessary, since the Excrements of Plants and Animals and their corrupted parts have this power, and the Seminal principles of these Animals are fastned upon Plants by the dew and Rain.

The Third manner he makes to be, when Atomes or Juyces of the same kind, being any waies slipt out of the Bodies of Animals, and by the Earth communicated to a Plant, are by the heat of the ambient Air awakened and enlivened. Nor yet is it necessary that this should be done, but the parts of Plants themselves if they be corrupted may turn to such petty Animals. And if after this manner Animals should be bred of living Plants, many more would be generated then are: Howbeit certain Animals are nevertheless bred of certain Plants.

The fourth manner he makes to be proper to those which are bred in the Water, viz. when of the Juyce, Atomes, or Excrements of Plants mingled with the Water, and cleaving to the substance of Plants which grow in the Water, Animals are bred.

Two manners therefore are altogether sufficient. The First is, when of the corrupted parts of Plants Animals are bred, as of the Barks of Pine Trees corrupted Pine Caterpillars are bred. The other is, when Atomes containing the Forms of such Animals do with the Dew or Rain fall upon Plants; which happens most frequently when few little drops fall as the Sun shines, which we call heat Drops. For with these not only the Leaves of Plants (as it is well known) are corrupted, but also Husbandmen know, that by this shower little Animals are bred in them.

Animals are also bred of dead and dry Plants; and that Moths, and Wood-Lice, Coss-worms, and sundry sorts of Worms are bred in rotten Wood, every body knows. *Aristotle, Lib. 5. de Hist. Animal. Cap. 19.* writes that the Beetles called Bulls are bred of the Worms which are generated out of dry Wood; and in the same Book, Chap. 32. he relates, that the smallest creature in the world, called *Acari*, is bred not only in old wax, but also in white Wood.

Among Animals that breed out of rotten Wood, we must reckon that little worm which is called *Xulophthoros*, and which *Aristotle, 5. Histor. Animal. Cap. 32.* describes. Which I take to be no other then that which our Germans call *Stoch-wurm* that this Stick-worm, and we in England, if I mistake not, call them *Cad worms*, which is bred in the Water of Rotten sticks and Stocks of Trees, being a River Worm, and taken in the Spring time with River Gudgions. But *Aristotle* seems to have described this Worm, rather when it puts on the Form of a Gold-worm, then when it lives in the Water. The same *Aristotle*

writes, that he had not yet experimented what Animal was bred thereof. But experience shewes that it is changed into that commonly known insect which *Ulysses Aldrovandus* (2 de *Insectis* Cap. 10.) calls *Perlas*, the *Silesians* term it *Schneider*, those of *Misnia* *Boltzen*.

*wall-Lice.* Whence the *Cimices* Wig-lice or Wall-lice so called are bred, is doubtful. Most are of Opinion they are bred of the filth proceeding from mankind; and *Aristotle*, 5. de *Hist. Animal.* Cap. 31. saies: they are bred of the Humor which is in the upper parts of the Bodies of Animals. But if this were true, why should they not be bred in the Skin, hairs, or Garments of Men and Women, as Lice and Fleas are? And therefore it is more likely, and experience doth witness the same, that they are bred in Bedsteads [*understand Dutch Bedsteads*] and especially in their chinks, and in the Wood of the Walls next the Bed, which is their proper place. And if they are found elsewhere in the Straw, or in Garments, they have crept thither from the Bedsteads. Howbeit, there is assistant to their Generation the filth or rather the Vapors of Men and Women sleeping, which sticking to the Wood corrupt the same and cause it to breed these Vermin. Now they are chiefly bred in Wood of the Fir and Poplar Trees. Whereof *Julius Cæs. Scaliger* doth well write (save that he holds they are bred in straw likewise) in *Lib. 2. de Plantis*; That certain Woods, as the Fir, and Straws, have in them Natural Rudiments of these Animals.

Concerning the Scotch Geese call'd Brant-Geese.

Hither some refer the Stotch Geese called Barnacles, which some write are bred of rotten Wood. Because Authors Dissent hereabouts, I think here fitting to speak somewhat Particularly thereof. Most, as hath been said, are of Opinion, that they are not bred of Eggs, but in the Sea, out of rotten Wood; although some say in one place some in another. *Munster* saith in the Islands call'd *Orcades*, others in *Ireland*, others in *Scotland*, others in the Islands called *Hebrides*; some say they breed in any Sea if the Ships be made of Wood which grew in *Scotland*, and therefore some do not ascribe the place of their breeding to one part, but to all that tract betwixt the *Orcades* and *Scotland*, and betwixt the *Hebrides* and *Ireland*. Moreover, there is a controversie whereof they are bred. For some suppose, that in the *Orcades* upon the Banks of the Rivers there is a Tree which bears a fruit resembling Ducks, which when it is ripe falls off, and if it light upon the water it presently conceives life, and becomes a bird, but if it fall upon the Land it putrifies. Others write that of the pieces of Ship-Masts floating in the Ocean there is first of all somewhat thrust forth, and that afterward at the Sea-weed (or Sea-grass called *Wier* or *Wear*) sticking with the pitch to those pieces of wood, there hang little Shel-fish like *Cockles* or *Muscles*, which in process of time receive wings and Fly through the Air, or fall into the water and Swim. Others think that these Geese are bred, neither of rotten wood, nor on Trees, but out of Shells. Others conceive they are bred none of these waies, but that they are hatched of Eggs, as other Animals are.

But I think it will be best to set down the Relations of Authors themselves concerning this matter. *Fortunius Licetus* produceth this following Account (in *Lib. 3. de Spont. Viv. Ort. Cap. 47.*) out of *Turner*. The former Goose is termed by our countrymen a *Brand Goose* and a *Barnacle*; it is less then a wild Goose, on the breast partly black, on the Rest of the Body of an *Ash-color*. It Flies and cries like wild Geese, frequents standing Waters, and devours standing Corn. The flesh of this kind is somewhat unpleasant, and not in request amongst the Rich. No man ever saw the Nest or Egg of a *Barnacle*; which is no wonder: because they are without the help of any parent, Spontaneously bred after this manner. When the mast, or some *Fir-boards* of a Ship have lain Rotting for a time in the Sea, there grows thereout, at first, certain *Mushrooms* as it were; in which in process of time the manifest Forms of Birds are to be seen, which are afterward cloathed with Feathers, and at last quicken and fly. And I would not have any one think that this is a Fable, for besides the common Testimony of all People living upon the Sea-coasts of *England*, *Scotland* and *Ireland*, that same Famous Historian *Gyraldus*, who hath writ the History of *Ireland*, (more happily much then could be expected in the Age wherein he lived) doth testifie that *Barnacles* are Generated no otherwise then as we have said. But counting it not safe to believe

believe vulgar reports, and not crediting Gyraldus by reason of the Novelty of the matter, while I was ruminating upon this subject whereof I now write, I made enquiry of a certain Irish Divine Named Octavianus, whom I knew by experience to be a very honest and credible Person; whether he conceived a man might believe Gyraldus in this point: whose answer was (swearing by the Gospel he did profess) that what Gyraldus had reported concerning the Generation of this Bird was most true; and that he had seen with his own Eyes, and handled with his hands some of these fowl before they were come to perfection; and that if I would tarry a month or two longer at London, he would ere long cause some of the imperfect Birds to be brought to me. I am therefore by the credible report of honest and learned men who were Eye witnesses perswaded, that it is a real truth, that Brand-Geese or Barnacles, are bred out of the rotten Masts of Ships, after the manner of Mushrooms. In Wales, which is a part of England, in Ireland and Scotland, these Birds are found up and down upon the Sea-shores imperfect and unfeathered, but having the true and proper shapes of Birds.

Hector Boetius in his description of the Kingdom of Scotland, thus writes concerning this matter: It remains (saith he) that we should declare what (after long and diligent search into the matter) we certainly know and understand concerning the Scottish Geese which they call Clack-Gees, and which are commonly but falsely thought to grow upon Trees in these Islands. For I conceive that the Virtue which breeds them is rather in the Seas which flow betwixt these Islands, then in any other thing. For we have seen them Generated sundry waies, but evermore in the Sea. For if you cast a piece of Timber into that Sea, in process of time, there are first of all Worms bred, the Wood being hollowed, which by little and little have Heads shaped, and then Leggs and Wings, and at last are covered with Feathers: Finally growing as large as Geese, when they are come to their full ripeness of Age they fly in the Air like other fowl, which was evidently seen in Buchphan by many Spectators, in the year of our Lord 1490. For when as in that Island at the Castle of Pech-llège a great log of this kind of Wood was brought a shore by the Sea Waves, those that first espied it, being astonished at the Novelty of the thing, ran to the Lord of that place and acquainted him with the news. He coming caused the Log to be sawed asunder, which being done, presently there appeared an huge Multitude, partly of Worms, of which some were yet unshaped, others had some members formed; and partly of Birds perfectly shaped, of which some had Feathers, others had none. Being therefore astonished at the strangeness of the thing, at the command of the Lord they carry the Log into the Church of St. Andrew at Tyra (a Village so called) where it remains at this day bored through as it were with Worms. The like Log in the Isle Taum was cast ashore by the working of the Sea, at the Castle of Bruche, two years after, which was shewed to many that came running of purpose to see it. Nor was that any other which two years after the former was seen by all the people in Leche a port of Edin-burge, For an huge Ship whose name and Badge was St. Christopher, when it had Lien at Anchor three years together by one of the Hebrides Islands, and was brought hither again and laid in Dock, the Beams being eaten asunder as far as it had lien in the Water, there were seen therein a great number, partly of such rude Worms, not yet having their perfect shape, and partly of fowls fully perfected. But some may cavil and say, that there is such a virtue in the Wood of the Trees which grow in those Islands: and that the Ship Christopher was made of Timber which had grown in the Islands Hebrides: Therefore I shall not think it tedious to set down, what I my self saw seven years ago. Alexander Gallowid the Pastor of Kilkenny, a man besides his singular honesty incomparably studious after Rarities, having drawn out some Sea-weeds, and seeing betwixt the stalk and the branches, from the bottom to the top, certain Shell-fish growing, he was amazed at the Novelty of the thing; but when presently for his further satisfaction he opened the Shells he stood much more astonished then before. For he found no Fish in the Shells, but (strange to tell) a Bird, and according to the bigness thereof, he observed the Shells to be bigger or lesser. Wherefore he speeds him to me forthwith, whom he knew of old to be exceedingly desirous of the knowledg of such things, and acquaints me with the whole business, being no less astonished at the strangeness of the thing, then delighted with a Spectacle so strange and unheard of. Now I conceive it is sufficiently apparent, that these Seeds of breeding these fowles are not in the Trunks or Boughes of Trees, but in the Ocean it self, which Virgil and Homer do not without cause term the Parent of things. But when they saw that Apples falling from Trees that grew upon the Sea-shore, in process of time, the like Birds came out of them, they were brought to conceive  
that

that the Apples were changed into such Birds; but they were mistaken. For in time by the Seas virtue Worms grew to the Apples, and they encreasing, and the Apples rotting by the moisture and vanishing, they through want of good heed imagined that the Apples were turned into these kinds of Fowles. So far Hector Boetius.

The relation of Julius Cæsar.

Julius Cæsar Scaliger, Exercit 59. Sect. 2. thus writes concerning this matter: You may rather wonder that in the Britannick Ocean, a Bird unknown in your parts hangs by the Beak in the Timber of rotten Ships, till it grow to perfection, and swim away, being fashion'd like a Ducks, and living upon Fish. I have also seen one of these Fowls. The Gascoigns inhabiting by the Sea side call them Crabrans, but the Britanies Bearnacles. And a little after: There was brought to the most excellent and great King Francis, a Shell-fish as it seemed, not very large, in which there was a young Bird almost perfected, with the tops of the Wings, the Bill and Feet, sticking to the farthest parts of the Shell.

Of Petrus Pena and Matthias Lobelius.

Petrus Pena, and Matthias Lobelius, In their Observations of Plants, near the end, write thus concerning these Geese. This example of Natures endeavouring to draw some good even out of corruption makes us now willing to believe many things which else we should have laughed at, if we had read them in the Historians of the Northern parts of the World. Although they relate the matter somewhat differently, that this is only found in Scotland, or in the Islands of Orcades, anciently conquered by the Roman Navy. But we have not only from Scotland, but here also, in the River Thames where it runs by the City of London, Shells which have been pluckt from the Bottom of an old Ship, with thick rugged stalks. They are very smal, as round in a manner as Cockles, white without, shining, Smooth, as thin and Brittle as Egg shells, opening with two sides like Limpins, of the size of an Almond Nut compressed: now these hung on the outside of the Belly of a large Ship, upon which being half rotten with Moss and Mud there grew as it were the stalks of Mushrooms, resembling the Navil strings, the ends whereof after the manner of Fruits were inserted into the broad end or Basis of the Cockles, as if the little Birds were thence to draw their life and nourishment, the rudiments of which Birds were to be seen in the upper sides of the Cockles which gaped. These stalks Historians report to grow first out of Worms, which we could not discern, nor do we yet believe it to be so: although we know that such kind of Cockles most neatly shaped do grow on pieces of Wood cast up by the working of the Sea. And such of them as fall upon the dry land dye; but such as remain in the Water do hatch a Duck or a Fowle of that kind. The English and Welsh call them Barnacles; the Scots call them Clack-Geese, and there are many of them in Scotland, where they are caught, when the standing Waters are frozen with Ice. When we did eat of them, we conceived that they tasted like a Duck, or wild Goose.

Of Michael Mejer.

Among the Germans, Michael Mejer, in his Treatise de Volucris Arborea Chap. 3. himself being an Eye witness relates, that out of Shells like Cockles such Geese are bred, and that he had seen wellnigh an hundred such Cockles, which being opened, there were smal young birds in them, ready as it were to come out of the Egg, with all members necessary to fly with, some of which Birds he had in his own hands. Thus he describes them: if at any time a piece of a Ship-mast smeared with pitch fall into the Sea which runs betwixt the Orcades and Hebrides Islands, and lies there for some considerable time, it grows not only rotten by reason of Worms bred within it, but it is covered all over with Sea-weeds, store of which grow in those parts, and upon any wood that is in the Water, especially if it sweat forth a Pitchy fatness, as the Masts of Ships made of Fir or Pitch-Tree, and abounding naturally with Rosin, and pitched over for the service of the Ship, that the sailes may be swiftly hoised up and let fall, and not stick any where. Now the Sea bears these weeds on the bottom thereof, whence at a certain season it rises up to the top, being as it were pluckt up or cut off, by the Waves. This weed being bred in the Water doth not easily putrifie, having much saltness in it; and therefore in North-Holand, and many other places, they make Dams thereof very strong against the Violence of the Ocean, so as they fetch a remedy from whence the Disease comes. The foresaid pieces of Wood therefore being covered with this weed, which insinuates it self into the smal holes which remain by reason of the rottenness thereof; in process of time, at the other End of the said weed smal Cockles as it were do grow, which are whitish, or of the colour of a Mans Nail, and in shape much resembling the Nail of ones little Finger, and the two Shells being so joyned together, that they stick close, on the upper and more pointed sides they receive the Sea-weeds end, and are firmly

firmly shut on the broader sides, which are afterwards opened, that the fruit being ripe may go out of its own accord to fly. After this manner thousands of small Shells more or less do stick, each Shell at the end of a Weed, the other end of the said Weed (as hath been said) being fastned to the pitched Logs of Wood, and that so many in number that the Wood can scarcely be seen: which pieces of Weeds are hardly above twelve Fingers breadths long, and strong, as if they were thongs of Leather. Sometimes they are certain feet long.

Carolus Clusius, in *Austario Exoticorum*, thus writes concerning them: The Clack-Geese so called by the Scots, which the English call Barnacles, the Highlanders Rot geese, is a kind of Fowl seen only in the Autumn and the Winter resembling a Duck. The Original of these Fowls being unknown, it came to pass that the common people imagined their first Rudiment to be certain Shells of whitish colour growing to the Trunks or fragments of Wood, which are wont in these parts to be driven on shore by the flowing in of the Sea, where the Wood doth not otherwise Grow, and resembles in some manner the shape of these Birds. But that he ever saw a living and perfect bird come out of those Shells, no man dares averre. So far Hoierus. Moreover, these are not the Birds which are commonly thought to grow upon Trees in the Orcades Isles, and are called Barnacles, or Rot-Geese; but Birds commonly not less than a Duck, which I have sometimes seen, yea and tasted of their flesh. And all is found to be fables which hath been reported of them by the Hollanders, who some few years since sailed to Nova Zembla, and past beyond the Bay of Nassou, commonly called Weygaz. For they observed those Birds sitting upon their Eggs in the Rocks, and brought many of their Eggs into the Ship, to satisfy their Hunger. So far Clusius.

Which is confirmed by Gerbhardus de Vera, of Amsterdam, in the Navigation to China: Then rowing, (saith he) to the Island which was middlemost, there we found many Eggs of Barnacles (which the Hollanders call Rot-Ganssen or Rot-Geese) and the Fowls themselves sitting in their nests; which being chased away, did cry Rot, Rot, Rot, (whence they have their name of Rot-Geese) and by the throw of a Stone we killed one of them, which we did boyl and Eat, with about threescore Eggs, which we carried with us to the Ship. These Geese or Barnacles were true Rot-Geese, such as in great Quantity do hant every year and are caught about Weiringen in Holland; which where they laid their Eggs (this man never read Albertus Magnus) and hatched their yong, hath been hitherto unknown. Whence it came to pass, that some Authors have dared to write, that they grow out of Trees in Scotland, from the branches whereof hanging over the Water, if the fruit fall into the Water yong Geese are thereout generated; but if they fall on the ground, they perish and come not to perfection: which appears now to be false. Nor is it any wonder that it hath been hitherto unknown where these Birds laid their Eggs, since 'tis most certain, that none was ever heard to have come to the eightieth degree of Latitude before, nor was that part of the Country (which I conceive to be Groenland) ever known before, much less were those Geese ever found sitting upon their Eggs.

Out of all which Narrations it is manifest, that these Geese are not bred out of rotten Wood, but out of certain Shells, which by means of Sea-weed are fastned to the holes of rotten wood, as the foresaid Mejer writes. Those Cockles as it were with black Shells are alwaies found sticking to wood lying in the Water, as to the wooden foundations of Bridges, and to Ships sunk under the water. Now they stick to the wood by certain thrids of Hair or Snevil as it were, or else by Sea-weed. And Mejerus adds this also in their description, that if the Cockles open themselves, those small yong Birds appear, like Chickens in their Eggs, which have a Bill, Eyes, Feet, Wings, also the Hairy Rudiments of Feathers. And as they encrease, so their Shells encrease, as it is with all Shel-fish and Snails. And credible it is, that these Cockles do draw nourishment out of the fat and clammy substance of rotten wood, by those pieces of Grass or Sea-weed, that goes between them, as by Navil-Vessels. And as to the relation of the Hollanders who found these Geese sitting upon Eggs, it may thus be reconciled with the rest, by saying that some were first bred in England and Scotland, out of the Shells, which might fly to other places: of the number of which were those Geese, which the Hollanders saw upon the Rocks in their Voyage to Nova Zembla. For since the greatest part of Insects being Spontaneously bred do afterwards couple and Generate: why may not these Fowls being Animals much more perfect do the same?

Now

Of carolina  
Clusius.

The true  
Opinion  
concerning  
these Scot-  
tish Geese.

The Generation of these Scottish Geese.

Now there is nothing of certainty to be found in Authors concerning the Generation of these Geese. The said Mejer Chap. 5. attributes the Generation of these kind of Shells and Birds to the Heaven, and conceits they proceed from I know not what imaginative Virtue in the Heaven. But, as we have said elsewhere, the Heaven is only an universal Cause; whereas here our question is about the next and immediate cause. Nor do I conceive that the Generation of these Fowls is Spontaneous, but I conceive they are bred as other Cockles or Shell-fish are.

The Vegetable Lamb of Muscovia.

And if any one shall wonder that a Bird should spring out of a Cockle or Shell-fish, let him think with himself that it was as easie for the Creator to make a Cockle bring forth a Bird as another Cockle; and let him consider how many other wonderful things do happen in Nature. Amongst which is that Relation concerning the Lamb which in Tartaria grows out of the ground, which Sigismund Baron of Herberstem (in *Rerum Muscoviticarum Commentariis*) thus describes: Not far, (saith he) from the Caspian Sea, betwixt the Rivers Volga and Jaik, there dwelt once the Samobensian Kings, of whom I shall speak hereafter. Among these Tartarians, Demetrius Danielis (as he was counted among the Barbarians, a grave and credible Man) told me a wonderful and scarce credible thing; How that his Father being once sent from the Duke of Muscovia to the Zamobensian King; while he was upon this Embassage he saw a Seed a little greater and rounder then the Seed of a Musk-Melon, but otherwise not unlike the same: out of which being set in the ground there grew up a thing very like a Lamb five hands high, which they called in their speech Boramez, or the little Lamb: For it hath an Head, and Eyes, and Ears, and all other parts like a Lamb newly brought forth, also a delicate fine Skin, which many use in that Country to line their Caps withal. He said moreover, that this Plant, (if it may be called a Plant) hath blood indeed, but no flesh: but instead of flesh a substance very like that of the flesh of Crabs. Moreover it had little hoofs, not horny like those of a Lamb, but Cloathed with hairs resembling horn: the Root thereof was at the Navil or the middle Belly. And it lived so long, til having eaten all the grass round about it, the Root it self for want of nourishment withered away. And this Plant was exceeding sweet, so that Wolves and other Ravenous Beasts did exceedingly delight to Eat thereof. This Relation is confirmed by others. Fortunius Licetus, Lib. 3. de Spont. Vivent. Ortu, Cap. 45. hath this Relation out of the Journey of Odoricus Utinensis to the great Cham of Tartary. I write, (saith he) a wonderfull thing, not seen by my self, but which hath been told me by very credible persons, who say that in a certain Kingdom there are Mountains called Capesci, where grow very great Pompions, which being ripe do open, and therein is found an Animal like a small Lamb, which hath flesh and the substance of a Pompion together; and although this may seem incredible, yet as there are Trees in Ireland which bring forth Birds, so may there in that place be such Pompions as we speak of. And in another place he reports the same thing saying. One day I saw a beast, as big as a Lamb, white as Snow, whose Wooll being like Cotton might easily be pulled off from its Skin; the by-standers being asked told me, that it was given by a certain Baron to the great Cham, as the best flesh in the World for a Man to feed upon: and they said withal, that there was a Mountain called Capsium, in which there grew great Pompions, which when they are ripe do gape, and put forth such an Animal. Julius Caesar Scaliger, approves the same in *Exercit. 181. Sect. 29.* The things aforesaid (quoth he) are but toys in comparison of that wonderful Tartarean plant. Zavolla is a prime Country of Tartaria Famous as the seat of their most ancient nobility. In that Country they plant a Seed, very like the Seed of a Melon, but rounder. From whence arise a plant which they call Boramez, or the Lamb. For it grows in the shape of a Lamb, about three foot above the ground, having Feet, Hoofs, Ears, and the whole head like a Lamb, only it is without horns. Instead of horns it hath hair resembling an horn. It hath a very thin skin whereof the inhabitants make Caps to cover their Heads. They say the inner pulp is like the flesh of a Crab, and of an admirable sweetness. A Root grows out of the ground fastened to its Navil. And which makes the wonder greater; as long as any Herbs grow about it; it lives like a Lamb in a good pasture: But when they are consumed it pines away and dies. Which happens not only by chance, and in tract of time, but also when the grass is taken away, for experiment sake. And to encrease the miracle, it is desired by Wolves, but not by any other Beasts which live upon Flesh. See concerning this thing, *Andreas Libavius, 2. Part. Singular. Exercit. de Agno Vegetabili Scythia.*

But

But how Animals should grow out of dried Plants, is a doubtful question. For *Licetus*, Lib. 3. Cap. 48. doth blame *Jul. Caesar Scaliger*, Exercit. 59. Sect. 2. for holding that Plants do generate Animals out of themselves, because a living piece of Wood contains only a vegetative Soul, and therefore cannot produce a sensitive Soul more noble than it self, whereby to constitute an Animal, nor change its own Soul into a sensitive. But he himself holds (which is the first manner according to his reckoning) that a Spontaneous Animal is bred out of the Excrements which yet remain in the rotten Wood, together with the Aliment drawn out of the Earth, made up of the dung and Juyces out of the Bodies of sundry Animals; which afterwards from some external agent receives a disposition at last, to put on the Nature of an Animal; and the Soul being present as in a Vessel presently displaies it self, and gives it self thereto, as an Essential and Quickening form.

Animals  
Springing  
from dried  
Plants.

Their man-  
ner of Ge-  
neration  
according  
to *Licetus*:  
First.

But although I leave every mans Opinion free to himself, yet the Opinion of *Scaliger* is more agreeable to truth. For the vegetable Soul doth not produce the Soul of an Animal nor is changed thereinto, but contains under it another Soul of an Animal, which doth belong to the disposition of the matter, which afterwards being set at liberty displaies it self. And therefore *Scaliger* said not absurdly, that Plants contain in them certain Seeds for the Generation of Animals. Nor is it sufficiently proved, that such insects and imperfect Animals are more noble than the noblest Plants; seeing both the Plants themselves have more noble faculties, and are of longer life than such petty Animals; nor were they produced at the beginning of the World by the first intention of the Creator, as other sorts of Living things; but were only bred out of the Corruption of other things. And if the Opinion of *Licetus* were true, a great many more sorts of Animals would be bred of Woods, seeing the Excrements which Plants draw are various, and therefore of the same Wood sundry Animals should be bred; whereas nevertheless only certain Animals are bred of certain Plants.

Afterwards *Licetus* propounds three other manners, according to which Animals are bred out of the Carcasses of plants. The Second manner he makes to be, when Animals are bred of the Carcasses of Plants in the Waters; and that he saith comes to pass, when the Juyces, Excrements or Particles of Animals contained upon any occasion in the Waters, have in themselves (as in a Vessel) some weakened part of the former sensitive Soul, with a small degree of heat, and so cleave to Plants, and sink into them through some pores or Chinks, and being digested by the ambient heat they are prepared for life again, whereupon the Soul as lying hid in the Form begins to be a substantial and quickning Form, and to constitute an Animal. But though it is not to be denied, that sundry Excrements of Animals with their Juyces and parts are contained in the Water, and may there cleave unto Plants; yet if this manner should be allowed, sundry Animals answering to the several forms of Animals should be bred of woods in the waters, which nevertheless is not so. And therefore after this manner also lately declared, I hold that Animals are bred in the Waters out of dry Plants, and that the Water contributes nothing, save that it disposes the dead Plants to putrification, and supplies heat necessary to actuate the hidden form.

The second  
manner.

He makes the Third manner to be, when as out of the water, in the surface of wood, Atomes or Juyces which have flowed from the Bodies of Animals, living or dead, and fly in the Air, do light upon logs of wood, when they are come to a due quantity, and have from the Ambient Air attained a disposition necessary for Life. For then the sensitive Soul which before lay hid in them as in a Vessel, gives it self to them in the Nature of a quickning Form. And thus he holds that Moths, Flies, Worms, and other such Animals, are bred in the rotten boughes of Trees, which touch neither the Earth nor the water. But those little Animals are Generated, not so much out of the woods, as out of the things which did stick to the said woods: and if they are generated of the substance it self of the rotten woods, they belong unto the first manner.

The Third

Finally, He makes the fourth manner to be, when out of the shavings and juyces of Animals shed from their Bodies upon the Earth, and from the Earth some waies thrust into the Bodies of dead Plants, being digested by the ambient heat, and prepared

The fourth

pared for life, an Animal is bred. But this manner seems not much to differ from the Third.

*Animals bred of the juyces of Plants.* Animals are also bred of the Juyces of Plants; as is seen by Vinegar and Wine, and other Juyces, and *Aristotle* makes mention of wine gnats 5. *Histor. Animal. Cap. 19.* to which also Honey may be referred. For Animals are also bred thereof, especially if bread be mingled therewith. Now *Licetus* makes a twofold original of these Animals, *Lib. 3. de Spont. Vivent. Ortu, Cap. 49.* The First is, when in particles long since fallen from the Body of an Animal, and infected with Dung and Onions, and pressed out with Wine or Juyce of Onions and Basil (for of the Juyce of Onions and Basil he conceives Scorpions are bred) some degree of the former Soul remains, which when by the ambient heat it is cherished and disposed to life; the sensitive Soul lying hid as in a Vessel joyns it self thereto as a quickning form, by which the Worms are first Animated. But *Licetus* hath recourse to the same manner, which he never proved, as if it were impossible that an Animal could be bred of other than an Animal; whereas nevertheless experience teacheth, that such Ignoble petty Animals are bred of the matter which in living Plants was the proper subject of the specific Form of the Plants. And if Animals were bred of Juyces after this manner, not only Flies and Wine gnats would breed out of Wine, but other Animals also; since it is not credible that the forms of Flies only are contained in the dung wherewith Vines are manured. And whereas many things are every where reported by Authors concerning the breeding of Scorpions out of Basil, (concerning which experience must be consulted) it is not credible that all Basil Plants have drawn with their Aliment the particles of Scorpions; since in many places Basil grows, where there are no Scorpions. It is more credible, that since of certain Juyces not any Animals but only a certain sort is bred; the Creator being rather willing that of the Corruption of Plants an Animal should be made, than a putrid Body, hath given to the Bodies of Plants a power for the production of such determinate Forms.

*Some Animals generate without Copulation Female Mice engender of themselves without the Male* Moreover it is well known, that most Animals are generated by the Copulation of Male and Female, or of the Seeds of Male and Female Joyned together. Yet it is also observed that some Animals are Generated without the Congress of Male and Female. Female Mice engender of themselves, and thence it is they are so speedily and plentifully generated. So, *Aristotle 6. de Histor. Animalium relates, Cap. 37.* that a Mouse with young being shut up in a Barrel of Milet, a while after the Vessel being opened, an hundred and twenty yong Mice were found therein. And a little after he writes, that in a part of *Persia*, a Mouse with yong being cut up, the Female Mice in her Belly were found to have yong ones in them: and that there are some who stand stiffly in it, that if Mice lick Salt they breed yong without Copulation. So that a man may (not without Reason) doubt, whether that is true which is reported of Mice being bred of rubbish. For since Mice can be so easily generated, if some Mice do but Leap to seek Food out of an old Ship into a new one, they may easily grow to a great multitude. So *Aristotle* tells us that Eels have no Male nor Female 4. *Histor. Animal. Cap. 11.* and that they have neither Seed nor Eggs, but they are generated of a slimy matter coming from the whole surface of the old Eele, as Snakes Skins come from them. And he tells the same thing in 6. *de Histor. Animal. Cap. 14. and 16.*

*The Seminal principle of some Animals may lie hid in sundry Bodies.* From the premises 'tis easie to answer to the objection of some men, who cannot understand how the Seminal matter may lie hid in rubbish, (*viz.* Such as mice are said to be bred of, if so be they are so bred as hath been said) can be of the same specific Nature with the Seed of the Male and Female, of which they are otherwise generated. For we must observe that in such more Ignoble Animals Generation is not so strictly tied to the Seed of Male and Female, as in perfect Animals, but that one sex alone may also generate. And as some Seeds of Plants can consist and abide even in a base matter, as in Rain; So also the Seminal matter of these Animals can lie hid in rubbish, or other base matter.

*The Generation of Animals without sex is not Spontaneous.* *Fortunius Licetus* reckons this kind of Generation, when an Animal is bred of another Animal of the same sort, but without Seed, or without the Seed of the Male, to be a Spontaneous Generation, *Lib. 3. de Spont. Viv. Ort. Cap. 50.* But I conceive this to be no Spontaneous Generation properly so called. And as the Generation



of Plants which have no sex by their Seed, or by a branch or Root, is therefore termed non-Spontaneous, because it is made by the same sort, and by Seed, or part containing in it the Seminal principle: so also Mice, if they breed Seed in themselves without the Male, or if Eeles are produced out of the slime containing in it the Seminal principle, they are not properly said to be of Spontaneous Original.

Those Animals are more properly said to be Spontaneous, which are generated out of Animals of a different sort. Now this comes to pass three manner of waies. For somtimes petty Animals are generated in Living Animals; and somtimes Animals proceed from the Excrements of Living Animals, and somtimes out of the Bodies of such as are dead. And of such as are bred in live Animals, some are bred in the very substance of the living parts, and some in the Cavities. And because both these kinds proceed from Excrementitious Humors, we shall treat of them together. Hitherto pertain those little Dragons which are bred in the external habit of the Body of such as dwell in the Easterne parts of the world. Of these *P. Ægineta* doth write, *Lib. 4. cap. 59.* In the *Indies* (saith he) and the upper parts of *Egypt*, little Dragons are Generated, or certain Animals resembling Worms, in the Musculous parts of the Body, as in the Arms, Thighs, Legs; and they creep along the sides of Children, under the Skin, so as they are plainly seen to move. Moreover when some reliques of a Dragon have remained long in a place, the place suppurates, and the Skin being opened, the Head thereof comes forth; when it is drawn it causes pain, especially if it be broken off. *Diodorus Siculus* also mentions the same Disease, *Lib. 4. Cap. 3.* and *Strabo* *Lib. 6.* who writes that this Disease happens to the Ethiopians who are next to the *Silli* who live upon Locusts; and *Plutarch* *8. Sympof. Quæst. 9.* in these words: those that inhabit about the red Sea, when they are lick (as *Agacharebides* relates) as they are vexed with other unheard of Symptomes; so also with little Snakes, which breed in their Arms and Thighs and put out their Heads to eat the flesh, and being touched enter into the Flesh again, and creeping through the Musculous parts cause intollerable inflammations; which kind of Disease was never heard of before, or since, in any other people. Also *Amatus Lusitanus* treats of this Disease in *Cent. 6. Curat. 64.* [I have heard here in England strange stories of People that have had Wolves in their flesh which they were fain daily to feed with raw beefe. Which I allwaies reckon for Fables. I knew a Woman in Amsterdam that pretended one in her brest, but upon visitation I found it an Imposture, to move pity, and that the Meat which was given her to feed the Wolfe she might Eat her self.

*Fortunius Licetus*, *Lib. de Spont. Viv. Ort. cap. 51.* makes the fiery Serpents which God sent amongst the Israelites, *Numb. 21.* to be these kind of Dragons afore said, and reprehends *Vallesius*, for that in his *Philosophia Sacra* where he handles such like subjects, he did not observe and signifie as much; and holds that really out of the Bodies of the living Israelites little Serpents and Worms were generated, of so Malignant a Nature that they did cruelly eat their Members, and exceedingly inflamed the same, raising most sharp and burning pains, whence they were called fiery Serpents. But he reproves *Vallesius* without cause, and his Opinion doth not agree with the text of the Bible, from which it is manifestly apparent, that as by the sight of the Brazen Serpent the stinging of those Serpents were cured, so God for to punish the People of Israel had sent amongst them such Serpents as did bite them without, but were not bred in their Bodies.

It hath been observed that Worms grow under the Tongue of an Hart, and *Aristotle* saith as much, *2. de Histor. Animal. Cap. 15.* And Hunts-men relate, that mad Dogs have a great Worm in the loose parts under their Tongues, bred of black blood, whereof that Vein is full, which being shut up in a little bag sends Poisonous vapors into the brain and makes the Dogs mad; which Worm being taken out in time prevents their madness. *Pliny* makes mention thereof, *Lib. 29. Cap. 5.* and writes that the Greeks call this Worm *Lytta*.

That certain Vermine called *Ricini* and *Cynorrhæsta* or Tykes are bred in the Skins of Dogs, Sheep, Oxen and Harts, is very well known. That Worms are bred in almost all the parts of a Mans Body, I have shewed, in *Lib. 2. Instit. Medic. Part. 3. Sect. 1. Cap. 11.* which happens also in other Animals. For in them are

A three-  
fold Original of  
Spontaneous Ani-  
mals

Dragon-  
worms.

The Ser-  
pents sent  
by God a-  
mongst the  
Israelites  
in the wil-  
derness  
were not  
these little  
Dragons.

Worms bred  
under the  
tongue of  
Harts and  
Dogs:

Ricini or  
tykes,  
worms so  
called:

bred Fleas and Lice. Aristotle makes mention of the Acari. And Julius Caesar Scaliger speaks of an Animal much lesser, Exercit. 194. Sect. 7. which the Piceni call *Pedicellus*; the *Taurini*, *Scirus*; the *Gascoignes* a *Brigant*. They are vulgarly called *Sirones* or *Chirones*. And he writes that it is wonderful, that they have no express shape, save of a Globe, and that they are scarce discernable by the Eye-sight, and so little that they seem not to be made of Atomes, but to be themselves the Atomes of *Epicurus*; it quarters so under the Skin, that by making holes it breeds a burning pain.

*Animals Breed in Animals after a threefold manner, according to Licetus.* As to their Generation, *Licetus* propounds a threefold way and manner, *Lib. 3. de Spont. Vivent. Ortu, Cap. 51.* The First is when the Soul of the old Animal begets another Soul in the Excrements contained within the Body subject thereto, not like it self, but much more imperfect; being hindred by the imperfection of the matter; as the Seed of an Horse coupled with an Ass doth not generate the Soul of an Horse, but one of a far inferior Nature, by Reason of the baseness of the matter.

The Second manner he makes to be out of the Excrements separated from the Aliment, wherein (as in a Vessel) there is a portion of the former living Creature from whence the Aliment came. For such Excrements being digested in the Body of the Animal by the heat of the Ambient Bowels, and by digestion having attained dispositions necessary to Life, they come to receive the Latent Soul, in the notion of a quickning form. And after this manner Worms (he saies) are frequently bred in the Belly of Man, out of the Excrements of the first digestion brought thither.

The Third manner he holds to be of Excrements into which by the action of heat the substance of that living thing is turned, in which such Animals are Spontaneously generated, in which Excrements there is yet remaining some portion of the former Soul, as in a Vessel; which when by the digestive heat of the Ambient Air it hath attained dispositions necessary to Life, it gives it self to its subject matter in the Nature of a quickning Soul, which constitutes divers kinds of Animals; for that the former Soul is so impaired as to degenerate into an Essence much more imperfect then it was before. And that after this manner a Serpent may Spontaneously breed in the Womb of a Woman, a Flea or Louse in the Skin of a man, or a Crab-Louse within the pores of the Skin.

But in very deed, as to his first manner of Generation, it is hardly agreeable to truth. For it is not yet proved that one Soul can beget another of a different sort. The forms indeed by the indisposition of the matter are so hindred that they cannot attain their end, so that sometimes Monsters are bred; and that one Soul may put on different Bodies, was said before: but that it may produce another Soul, is not agreeable to truth. Every Soul indeed can multiply it self, not by generating another out of or in the subject matter, but by multiplying it self, by the divine Benediction, and by communicating some of its Essence, without Diminution of its self. Nor doth a Mule Generate, because the Soul of an Horse acting upon the matter of an Ass doth produce the Soul of a Mule, as baser then it self; but the Horse communicates his Soul, which being mixed with the Seed and Soul of the Ass doth not produce an Ass, but a Mule, equally participating of the Nature of an Horse and an Ass.

Also the Second manner cannot take place. Nor when Worms are bred in the Guts, was there a portion of the Soul divided from the Worm; but such was the disposition of the matter, that thereof a Worm might be bred.

Thirdly, In Excrements indeed into which the substance of some part is turned, Worms are bred, as happens sometimes in Ulcers: but who can believe that the Soul of a man (for that there is but one Soul in a Man we proved before) should so degenerate as to turn into the Soul of a Worm? And to let pass that question concerning the Soul of a Man; Worms often breed in the Ulcers of Horses, but who will believe that the Soul of an Horse is turned into the Soul of a Worm? I hold to that which I have said in my 12. Chap. de Consens. & Disen. Chymic. cum Galen. And I have said before in general, that of the matter which is the subject of the specific Form such Animals are bred; and therefore as that matter is various, so also various Animals are generated, and determinate Animals of such and such matter;

in Ulcers Worms, not Lice or Fleas, of the filth of the Skin Lice and Fleas, not Worms. For just as Plants (as Scaliger writes, *Exercitat. 59.*) breed Animals, not by putrefaction, but cherishing certain Seeds within themselves; and in *Exercit. 100.* Animals are not bred in putrid Plants, but are the work of the remaining vigor of the said Plants; so is it in Animals: and as he writes in *1. de Causs. Plant. Cap. 5.* in Spontaneous living things there are certain most secret Seeds.

Moreover Animals are bred of the Excrements of Animals of the same sort. *Pliny Lib. 9. Cap. 51.* writes concerning Frogs, that they are dissolved into slime, and in the Springtime breed again in the Waters. That dead Flies and Bees revive again, is most known; and of dead Bodies little Animals of the same sort are generated. Concerning Silk-worms it is a noted Case, of which *Hieronymus Vida* in his 1 Book of his Poem of Silk-Worms, hath these Verses:

*Go luckie Souls, and in your labors blest,  
That die with courage; when you are at rest  
Venus of pitty shall new Bodies give,  
And you in open Air again shall Live.*

And *Paulus Zacchias* writes concerning this matter, *Quaest. Medico-Legal. Lib. 4. Tit. 1. Quaest. Ult.* Also that Worms and Beetles, and many Bodies of Insects, are oftentimes changed, and do many times live again, and take new shapes; any one that will may easily experiment, and the most industrious Physitian *Petrus Castellus* hath a thousand times experimented. Which it would also become others to experiment, before they did deny things contrary to manifest experience, yea and traduce them as absurdities. This indeed is strange, but experience manifests it to be true. For the more Ignoble Forms are so ordered by Nature, that they can lie hid under matter of a different sort as to external Form, and their Soul can retain its Essence entire without the operations of Life. Where it is to be noted that such insects sometimes do not really die, but only because they are ill disposed they lie as it were dead, exercising no manifest operations: in which manner, Flies lie in cold Chambers as it were dead in the Winter time, but as soon as the Chambers are heated they begin to Fly again. But sometimes they die really, which comes to pass when Frogs are turned into Mud as it were, or such insects are so broken to pieces that there is no more disposition to Life; where nevertheless the Latent Soul having gotten fit matter it shapes it self a Body like the Former.

Fourthly, 'Tis very well known, that Animals of a different sort are bred out of the Carcasses of Animals. That Bees may be generated out of the Carcass of an Heifer *Columella* relates from *Democritus*, *Magus*, and *Virgil, de Re Rustic. Lib. 9. Cap. 14.* That of the Carcass of an Ass, drones are bred, and Hornets of the Carcass of a Mule, and Wasps of the Carcass of an Horse, many Authors relate. *Hieronymus Vida* tells us that Silk-worms are bred of the Body of a young Heifer fed with Mulberry Leaves, *Bombyc. Lib. 2.* And many like things are related, concerning the truth whereof we must consult with experience. Many report that a Toad will breed of the Carcass of a Duck. And divers give out, that of the marrow of a Mans Body lying in the Grave Serpents are bred, of which the Poet;

*When a Mans Back bone in the Grave doth Rot  
Some think a Snake is of his Marrow got.*

And *Pliny, Lib. 10. Cap. 66.* reports from many Authors, that a Snake is bred of the marrow of a Mans Back-bone. But this is doubtless Fabulous, nor doth experience confirm the same. *Ovid* writes that Scorpions are bred of Crabs:

*From a Land-Crab taking his Claws away,  
If what remains under the Ground you lay,  
Out comes a Scorpion with his hooked Tail  
Threatning to sting you, if he can prevail.*

Concerning

Concerning these things therefore we must consult with experience. For all such Animals are not bred of every Animal; but some of one only, some of another.

How  
worms are  
bred of the  
bodies of  
Animals:  
Nor doth it follow from our Opinion, as one man cavils, that the Bodies of Serpents, or Serpents themselves, Frogs, Toads, Lizards, do go to the constitution of our Bodies, and that we are actually made up of such things as are destructive to our Natures. For no man ever saw such Creatures bred of the Body of a Man. And although such things have been bred in Mens Bodies, yet have they not been bred of the Body it self, but of vitious matter brought into the Body from elsewhere. Yet is our Body so disposed that some Worms may breed thereof, which nevertheless were not actually in the Body, but that matter had a disposition that Worms might be made thereof. Where nevertheless this is also to be considered, seeing our Body may be considered as in health, and as being sick, we must mark whether these Worms are bred in the Body being sick or in health. And it is most credible that such Worms are bred in Mans Body being sickly, but not as it is found; but rather of vitious Aliment, and Excrementitious Humors, as in *Arabia* the fore-said little Dragons are reported to be bred of Excrementitious Humors in living Bodies; and little Worms breed in the back of Infants, of which we spake before. *Johannes Marci* in his *Idea Idearum Operatric.* makes the cause thereof to be the eating of Locusts. For since those people Eat Locusts frequently (from whence they are termed *Acridophagi*) in proces of time there grows an itching and putrefaction in their members, and their flesh is changed into a kind of insect not unlike a Locust, whereupon they pine away and die. For he writes, that in the *Chile* and blood, yea and in the flesh it self, strange forms are contained and may be preserved; because in all those Mutations nothing is generated contrary to them. For the latter Form approaching doth not change the whole substance and abolish the former Forms, but takes away only such as are contrary to its own faculties. So, that same subordination of forms must not be stretched too far, nor must we if any thing be bred of the Body of an Animal presently conclude, that it proceeds from the Natural matter thereof; since it may be bred from the Aliment and Excrementitious Humors therein. So I do not conceive, that the Form which shapes the Body of a Silk-worm in the Carcass of an Heifer is a form subordinate to the form of an Ox, but that it lay concealed in the Mulberry-leaves, as appears out of these Verses of *Hieronimus Vida*, in the 2. Book of his Poem of Silk-worms.

But if your stock of Silkworms should decay,  
And all your Seed should chance to die away,  
By wrath of Jove: As Bees they say are bred  
From Heifers Body, kil'd and buried;  
From the same Body, only with more care,  
Your missed Silk-worms Generated are:  
For twice ten daies, and twice ten Nights, at first  
Keep her from Grass, nor let her quench her thirst  
With any Water. But in Stable shut  
Mulberry Twigs and Leaves see that you put  
Into the Crib: no other Meat or Drink;  
Then kill and let her Carcass Rot and stink:  
When lo a Lusty swarme of Silk-worms smal  
Out of her Sides and Back you'll see to Crawl.

The manner of Generation is the same, which we have formerly declared concerning Plants.

The dif-  
ference of  
Spontane-  
ous Ani-  
mals.  
Now this is also to be noted, that there is some difference betwixt Spontaneous Animals. For some are altogether base, which generate nothing, as the Wine Gnats and such like Worms; other somewhat more perfect do not Generate living yong ones, but produce little Worms, or somewhat like an Egg in Nature, out of which afterwards petty Animals of the same sort are Generated. So Flies engender little Worms, which grow to be Flies; which also *Julius Caesar Scaliger* observed, as he relates, *Exercit. 191. Sect. 2.* Lice breed Nits, which also turn to Lice; although some

some falsely deny the same; as we have shewed in our *Tract de morb. Infant. Part. 2. Cap. 5. de Phthiriasi*. Others produce Animals of their own sort, as is well known of Mice; provided it be certain that they are Spontaneously generated. And truly I conceive there are few Animals Spontaneously Generated, which do not afterwards generate such as themselves. Aristotle in *Lib. 5. de Hist. Animal. Cap. 19.* tells us that Glow-worms are Generated out of a certain kind of hairy Palmer-worms. Yet *Fabius Columna* relates, in *Observ. Lib. min. Cognit. et Rar. Stirp. Addit.* that *Carolus Vintimillias* the *Panormitan* observed in Sicily, that Glow-worms are some Male and some Female. For keeping divers naked ones in a Glass for his pleasure, and delighting to see them shine in the night, (for which cause he fed them with moistned bread) as he was at Supper, a winged one came flying about the Candle, which he caused to be caught and put into the Glass unto the rest, which presently (he looking on) one Trod one of them and stuck to her, as the Silk-worm is wont to do, and being Pluckt from her he Trod another and another: and the day following they laid their Eggs, resembling Millet Seed in shape and color.

Glow-worms do couple.

This only we shall add by way of Conclusion, that we conceive Aristotle to have been in the right when he wrote, *that all things in some sort are full of Souls*. Which though they do not allwaies Animate and inform the things wherein they are, nor act at all, yet they lie concealed in them; and when they find their time and have gained fit matter they display their forces. And therefore again, *Julius Caesar Scaliger* did well write, in *1 de Plantis*, that there are most secretly hidden Seeds of Spontaneous live things. And therefore, if we list to speak accurately, nothing can properly be said to be Spontaneously generated; but every thing is bred of its own Seed, though hidden and not discernable by our senses, or at least of a principle answering to Seed. And this is all the difference betwixt Spontaneous things and non-Spontaneous, that the latter have a manifest Seed, the former an hidden secret Seed, or somewhat equivalent thereto. For we list not here to contend about words. Only this must be remembered, that those things which are said to be Spontaneously generated do not proceed from an external equivocal agent, but from an internal principle; which if any man will call Seed, or a Seminal principle, or somewhat answering to Seed, he shall have my Consent. For although *Licetus*, *Lib. 4. de Spont. Viv. Ort. Cap. 2.* denies that all things have their Seeds: yet there he grants, that those things which are said to be of Spontaneous original have somewhat answering to Seed. Now the manner of their Generation is this; as an Animal is said to nourish and augment it self, whiles the common principle and first cause of nutrition and augmentation communicates it self to the assimilated Aliment, and insinuates it self thereinto, but doth not make a Soul like it self in the Aliment: so the Spontaneous original of live things is effected, whiles the agent lying hid within the matter, and not yet manifestly performing the operations of a Soul, having gained a matter rightly fitted and disposed, communicates it self thereto, and begins to perform therein the operations proper to it self, and to exercise the function of a Soul, but doth not produce another Soul in the matter.

All things full of souls

## THE CONCLUSION.

AND so much shall suffice to have spoken (though but briefly) of a most exceeding hard and obscure subject. It had been easie to have discoursed more largely of more sorts of Spontaneous living things: but my purpose is not in this place to write a natural History, but only to propound the manner of the original of Spontaneous living things, and to declare the same by certain examples. And although I know many things may be objected against that manner of the Generation of these things which seems to me most probable: yet this I know withall, that it is easier to oppose the truth then to declare the same; and that a right line is the measure of it self and a crooked line too; and who ever shall rightly discern the truth may easily answer all objections, of which a thousand may be invented.

Nevertheless

Nevertheless if any thing obscure and doubtful shall occur in an Argument handled by few Authors, it is not fit to reject or condemne the same, before somewhat better shall be substituted in the place thereof. And therefore, friendly Reader,

*If ought thou know'st, which is then this more true,  
Write it; if not, Use this: and so Adieu.*



Such is the Acuteness and Solidity of this Excellent Philosophical Treatise, wherein our learned Author hath in my Opinion performed his Master piece, that he and the English thereof may well say in the words of Ovid:

*And now the work is ended, which Joves rage  
Nor Fire nor Sword shall raze, nor Eating Age.  
Come when it will my deaths uncertain houre,  
Which of this Body only hath a power:  
Yet shall my better part transcend the Skie  
And my immortal name shall never die.  
For wheresoere the British Peoples spread  
Their conquering Arms, I shall of all be Read.*

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**F I N I S.**

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