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Discourse I. Of the primitive chaos and creation of the world.

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DISCOURSE I.

Of the Primitive CHAOS and Creation of the World.

IN the former Edition of this Treatise this Discourse concerning the *Primitive Chaos* and Creation of the World, and that other concerning the Destruction thereof by the Waters of the *General Deluge*, in the days of *Noah*, were brought in by way of Digression; because I design'd not at first to treat of them, but only of the *Conflagration* or *Dissolution* of the *World* by *Fire*; but was afterwards, when I had made a considerable progress in the *Dissolution*, at the instance of some Friends, because of their Relation to my Subject, prevail'd upon to say something of them. But now that I am at liberty so to do, I shall not handle them any more by the by, but make them substantial Parts of my Book,

B and

and dispose them, as is most natural, according to their priority and posteriority in order of time, beginning with the *Chaos* and *Creation*.

C H A P. I.

Testimonies of the Ancient Heathen Writers concerning the Chaos, and what they meant by it.

IT was an ancient Tradition among the Heathen, that the World was created out of a *Chaos*.

First of all the ancient Greek Poet *Hesiod*, who may contend for Antiquity with *Homer* himself, makes mention of it in his *Theogonia*, not far from the beginning, in these words.

Ἦτοι μὲν πρῶτα Χάος γένητ'.

First of all there was a Chaos. And a few Verses after, speaking of the immediate Production or Off-spring of the *Chaos*, he saith,

Ἐκ Χάεος δ' Ἐρέβος τε, μέλαινά τε Νύξ ἐγένοντο.

From

From Chaos proceeded Hell, and Night [or Darknes] which seems to have its foundation or occasion from the second Verse of the first Chapter of *Genesis*; And the Earth was without form and void; and darknes was upon the face of the deep. Of this testimony of *Hesiod*, *Lactantius* takes notice, and censures it, in the first Book of his *Institutions* cap. 5. *Hesiodus non à Deo conditore, sumens exordium, sed à Chao, quod est rudis inordinatâque materiæ confusæ congeries.* *Hesiod* not taking his beginning from God the Creator of all things, but from the *Chaos*, which is a rude and inordinate heap of confused matter. And so *Ovid* describes it in the beginning of his *Metamorphosis*;

*Quem dixere Chaos, rudis indigestâque moles,
Nec quicquam nisi pondus iners congestâque
eodem
Non bene junctarum discordia semina rerum.*

That is,
One face had Nature, which they Chaos nam'd
An undigested lump, a barren load,
Where jarring Seeds of things ill-joyn'd aboard.

Others of the Ancients have also made mention of the *Chaos*, as *Aristophanes* in *Avibus*.

Χάος ὡς ἐν Νύξ, Ἐρεβός τε μέλαν πρῶτον, &c.

And *Lucan* in the beginning of his first Book

Antiquum repetent iterum Chaos omnia, &c.

Of the formation of all the Parts of the World out of this *Chaos*, *Ovid* in the place fore-quoted, gives us a full and particular description: and *Euripides* before him a brief one,

Ὅδ' Οὐρανὸς ἐν γαῖά, τ' ὡς μορφὴν μίαν,
Ἐπεὶ δ' ἐχωρίσθησαν ἀλλήλων, &c.

The Heaven and Earth were at first of one form; but after they were separated, the Earth brought forth Trees, Birds, Beasts, Fishes and Mankind.

The like account also the ancient Philosopher *Anaxagoras* gives of the Creation of the World, beginning his Philosophy thus, Πάντα χεῖμασα ὡς ἑμῆ· εἶπε Νῆς ἐλθὼν αὐτὰ διεκόσμησε: that is, *All things (at first) were together, or mingled and confused, then Mind supervening disposed them in a beautiful order.*

That which I chiefly dislike in this Opinion

nion of theirs is, that they make no mention of the Creation of this *Chaos*, but seem to look upon it as self-existent and improduced.

C H A P. II.

That the Creation of the World out of a Chaos is not repugnant to the Holy Scripture.

THIS Opinion of a *Chaos*, if soberly understood, not as self-existent and improduced, but in the first place created by God, and preceding other Beings, which were made out of it, is not, so far as I can discern, any way repugnant to the Holy Scripture, but on the contrary rather consonant and agreeable thereto. For *Moses* in the History and Description of the Creation in the first Chapter of *Genesis*, saith not that God created all things in an instant in their full state and perfection, but that he proceeded gradually and in order, from more imperfect to more perfect Beings, first beginning with the Earth, that is, the Terrestrial Globe, which was made *tohu vabohu*, without form and void, the Waters cover-

ing, the face of the Land, which were afterwards separated from the Land, and gathered together into one place. Then he created out of the Land and Water first Plants, and then Animals, Fishes, Birds, Beasts, in Order, and last of all formed the Body of Man of the Dust of the Earth.

And whereas there is no particular mention made of the Creation of Metals, Minerals and other Fossils, they must be comprehended in the word *Earth*, as the Water it self also is in the second Verse of this first Chapter.

It seems therefore to me consonant to the Scripture, That God Almighty did at first create the Earth or Terraqueous Globe, containing in its self the Principles of all simple inanimate Bodies, or the minute and naturally indivisible Particles of which they were compounded, of various but a determinate number of Figures, and perchance of different magnitudes; and these variously and confusedly commixed, as though they had been carelessly shaken and shuffled together; yet not so, but that there was order observed by the most Wise Creator in the disposition of them. And not only so, but that the same Omnipotent Deity did create also the Seeds or Seminal Principles of all Animate Bodies, both Vegetative and Sensitive; and
disperst

disperst them, at least the Vegetative, all over the superficial part of the Earth and Water. And the Notion of such an Earth as this is, the Primitive Patriarchs of the World delivered to their Posterity, who, by degrees annexing something of fabulous to it, imposed upon it the name of *Chaos*.

The next work of the Divine Power and Wisdom was the separation of the Water from the dry Land, and raising up of the Mountains, of which I shall treat more particularly in the next Chapter.

To which follows the giving to both Elements a power of hatching, as I may so say, or quickening and bringing to perfection the Seeds they contained; first the more imperfect, as Herbs and Trees; then the more perfect, Fish, Fowl, Four-footed Beasts, and creeping Things or Insects. Which may be the meaning of those Commands of God, which were operative and effectual, communicating to the Earth and Water a power to produce what he commanded them, *Gen. I. 11. Let the Earth bring forth Grass, &c. and v. 20. Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the Earth, &c. And v. 24. Let the Earth bring forth the living creature after his kind, cattel and creeping thing, and beast of the Earth after his kind.*

So the Earth was at first cloathed with all sorts of Herbs and Trees; and both Earth and Water furnished with Inhabitants. And this the Ancients understood by their *διζυόσμις*.

But whether out of præ-existing Seeds, as I suppose, or not, certain it is that God at that time did give an extraordinary and miraculous power to the Land and Water of producing Vegetables and Animals: and after there were as many of every kind brought forth as there were Seeds created at first; or as many as it seemed good to the Divine Creator to produce without Seed; there remained no further ability in those Elements to bring forth any more; but all the succeeding owe their original to Seed; God having given to every *Species* a power to generate or propagate its like.

C H A P. III.

*Of the separating the Land and Water,
and raising up the Mountains.*

Supposing that God Almighty did at first create the Terrestrial Globe, partly of solid and more ponderous, partly of fluid and lighter

lighter parts; the solid and ponderous must needs naturally subside, the fluid and lighter get above. Now that there were such different parts created, is clear, and therefore it is reasonable to think that the Waters at first should stand above and cover the Earth: and that they did so, seems evident to me from the testimony of the Scripture. For in the History of the Creation in the first Chapter of *Genesis*, versè 2. it is said, That *the Spirit of God moved upon the face of the waters*, intimating that the Waters were uppermost. And God said, versè 9. *let the waters under the Heaven be gathered together into one place, and let the dry land appear*. Whence, I think, it is manifest to any unprejudiced Reader, That before that time the Land was covered with water. Especially if we add the testimony of the holy *Psalmist*, *Psalms* 104. vers. 6. & 9. which is as it were a comment upon this place of *Genesis*, where speaking of the Earth at the Creation, he saith, *Thou coveredst it with the deep as with a garment; the waters stood above the Mountains* and ver. 9. *That they turn not again to cover the Earth*. And that this gathering together of waters was not into any subterraneous Abyss, seems likewise clear from the Text. For it is said, That God called this Collection of waters *Seas*, as if it had

been on purpose to prevent such a mistake.

Whether this separation of the Land and Water, and gathering the waters together into one place, were done by the immediate application and agency of God's Almighty Power, or by the intervention and instrumentality of second Causes, I cannot determine. It might possibly be effected by the same Causes that Earthquakes are, *viz.* subterraneous Fires and *Flatufes*. We see what incredible effects the Accension of Gunpowder hath: it rends Rocks, and blows up the most ponderous and solid Walls, Towers and Edifices, so that its force is almost irresistible. Why then might not such a proportionable quantity of such Materials set on fire together raise up the Mountains themselves, how great and ponderous soever they be, yea the whole Superficies of the dry Land (for it must all be elevated) above the Waters? And truly to me the Psalmist seems to intimate this Cause, *Psalms* 104. 7. For after he had said, *The waters stood above the mountains*; he adds, *At thy rebuke they fled, at the voice of thy thunder they hasted away*. Now we know that an Earthquake is but a subterraneous Thunder, and then immediately follows, *The mountains ascend, the valleys descend, &c.* If there might be a high Hill raised up near the City *Traezen*, out of

a plain Field, by the force of a subterraneous
Fire or *Flatus*, as Ovid tells us.

*Est prope Pitthæam tumulus Træzena sine ullis
Arduus arboribus, quondam planissima campi* Ovid Me-
Area, nunc tumulus : nam (res horrenda relatu) tamorph.
Vis fera ventorum, cæcis inclusa cavernis, lib. 15.
Expirare aliqua cupiens, luctat àque frustra
Liberiore frui cælo, cum carcere rima
Nulla fuit toto, nec pervia statibus esset,
Extentam tumefecit humum, ceu spiritus oris
Tendere vesicam solet, aut derepta bicornis
Terga capri ; tumor ille loci permansit & alti
Collis habet speciem, longoque induruit ævo.

*A Hill by Pitthæan Træzen mounts uncrown'd
With Sylvan Shades, which once was level
ground,*

*For furious Winds (a story to admire)
Pent in blind Caverns, struggling to expire ;
And vainly seeking to enjoy th' Extent
Of freer Air, the Prison wanting vent,
Puffs up the hollow Earth extended so,
As when with swelling Breath we Bladders
blow.*

*The tumour of the place remained still.
In time grown solid, like a lofty Hill.*

A parallel Instance hereto we have of later
date, of a Hill not far from *Puzzuolo* [*Puteoli*]
be-

beside the Gulph of *Baiæ*, which I my self have view'd and been upon. It is by the Natives called *Monte di cenere*, and was raised by an Earthquake *Sept. 29. 1538.* of about one hundred foot perpendicular altitude; though some make it much higher: according to *Stephanus Pighius* it is a Mile ascent to the top, and four Miles round at the foot: We indeed judged it not near so great. The People say it bears nothing; nothing of any use or profit I suppose they mean: else I am sure there grows *Heath, Myrtle, Mastick-tree*, and other Shrubs upon it. It is a spongy kind of Earth, and makes a great sound under a Man's feet that stamps upon it. The same Earthquake threw up so much Earth. Stones and Ashes as quite filled up the *lacus Lucrinus*, so that there is nothing left of it now, but a fenny Meadow. If such Hills, I say, as these may be, and have been elevated by subterraneous Wild-fire, *Flatus* or Earthquakes, *Si parvis liceat componere magna*, if we may compare great things with small, why might not the greatest and highest Mountains in the World be raised up in like manner by a subterraneous *Flatus* or Wild-fire, of quantity and force sufficient to work such an effect, that is, that bears as great a proportion to the superincumbent weight and bulk to be elevated, as those
under

under these smaller Hills did to theirs?

But we cannot doubt this may be done, when we are well assured that the like hath been done. For the greatest and highest Ridge of Mountains in the World, the *Andes* of *Peru*, have been for some hundreds of Leagues in length violently shaken, and many alterations made therein by an Earthquake that happened in the year 1646. mentioned by *Kircher* in his *Arca Noæ*, from the Letters of the Jesuits. And *Pliny* tells us of his own knowledge, that the Alps and Apennine have often been shaken with Earthquakes: *Exploratum est mihi Alpes Apenninæ sæpius tremuisse*, lib. 2. cap. 80. Nay more then all this, we read that in the time of the Emperour *Valentinian* the first, there was an Earthquake that shook all the known World. Whilst this Innovator, [that is *Procopius*] was yet alive (saith *Amm. Marcellinus* lib. 26. cap. 14.) *Horrendi tremores per omnem orbis ambitum grassati sunt subito, quales nec fabulæ, nec veridicæ nobis antiquitates exponunt. Paulò enim post lucis exortum densitate prævia fulgurum acriùs vibratorum tremefacta concutitur omnis terreni stabilitas ponderis, marèque dispulsum retrò fluctibus evolutis abscessit, ut resecta voragine profundorum species natantium multifformes limo cernerentur hærentes, valliùmque vastitates &*
mon-

montium , ut opinari dabatur, suspicerent radios solis quos primigenia rerum sub immensis gurgitibus amandavit , &c. that is, Horrid Earthquakes suddenly raged all the World over, the like whereto neither Fables nor true Antiquities ever acquaint us with, or make mention of. For soon after break of day redoubled smart and violent flashes of Lightning preceding, the stable and ponderous mass of the whole Earth was shaken and made to tremble; and the Sea with revolved waves was driven backwards, and forced so far to recede, that the bottom of the great Deeps and Gulfs being discovered, multiform Species of Fishes forsaken by the water were seen lying on the Mud: and those vast Valleys and Mountains which the primigenial Nature had sunk deep and concealed under immense waters (as we had reason to think) saw the Sun beams. Wherefore many Ships resting upon the dry ground, the Mariners wandring carelessly up and down through the small reliques of the waters, that they might gather up Fishes and other things with their hands; The Sea-waves, being as it were grieved with their repulse, rise up again, and making their way backward through the fervid Shallows, violently dashing against the Islands and extended Shores of the Continents, threw down and levelled
in-

numerable Edifices in Cities and where else they were found. Where see more of the effects of it. Of this Earthquake we find mention also in *Zosimus* and *Orosius*.

If this story be true, as certainly it is, we have no reason to doubt of the possibility of the Dry land being thus raised at first by subterraneous Fire. And with us agrees the learned *Thomas Lydyat* in his *Philosophical Disquisition concerning the origine of Fountains*, &c. being of opinion not only that it might be so, but that it was so. I shall give you his own words, *Ubi aliud quoque summæ admirationis plenum Terræ motus atque Ignis subterranei effectum notandum venit, montium sci. generatio*. And then having mentioned the raising up Islands in the Sea by subterraneous Fires, he proceeds thus, *Quomodo etiam omnes montes qui uspiam sunt, unà cum ipsis terris Continentibus (quæ nihil aliud sunt quàm sparsi in Oceano majores montes sive insulæ) in mundi primordiis, (quando nimirum ignis quo de loquimur, in terræ visceribus à potentissimo mundi Conditore accensus est) extitisse maximè sit verisimile, mari in cava loca recedente, & terrestribus Animalibus (ejusdem Divini numinis sapientissimo consilio) habitandi locum relinquente*. That is, *After which manner also all the Mountains in the World, together with*
the

the Continents themselves, (which are nothing else but great Mountains or Islands scattered in the Ocean) in the beginning of the World, when the fire of which we speak was first kindled in the bowels of the Earth by the Almighty Creator, were (as it is most highly probable) originally raised up: the Sea receding into the cavities and depressed places, and by the most wise counsel of the supreme Deity leaving room for terrestrial Animals to inhabit. Then which nothing can be said more consonant to what we have written: And I was highly pleased and satisfied to find such Philosophy in so learned and judicious a Writer.

And in confirmation of this Doctrine, *Strabo* himself, though he had not, nor could have any knowledge at all of the prodigious effects of Gunpowder, yet makes no difficulty to affirm the possibility of raising up as well the Continents and Mountains as the Islands by Earthquakes and subterraneous Fires; toward the latter end of the first Book of his Geography discoursing thus:

Καὶ γὰρ σεισμοὶ, ἢ ἀναρροήματα, ἢ ἀποκλίσεις
 τῆς ὑφαλῆς γῆς μετεωρίζουσι, ἢ τινὲς θάλασσαν.
 Οὐ γὰρ μύθεον μὲν ἀνεγεθῆναι διώαντας, ἢ
 μικροὶ νῆσοι, μεγάλα δ' ἔσδ' νῆσοι μὲν, ἢ πε-
 ροὶ δ' ἔσδ'. And a little after, Καὶ τινὲς Σικελίαν
 ἔδδ' ἐν πᾶσι μάλιστα ἀπορροήματα τῆς Ἰταλίας εἰκάζουσι
 τίς

τις, ἂν, ἢ ἀναβληθεῖσαν ἰσθ' τῆς Αἰτναίης πυρρός
 ἐκ βύθου συμμεῖναι. That is, *For Earthquakes
 and Eruptions of Flatus [Blasts] or sudden tu-
 mors of the submarine Earth, or bottom of the
 Sea, may swell and elevate the Sea; so that not
 only small lumps or masses of matter, but even
 Islands may be raised up in the midst of it.
 Neither if small Islands can be raised, may not
 great ones too; neither may Islands be heaved
 up, and not Continents as well. And Sicily
 may as well be thought to have been thrown up
 out of the Deep by the force of the Ætnæan
 fire, and sticking together to have continued
 above water, as to have been a piece broken
 off from Italy. And the like may be said of
 the Islands of Lipara and Pithecusæ.*

Of the possibility of doing it we need not
 doubt, when we have sufficient proof of the
 thing done in lesser Islands thus heaved up
 in the midst of the Sea, by submarine fires.
 Strabo lib. 1. Ἀνα μέσον γὰρ Θήρας ἢ Θηρα-
 σίας ἐκπεῦσαι φλόγες ἐκ τῆς πελάγους ἐφ' ἡμέ-
 ρας τίσσασα, ἄσε πᾶσαν ζεῖν ἢ φλέμεναι τὴν
 θάλασσαν, ἀνερύσσειν καὶ ὀλίγον ἔχαιρμένῳ
 ὡς ἂν ὀργανικῶς ἢ σωλειθειμένῳ ἐκ μύθρων
 ἦσσαν, δάδεκα σαδίων τὴν περίμετρον. That is,
*Between Thera and Therasia flames issuing
 out of the Sea for four days, (so that the whole
 Sea boil'd and burned) blew up by little and
 little, as if it had been raised by Machines,*

and composed of great lumps or masses, an Island of twelve furlongs circumference.

And *Pliny* tells us, that the Island *Hiera* near *Italy*, in the time of the Social War, together with the Sea it self, did burn for several days. His words are, *In medio Mari Hiera insula juxta Italiam cum ipso Mari arsit per aliquot dies.*

And *Strabo* lib. 1. reports, That about *Methone* in the Bay of *Hermione*, there was Earth raised, and as it were blown up to the height of seven Furlongs by a fiery breath or exhalation, which by day time was unaccessible by reason of heat and sulphureous stench, but smelling sweet by night, and shining so as to be seen afar off, likewise casting such a heat, as to cause the Sea to boil for five Furlongs, and to render it troubled for the space of twenty; raising up therein a Baich or Bank of Stones as big as Towers.

These Instances I alledge principally because they seem to demonstrate a possibility of the accension of fire in the Earth when it was wholly covered with Water, and had no intercourse or communion with the superior or external Air: which is the main and most material Objection against the elevation of the dry Land at the beginning by subterraneous fires.

You will say, If the Mountains be thus heaved up by subterraneous fires, the Earth must needs be hollow all underneath them, and there must be vast Dens and Caverns dispersed throughout them.

I answer, 'Tis true indeed, so there are; as may undeniably be proved by instances. For the new Mountain we mentioned at *Puteoli*, that was thus raised, being of a Mile steep ascent, and four Miles round at the foot, a proportionable Cavity must be left in the Earth underneath: And the Mountain *Ætna* at the last Eruption alone having disgorged out of its bowels so great a flood of melted Materials, as if spread at the depth and breadth of three foot, might reach four times round the whole Circuit of the *Terraqueous Globe*, there must likewise an answerable Vault be left within. You will demand, How then comes it to pass, that they stand so firm, and do not founder and fall in after so many Ages. I answer, that they may stand, appears by the foresaid new-raised Mountain. For notwithstanding the Cavity in and under it, it hath stood firm and staunch, without the least sinking or subsidence, for above an hundred and fifty years: neither is there any great sinking or falling in at *Ætna* it self; at least in no degree answerable to its ejected matter. This asser-

tion is confirmed by the unanimous vote and testimony of all Writers, Ancient and Modern, who have handled this Subject. But *Alphonsus Borellus* supposes them not to have duly considered the matter, and calculated the quantity of the ejected materials and the bulk of the Mountain, and compared them together; but to have been carried away by the prejudices and persuasions of the People, who looking upon the top of the Mountain at a distance, think it but a small thing in comparison of the ejected Sand and Ashes that covered whole Countries; and those vast Rivers of liquid stones and other ingredients, that ran down so many miles, whereas he by a moderate computation found out that the total of what the Mountain disgorged at the last eruption amounted not (as I remember) to the fourteen thousandth part of the Solidity of the whole Mountain. The reason is the strength and firmness of their Vaulture and Pillars, sufficient to support the superincumbent weight. And yet in some places there are sinkings and fallings in, which have afterwards become Valleys or Pools of Water. But as for the Cavities that are lower than the *Superficies* of the Ocean, the Water, where it could insinuate and make its way, hath filled them up to that height. I say where it could make its way,

way, for that there are many empty Cavities even under the Sea it self, appears by the shaking and heating too of the very Water of the Sea in some places in Earthquakes, and raising up the borders or skirts of it, so as to drive the Water a great way back; and the raising up new Islands in the middle of the Sea; as *Delos* and *Rhodes*, and *Anaphe*, and *Nea*, and *Alone*, and *Hiera*, and *Thera* mentioned by *Pliny*, Hist. lib. 2. c. 87. and *Thia* in his own time; and *Therastia* in the *Ægean* in *Seneca's* time, which was heaved up in the sight of many Mariners then present and looking on.

I am not ignorant, that the learned Man I lately quoted, I mean *Alph. Borellus*, in his Book *De Incendiis Ætnæ*, is of opinion, that the middle part, or as he calls it, the kernel of that Mountain is firm and solid, without any great caverns or vacuities, and that all those vaults and cavities in which the fire rages are near the superficial or cortical part: And derides those who fancy that *Ætna*, the *Æolian* Islands, *Lipara*, *Strongyle*, &c. and *Vesuvius* do communicate by subterraneous channels and passages running under the bottom of the Sea. But saving the respect due to him for his learning and ingenuity, there is good Authority on their side; and our ratiocinations against the possibility of

such a thing must give place to the clear proof of matter of fact. *Julius Ethnicus* an ancient Writer, quoted by *Ludovicus Vives* in his Annotations upon *S. Augustine, De Civitate Dei*, gives us this Relation, *Marco Æmilio, Lucio Aurelio Consulibus, Ætna mons terræ motu ignes super verticem latè diffudit, & ad Insulam Liparam mare efferbuit, & quibusdam adustis navibus vapore pleròsque navaleis exanimavit: Piscium vim magnam exanimem disperfit, quos Liparenseis avidiùs epulis adpetenteis contaminatione ventris consumpti sunt, ita ut novà pestilentia vastarentur insulæ.* That is, *Marcus Æmilius and Lucius Aurelius being Consuls, Mount Ætna being shaken by an Earthquake, cast forth and scattered fire from its top far and wide. At which time the Sea at the Island of Lipara was boyling hot, and some Ships being burnt most of the Seamen were stifled with the vapour: besides it dispersed abroad a power of dead fish, which the Liparenseis greedily gathering up and eating, were consumed with a contagious disease in their bellies: so that the Islands were wasted with a new sort of pestilence.* And *Father Kircher* the Jesuite, in the Preface to his *Mundus Subterraneus* giving a Relation of an Earthquake which shook a great part of *Calabria*, and made notable devastations there, which himself saw, and
 was

was in, Anno 1638. clearly demonstrates that *Ætna, Stromboli*, and the Mountains of *Calabria*, do communicate by vaults and caverns passing under the bottom of the Sea. I shall insert but one passage out of him, referring the Reader to the fore-quoted Preface for the rest. *Hiscæ calamitatibus* (saith he) *dum jactamur, ego curiosius intuitus Strongylum, 60 ferè milliarium intercapedine dissitum, illum insolito modo furere notavi, &c. i. e. While we were tost with these calamities, I beholding curiously the Island Stromboli about 60 miles distant, observed it to rage after an unusual manner, for it appeared all filled with fire in such plenty, that it seemed to cast forth mountains of flame: a spectacle horrid to behold and formidable to the most undaunted Spirit. In the mean time there was a certain sound perceived as it were of Thunder, but by reason of the great distance from whence it came somewhat obscure, which by degrees, proceeding forward in the subterraneous conduits, grew greater and greater, till it came to the place just underneath us, [they were at Lopez by the Sea] where it shook the Earth with such a roaring or murmure and fury, that being not able to stand any longer upon our Legs, we were forced, to support our selves, to catch hold upon any shrub or twig that was near us, lest our limbs*

should be put out of joynt by too much shaking and concussion. At which time happened a thing worthy of immortal and eternal memory, viz. the subversion of the famous Town of S. Eufemia; which he goes about to relate. As for *Vesuvius*, if that be not hollow down to the very roots and foundations of it, how comes it to pass that at the times of its deflagrations it should vomit out such floods of boiling Waters? as if we had not read of them in Histories, and been told so by our Guide when we ascended that Mountain, we must needs have perceived our selves by the mighty guls and channels in the sides thereof, it being of it self near the top so spongy and dry, that it is more likely to imbibe then to cast off much rain in the Winter time. And again, what causes the Sea to recede at those times, and that to so great a distance, that the Gallies have been laid dry in the very Haven of *Naples*?

Howbeit, I cannot positively assert the Mountains thus to have been raised. But yet whether without means, or by whatsoever means it were, a Receptacle for the Waters was prepared, and the dry Land and Mountains elevated, so as to cast off the Waters, on the third day, and which is wonderful, the Cavities made to receive the Waters, and the whole *terra firma*, or dry
Land

Land with its Mountains were so proportioned one to the other, as that the one was as much depressed below the Shores, as the other was elevated above them. And, as if the one had been taken out of the other, the Sea with all its Creeks, and Bays, and Inlets, and other Appendants was made, and is very near equal to the whole dry Land with its Promontories and Mountains, if not in *Superficies*, yet in bulk or dimensions, though some think in both. Which equality is still constantly maintained, notwithstanding all Inundations of Land, and Attentions of Sea; because one of these doth always nearly ballance the other, according to the vulgar Proverb we have before mention'd, *What the Sea loses in one place, it gains in another*. If any shall demand, How the Sea comes to be gradually depressed, and deepest about the middle part; whereas the bottom of it was in all likelihood equal while the Waters covered the whole Earth? I answer, the same Cause that raised up the Earth, whether a subterraneous fire or *flatus*, raised up also the skirts of the Sea, the ascent gradually decreasing to the middle part, where, by reason of the solidity of the Earth, or gravity of the incumbent Water, the bottom was not elevated at all. For the enclosed fire in those parts where its first ascension

ension or greatest strength was, raised up the Earth first, and cast off the Waters, and thence spreading by degrees, still elevated the Land, and drove the Waters further and further; till at length the weight of them was too great to be raised, and then the fire brake forth at the tops of the Mountains, where it found least resistance, and dispersed it self in the open Air. The Waters also, where they found the bottom sandy, or yielding, made their way into all those Cavities the fire had made and left, filling them up as high as the level of the Ocean. Neither let any man imagine, that the Earth under the Water, was too soft and muddy to be in this manner raised by subterraneous fire; for I have shewn before, that the bottom of the Sea is so saddened and hardened by the weight of the incumbent Water, that the High-ways, beaten continually by Horses and Carriages, are not more firm and solid. But omitting this (which is only a conjecture) I shall discourse a little more concerning the Equality of Sea and Land.

It hath been observed by some, That where there are high Cliffs or Downs along the Shore, there the Sea adjoining is deep; and where there are low and level Grounds, it is shallow: the depth of the Sea answering to the Elevation of the Earth above it: and as the
Earth

Earth from the Shores is gradually higher and higher, to the middle and parts most remote from the Sea, as is evident by the descents of the Rivers, they requiring a constant declivity to carry them down; so the Sea likewise is proportionably deeper and deeper from the Shores to the middle. So that the rising of the Earth from the Shores to the Mid-land is answerable to the descent or declivity of the bottom of the Sea from the same shores to the Mid-Sea. This rising of the Earth from the Shores gradually to the Mid-land, is so considerable, that it is very likely the Altitude of the Earth in those Mid-land parts above the *Superficies* of the Sea, is greater than that of the Mountains above the level of the adjacent Lands. To the height of the Hills above the common *Superficies* of the Earth do answer in *Brerewood's* Opinion the extraordinary Depths or Whirl-pools that are found in the Sea, descending beneath the ordinary bottom of the Sea, as the Hills ascend above the ordinary face of the Land. But this is but a conjecture of his, and to me it seems not very probable, because it is not likely there should be in the Sea extraordinary Depths of that vast length and extension, as those huge Ridges of Mountains that run almost quite through the Continents. And because I have
sobserved

observed the Waters of Rivers that flow gently, but especially of the Sea to level the bottoms of their Channels and Receptacles, as may be seen in those parts of the Sea whose bottoms are uncovered at Low-water; and in dry Lands that have been deserted by the Sea, as the Fens in the Isle of *Ely*, and the *Craux* in *Provence* in *France*, &c. which appear to be a perfect Level, as far as one can ken. Though possibly the motion of the Sea may not descend down so low as those Depths, and so may not level the bottoms of them.

But against what I have said concerning the levelling of the bottom of the Sea, it may be objected, That Mariners and Divers find no such thing, but the quite contrary, viz. That the bottom of the Sea is as unequal as the Land, sometimes ten or twelve Fathoms on one side of the Ship, and One hundred on the other, as *Mr. Boyl* tells us in his *Relations about the bottom of the Sea*, consonant whereto are the Accounts of Divers. And I have (saith my worthy Friend *Dr. Tanc. Robinson* in one of his Letters to me) read in *Voyages*, of vast Rocks of Salt observ'd in some places under the Sea.

To which I answer, That I should indeed have excepted such places as are rocky, which bear a very little proportion to the Latitude
and

and Extent of the Sea, and are for the most part not far off the Land. I my self have seen so much of the bottom of the Sea, round about the Coasts of *England*, and a good part of the Low-Countreys, of *Italy* and *Sicily*, that I think I may boldly pronounce in general, That where the bottom of the Sea is not rocky, but Earth, Owze or Sand, (and that is incomparably the greatest part of it) it is by the motion of the Waters, so far as the reciprocation of the Sea extends to the bottom, brought to a level; and if it should be now unequal, would in time be levelled again. By level I do not mean so as to have no declivity (for the reciprocation preserves that, the flood hindring in good measure the constant carrying down of the bottom) but only to have an equal, uniform and easie descent from the Shores to the Deeps. Now all those Reports of Divers and Navigators refer for the most part to rocky places, For Mariners seldom found but in such places, and in shallows; and Urinators have no reason to dive where the bottom is level and sandy. And that the motion of the Waters descends to a good depth, I prove from those Plants that grow deepest in the Sea, because they all generally grow flat in manner of a Fan, and not with Branches on all sides like Trees; which is so contrived by the Providence

dence of Nature, because the edges of them do in that posture with most ease cut the Water flowing to and fro: And should the flat side be objected to the Stream, it would be turned edgewise by the force of it; because in that site it doth least resist the motion of the Water: whereas did the Branches of those Plants grow round as in Trees, they would be thrown down backward and forward every Tide. Nay not only the herbaceous and woody submarine Plants, but even the *Lithophyta* themselves affect this manner of growing, if they be any thing ramose and rise to a considerable height, as I have observed in various kinds of *Corals* and *Pori*. Hence I suspect those Relations of Trees growing at the bottom of the Sea, and bringing forth Fruit there. As for the *Maldiva Nut*, till better information, I adhere to *Garcias* his Opinion, That the Trees that bare those Nuts were of old time, together with the Land on which they grew, overwhelmed by the inundations of the Sea, and there hardned in the Earth, and afterwards cast up by the working of the Sea again. Which thing is very probable; for to this day some of those *Maldiva* Islands are now and then drowned and swallowed up by the Sea. Further I do believe, that in the great depths of the Sea there grow no Plants at all,

all, the bottom being too remote from the external Air; which though it may pierce the Water so low, yet I doubt whether in quantity sufficient for the vegetation of Plants. Nay, we are told, that in those deep and bottomless Seas there are no Fish neither: yet not because there are no Plants or Insects to feed them; for that they can live upon Water alone, *Rondeletius* his Experiment about keeping them in a Glass, doth undeniably prove; but because their Spawn would be lost in those Seas, the bottom being too cold for it to quicken there. This Answer and Discourse, though it be inserted into another Treatise, yet properly belongs to this place, to which I have therefore restored it, begging the Readers excuse for this repetition. I now proceed.

That it is consonant to the best Observations of the height of the Earth and its Mountains above the *Superficies* of the Sea; and of the depth of the Sea; that the one is answerable to the other. *Varenius* in his *Geogr.* witnesseth, p. 152. *Cæterùm ex observata hæcenus in plerisque locis profunditate Oceani manifestum est, eam fere æqualem altitudini sive elevationi montium & locorum Mediterraneorum supra littora, nimirum quantum hæc eleantur & extant supra littorum horizontem, tantum alvei maris infra eum deprimentur;*

muntur ; sive quantum assurgit terra à littoribus versùs mediterranea loca, tantundem paulatim magis magisque deprimitur usque ad medii Oceani loca, ubi plerùmque maxima est profunditas. That is, From the depth of the Ocean, as far as hath been hitherto observed in most places, it is manifest that that [profundity] is near equal to the altitude or elevation of the Mediterranean places above the Shores; that is to say, as much as these are elevated, and stand up above the Horizon of the Shores; so much are the Channels of the Seas depressed below it: or, as much as the Earth riseth from the Shores towards the Mediterranean places; so much is it by little and little more and more depressed to the middle parts of the Ocean, where the greatest depth for the most part is.

And Brerewood in his Enquiries pertinent-ly to our purpose, supposeth the depth of the Sea to be a great deal more than the height of the Hills above the common surface of the Earth. — For that in making estimation of the depth of the Sea, we are not to reckon and consider only the height of the Hills above the common Superficies of the Earth, but the advantage or height of all the dry Land above the Superficies of the Sea: Because the whole mass of the Earth, that now appeareth above the Waters, being taken, as it were,
out

* De fide
Orthod. l. 2.
c. 10.

ings of Rivers on all sides from the Mid-land parts towards the Sea (whose property we know is to slide from the higher to the lower) evidently declare so much. * This Author with *Damascen* supposes, that the unevenness and irregularity, which is now seen in the *Superficies* of the Earth, was caused either by taking some parts out of the upper face of the Earth in sundry places to make it more hollow, and laying them in other places to make it more convex: or else (which in effect is equivalent to that) by raising up some, and depressing others to make room and receipt for the Sea: that Mutation being wrought by the Power of that Word, *Let the waters be gathered into one place that the dry land may appear.* This proportioning of the Cavities appointed to receive the Seas, to the protuberancy of the dry Land above the common *Superficies* of the Ocean, is to me a sufficient Argument, to prove, that the gathering together of the Waters into one place, was a work of counsel and design; and if not effected by the immediate Finger of God, yet at least governed and directed by him. So the Scripture affirms the place to receive the Sea, to have been prepared by God, *Psalms* 104.8. Now in things of this nature, to the giving an account whereof whatever *Hypothesis* we can
pos-

possibly invent, can be but meerly conjectural, those are to be most approved that come nearest to the Letter of Scripture, and those that clash with it to be rejected, how trim or consistent soever with themselves they may seem to be: this being as much, as when God tells us how he did make the World, for us to tell him how he should have made it.

But here it may be objected, That the present Earth looks like a heap of Rubbish and Ruines; And that there are no greater examples of confusion in Nature than Mountains singly or jointly considered; and that there appear not the least footsteps of any Art or Counsel either in the Figure and Shape, or Order and Disposition of Mountains and Rocks. Wherefore it is not likely they came so out of God's hands; who by the Ancient Philosophers is said *αὐτὸν μετρίσειν*, and to make all things in number, weight and measure.

To which I answer, That the present face of the Earth, with all its Mountains and Hills, its Promontories and Rocks, as rude and deformed as they appear, seems to me a very beautiful and pleasant object, and with all that variety of Hills, and Valleys, and Inequalities far more grateful to behold, than a perfectly level Country without any rising

or protuberancy, to terminate the sight : As any one that hath on the one hand seen the Isle of *Ely*, or any the like Countrey exactly level, and extending on all sides further then one can ken, or that hath been far out at Sea, where nothing is to be seen but Sky and Water : and on the other, from the Downs of *Suffex* enjoyed that spacious and ravishing prospect of the Countrey on one hand, and the Sea on the other, comparing both objects, must necessarily confess.

2. They are useful to Mankind in affording them convenient places for habitation, and situations of Houses and Villages; serving as Skreens to keep off the cold and nipping blasts of the Northern and Easterly Winds, and reflecting the benign and cherishing Sun-beams, and so rendring their habitations both more comfortable and chear-ly in Winter; and promoting the growth of Herbs and Fruit-trees, and the maturation of their Fruits in Summer. Besides, casting off the Waters they lay the Gardens, Yards and Avenues to the Houses dry and clean, and so as well more salutary as more elegant. Whereas Houses built in Plains, unless shaded with Trees, stand bleak and exposed to wind and weather; and all Winter are apt to be grievously annoyed with mire and dirt.

3. A Land so distinguished into Mountains, Valleys and Plains is also most convenient for the entertainment of the various sorts of Animals, which God hath created, some whereof delight in cold, some in hot, some moist and watery, some in dry and upland places, and some of them could neither find nor gather their proper food in different Regions. Some Beasts and Birds we find live upon the highest tops of the *Alps*, and that all the Winter too, while they are constantly covered with Snow, as the *Ibex*, and *Rupicapra* or *Chamois* among Quadrupeds, and *Lagopus* among Birds.

4. The Mountains are most proper for the putting forth of Plants; yielding the greatest variety, and the most luxuriant sorts of Vegetables, for the maintenance of the Animals proper to those places, and for Medicinal Uses, partly also for the exercise and delight of such ingenious persons as are addicted to search out and collect those Rarities, to contemplate and consider their Forms and Natures, and to admire and celebrate the Wisdom of their Creator.

5. All manner of Metals, Minerals and Fossils if they could be generated in a level Earth, of which there is some question, yet should they be dug or mined for, the Dells must necessarily be so flown with Water,

(which to derive and rid away no *Adits* or *Soughs* could be made, and I much doubt whether Gins would suffice) that it would be extremely difficult and chargeable, if possible to work them at all.

6. Neither are the very tops of the highest Mountains barren of Grass for the feeding and fattening of Beasts. For on the Ridges of the high Mountains of *Jura* and *Saleve* near *Geneva*, and those of *Rhætia* or the *Grisons* Countrey, which are the highest of all the *Alps*, excepting the *Vallesian* and *Sabaudian*, there are multitudes of Kine fed in Summer time, as I my self can witness, having in my Simpling Voyages on those of *Jura* and *Saleve* observed Herds of Cattel there, and many Dairy-houses built, where I have been more than once refreshed by their Milk and Milk-Meats. Nay there are but very few, and those of the highest Summits of the *Alps* that keep Snow all Summer: and I was told by the Inhabitants, that one time or other, in seven or eight years space, for the most part there came a Summer that melted all the Snow that lay on them too.

7. Another great use and necessity of the Mountains and Hills is for the Generation and Maintenance of Rivers and Fountains, which (in our *Hypothesis*, that all proceed from

from Rain-water) could not be without them, or but rarely. So we should have only Torrents, which would fail in Summer time; or any dry Season, and nothing to trust to, but stagnating Water reserved in Pools and Cisterns. Which how great an Inconvenience it would be, I need not take pains to shew. I say that Fountains and Rivers would be but rare were there no Mountains. For upon serious consideration I find that I was too hasty in *concluding, because I had observed no Fountains springing up in Plains, therefore there were, or could be absolutely none; and do now grant that there is reason to believe the Relations made of such. For the whole dry Land being but one continued Mountain, and ascending all along from the Sea to the Mid-land, as is undeniably proved by the Descent of Rivers even in plain Countries; the Water sinking into the Earth, may run underground, and according as the Vein leads it, break out in the side of this Mountain, though the place as to outward appearance be a Plain.

*Observat.
Physical,
&c.

I shall now add, That though it be possible that without Mountains there may be Springs, if there should be Rains, (which it is somewhat questionable were there no Mountains, whether there could be or no, at

least in hot Countreys) yet is it probable, that most of those Springs we find in Plains or depressed places distant from Mountains may come along in subterraneous Channels from the next Mountains, and there break out. Monsieur *Blundel* related to the *Parisian* Academy, what device the inhabitants of the lower *Austria*, which is encompassed with the Mountains of *Stiria*, are wont to use to fill their Wells with Water; They dig in the Earth to the depth of twenty or five and twenty feet, till they come to an *argilla* [clammy earth] then they bore a hole in the midst of a stone about five or six inches broad, and through it bore the *argilla* so deep till the Waters breaks forcibly out; which Water it's probable comes from the neighbouring Mountains in subterraneous Channels. And *Cassinus* observed, That in many places of the Territory of *Modena* and *Bologna* in *Italy*, they make themselves Wells of springing Water by the like artifice. They dig in the Earth till they come to the Water (which stagnates in common Wells) which they draw quite out. Then within this new digged Well they make two cylindrical Walls, concentric one to another; the space or interstice between them they fill and ramm close with well wrought *Argilla* or Clay, to keep out the ambient Water; which

which done, they sink the Well deeper into the ground, and continue the inner Wall so low till the Earth underneath seems to swell by the force of the Water rising up: And lastly, they bore this Earth or Soil with a long Wimble; whereupon the Water breaks forth through the hole with a great force, so that it doth not only fill the Well, but overflows and waters the neighbouring fields with a constant stream: By this means the same Seigneur *Cassini* made a Fountain at the Castle of *Urbino*, that cast up the water five foot high above the level of the ground. It is very probable that these waters descend by subterraneous passages from the *Appennine* Mountains, which are about ten miles distant. If such things may be done by Art, why may they not also by Nature? Nay, that the like are done we find by experience in the *Lacus Lugeus*, or *Zirchnitzer-Sea* in *Carniola*, which after it is empty of water running out at holes or pits in the bottom, (which it doth yearly in the Summer time, in the Months of *May*, *June*, or *July*) in the Autumn when it rains moderately, the water spouts out of some of the forementioned pits two or three fathoms perpendicularly, but when it rains very hard and long together, especially with Thunder, then the water breaks forth with great force,

not

not only from the foresaid pits, but likewise at a thousand other Caves and Holes, spouting several fathoms high, from some perpendicularly, from others obliquely, so that there is not a pleasanter sight then this; and in a short time fills the lake. A full description and an account of all the *Phænomena* of this admirable Lake see in *Philosoph. Transact.* Numb. 191. p. 411. &c. So we see water may be brought down from the Mountains and raised up naturally in strait Channels with that force, and to that height, as to exceed all the artificial jets in the World, if not in the altitude of the spout, yet in the bigness of the stream abundantly.

This end and use of Mountains I find assigned by Mr. *Halley* in his Discourse concerning the original of Springs and Rivers, in these words: *This, if we may allow final causes* (and why may we not? what needs this hesitancy and dubitation in a thing that is clear?) *seems to be the design of the Hills that their ridges being placed through the midst of the Continents, might serve as it were Alembicks to distil fresh water for the use of Man and Beast, and their heights to give a descent to those streams to run gently like so many veins of the Macrocosm, to be the more beneficial to the Creation.*

But

But some may say, Granting there be some use and benefit of moderate Hills and Ridges; what necessity is there of such extended Ridges of vast and towering Mountains, hiding their Heads among the Clouds, and seeming for Altitude to contend with the Skies? I answer there is very great use of them for repelling the Vapours exhaled by the Sun-beams in the hot Regions, and hindring their Evagations Northward, as we have already shewn, and shall not repeat. I might add hereto,

8. Those long Series and Chains of Mountains are of great use for Boundaries and Limits to the Territories of Princes or Commonwealths, to secure them on those parts from sudden Incurfions of Enemies. As for the rudeness and confusion of Mountains, their cragged and broken Rocks and Cliffs, and whatever other Disorder there may be among them, it may be accounted for, from the manner of their first Generation, and those other mutations they have been since obnoxious to, by Earthquakes, Eruptions of *Vulcano's*, foundering and falling in of their Props and Foundations, and by time and weather too, by which not only the Earth is washed away, or blown off from the Stones, but the very Stones and Rocks themselves corroded and dissolved, as might easily

fily be proved by Instances, could I spare time to do it.

To sum up all relating to the Division and Disposition of the Water and Earth in brief.

1. I say, the Water being the lighter Element doth naturally occupy the upper place, and stand above the Earth, and so at first it did. But now we see it doth not so; the Earth being contrary to its nature forcibly elevated above it; being (as the *Psalmist* phraseth it) founded above the Seas, and established above the Floods: and this because it was best it should be so, as I shall clearly prove and deduce in particulars in another Discourse.

2. The dry Land is not elevated only upon one side of the Globe; for then had it had high Mountains in the middle of it, with such vast empty Cavities within, as must be equal to the whole Bulk raised up, the Center of Magnitude must needs have been considerably distant from the Center of Gravity: which would have caused a very great and inconvenient inequality in the Motion of the parts of the Earth: but the Continents and Islands are so equally dispersed all the Globe over as to counterbalance one another, so that the Centers of Magnitude and Gravity concur in one.

3. The

3. The Continents are not of exactly equal and level *Superficies* or Convexity. For then the Parts subject to the Course of the Sun, called the *Torrid Zone*, would have been, as the Ancients fancied them, uninhabitable for Heat and Drought. But there are huge Ridges and extended Chains of lofty Mountains, directed for the most part to run East and West; by which means they give free admittance and passage to the Vapours brought in by the Winds from the *Atlantick* and *Pacifick* Oceans; but stop and inhibit their Excursions to the North and South, either condensing them upon their sides into water, by a kind of external *Destillation*; or by streightening and constipating of them compelling them to gather into Drops, and descend down in Rain.

These are great things, and worthy the Care, Direction, and Disposal of the Great and Wise Creator and Governour of all things: And we see they are accordingly excellently ordered and provided by him.

C H A P. IV.

Of the Creation of Animals ; some
Questions resolv'd.

AS to the first Creation of Animals I have already propos'd two Opinions, both consonant or reconcileable to the Scriptures.

1. That God Almighty did at first create the Seeds of all Animals, (that is, the Animals themselves in little) and dispers't them over the superficial part of the Land and water, giving power to those Elements to hatch and bring them forth ; which when they had done, and all the Animals of these created Seeds were produced and perfected, there remained no more ability in them to bring forth any more ; but all the succeeding owe their Original to Generation.

2. Because some will not admit that God at first created any thing imperfect, we did propose that he might by his Almighty Power, out of the Water and Earth, make the first set of Animals in their full state and perfection, (as it is generally believed he did *Adam*) and give to each *Species* a power by
gene-

generation to propagate their like. For his commanding the Waters and Earth to produce such and such living Creatures, signifies that he did himself efficaciously form them out of the Earth and Water; as when he saith, *Let there be light, &c.* the meaning is not that he did permit or command something else besides himself to produce light; but that he did by his own Almighty power effectually create it. Indeed the Scripture doth in this manner interpret it self: For whereas it is said *verses 20. and 24. Let the waters bring forth, &c. and Let the earth bring forth the living creature, &c.* in the next verses it follows, *And God created great whales and every living creature that moveth, &c. And God made the beast of the earth, &c.* But now there may a further Question or two be moved concerning the Creation of Animals.

I. Whether God created at first a great number of every kind of Animal all the Earth over, in their proper Places and Climates; or only two of each *Species*, a Male and a Female, from which all the rest proceeded by generation? This latter opinion I find embraced by some modern Philosophers, and it may be made probable by several Arguments.

First

First from the Analogy to Mankind. There being at first only one Man and one Woman created, it is very likely, there were no more of any other Creatures, two being sufficient in a short time to stock the World.

Secondly, Because at the time of the General Deluge there were only two of each kind (of unclean Beasts) preserved in the Ark; and if two might then suffice, why not as well at the first Creation? And if there were no need of creating more, what likelihood that there were more created?

But the first Opinion, That there were many at first created, seems more consonant to Scripture, which in the mention of the Creation of Aquatic Creatures useth the word *Abundantly*, Gen. 1. 20. *And God said, 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 in the next verse it is said, *That the waters did bring them forth abundantly.* So that at least of Birds and Fishes there were many individuals at first created. As for Plants, certain it is that they were created dispersedly all the world over; they having no locomotive power, but being fixt to a place, and the Seeds of many of them being ponderous, and not portable by winds or
any

any other means, and yet those of the same *Species* to be found in far distant places, and on the tops of high Mountains as remote from each other, as the *Helvetick* and *Austrian Alps*.

2. Concerning the Creation of Animals there may yet a further Question be moved, *viz.* Whether all Animals that already have been, or hereafter shall be, were at first actually created by God? or whether hath he given to each kind of Animal such a power of generation, as to prepare matter and produce new individuals in their own bodies? Some are of opinion that God did himself at first actually create all the individual Animals that ever were or ever shall be, and that there is no such thing as any production of new ones. For, say they, what were that but a creation of such individuals? And what did God at the first Creation more then, if this be true, we see every day done, that is, produce a new Animal out of matter, which it self prepares: All the difference is the doing that in an instant which the Creature must take time to do. For as for the preparation of matter, that must be made fit, be the Agent never so Omnipotent.

E Besides

Besides, the Animal-parent cannot be the Agent or Efficient in the generation or forming and nourishing of the *fœtus*. Because that is a work of Art and Reason, which brute Creatures are not endued withal, nor indeed doth Man himself understand any thing of the process of generation in himself, neither is conscious of what is done in the Womb, so far is he from being the doer of it.

Again, it is most probable, if not certain, that most Animals have in them from the beginning the Seeds or Eggs of all the young they shall afterward bring forth, which when they were spent and exhaust the Creature becomes barren or effete. So we see all the female *fœtus* of viviparous Quadrupeds are brought forth with their *Testes* or *Ovaria* in them, which are esteemed parts of their bodies; and all Birds have in them from their first formation their Ovary or Egg-cluster, containing the Seeds of all the Eggs they shall ever lay. Now had the Creature a power of producing new ones, what need was there that there should be so many at first formed in them? and why might they not breed them as well afterwards, as at the beginning?

Here-

Hereupon these Philosophers argue thus: Suppose we that God did at first create two Animals, a Male and a Female: The Female must be created with its *Ovaries* or *Testes*, which (as we said) contained so many Seeds or Eggs as the Creature should ever bring forth young. So it is clear that not only the first pair, but the first generation of Animals were actually created. Again, this first generation from their first appearance had each of them (the Females I mean) its *Ovaria* or Clusters of Eggs, every one whereof had in like manner its *Animalcule* in it; so that this second generation was also created in the first. The same may be demonstrated of the third and fourth, and so on of all the generations that shall be as long as the World lasts.

Against this Doctrine it may be objected, First, That it seems impossible that the *Ovaries* of one Female should actually include and contain the innumerable myriads of Animals that may proceed from it in so many Generations as have been and shall be during the continuance of the World. Who can conceive such a small portion of matter to be capable of such division, and to contain such an infinity of parts?

But to this it may be answered, That our sight doth not give us the just magnitude of things, but only their proportion, and what appears to the Eye as a Point, may be magnified so, even by Glasses, as to discover an incredible multitude of parts; nay, some Animals there are so small, that if a grain of Sand were broken into 8000000 of equal parts, one of these would not exceed the bigness of one of those Creatures, as Mr. *Lewenhoek* affirms. And Mr. *Hook* proceeds further, and says, that he had discovered some so exceeding small, that Millions of Millions might be contained in one drop of water. If these whole Creatures be so incredibly little, what shall we think of their parts containing and contained, their Entrails and Muscles, their Ovaries and Eggs? But for a sensible demonstration of the unconceivable, I had almost said infinite, divisibility of matter, I might refer the Reader to the Honourable Mr. *Boyl* of famous memory his Discourse concerning the strange subtlety of *effluvioms*. I shall mention one or two Experiments. He dissolved one grain of filed Copper in Spirit of *Salt-armoniack*, and upon this Solution he poured so much distilled water by degrees, as till the fair and deep blew colour grew somewhat pale without being too dilute to be manifest.

manifest. And then carefully weighing the Vessel and the Water, and subducting the weight of that out of this, he found the weight of the Liquor alone, when reduced to grains, to amount to 28534, so that a grain of Copper communicated a tincture to 28534 times its weight. Now considering that the weight of Copper to the weight of Water of the same bulk is *proximè* as 9 to 1, a grain-weight of Copper is in bigness but the ninth part of as much Water as weighs a grain; and so the formerly mentioned number of grains of Water must be multiplied by 9, to give us the proportion between the tinging Body and tinged Liquor; whence it will follow, that a single grain of Copper gave a blewness to above 256806 parts of limped Water, each of them as big as it. And to prosecute this Experiment further, he mixt together equal parts of distilled colourless Water, and of the said tincted Liquor, and found, that though the colour were very faint and dilute, yet an attentive Eye could easily discern it to be blewish: whereby it appears that one grain of Copper was able to impart a colour to double the quantity of Water above-mentioned, that is to 513612 grains of Water.

Other Experiments there are in the same Discourse made in odorate Bodies : *Having*, saith he, *for curiosity sake suspended in a pair of exact Scales, that would turn with a very small part of a grain, a piece of Amber-greece bigger then a Walnut, and weighing betwixt an hundred and sixscore grains, I could not in three days and an half that I had opportunity to make the trial, discover even upon that balance, any decrement of weight in the Amber-greece, though so rich a Perfume lying in the open Air was like in that time to have parted with good store of odoriferous steams. And a while after suspending a lump of Asafœtida 5 days and a half, I found it not to have sustained any discernible loss of weight, though, in spite of the unfavourable cold weather it had about it a neighbouring Atmosphere replenished with fœtid exhalations, &c.*

But what can be imagined more small and subtile then the minute parts of the steams of Animals? The same Author in the same Tract tells us, That a good Setting Dog by his way of ranging the Fields, and and his other motions especially of his head, would not only intimate the kinds of Game, whose scent he chanced to light upon, but would discover where Partridges had been (though perhaps without staying in that place)

place) several hours before. He further tells us, That a very sober Gentleman of his acquaintance, who had often occasion to employ Blood-hounds, assured him, that if a Man had but passed over the Field, the scent would lye, so as to be perceptible enough to a good Dog of that sort for several hours after. And an ingenious Hunter likewise assured him, That he had observed, that the scent of a flying and hunted Deer will sometimes continue upon the ground from one day to the next following. He proceeds further, And now we may consider these three things; *First*, That the substance left upon the ground by the transient tread of a Partridge, Hare or other Animal, that doth but pass along his way, does probably communicate to the grass or ground but some of those effluxions that transpire out of his feet, which being small enough to escape the eye, may probably not amount to one grain in weight, or perhaps not to the tenth part of it. *Next*, That the parts of fluid Bodies, as such, are perpetually in motion, and so are the invisible Particles that swim in them, as may appear by the dissolution of Salt or Sugar in Water, and the wandering of aqueous Vapours through the Air, even when the eye perceives them not. And *thirdly*, that though the Atmosphere of one of these small

parcels of the exhaling matter we are speaking of may oftentimes be exceeding vast in comparison of the emittent body, as may be guessed by the distance at which some Setters or Bloodhounds will find the scent of a Partridge or Deer; yet in places exposed to the free Air or Wind, 'tis very likely that these steams are assiduously carried away from their fountain to maintain the forementioned Atmosphere for six, eight or more hours, that is as long as the scent hath been observed to lye, there will be requisite a continual recruit of steams succeeding one another. And that so very small a portion of matter, as that which we were saying the *fomes* of these steams may be judged to be, being sensibly to impregnate an Atmosphere in comparably greater than its self, and supply it with almost continual recruits, we cannot but think, that the steams it parts with, must be of extreme and scarce conceivable minuteness. So far the Author. To which I shall add, That by the steams, I suppose, he means the minute Particles of which the steams are compounded. Now these minute Particles themselves must be compound Bodies, because they affect the sense in a particular manner, so that a sagacious Creature can distinguish by them, not only Species but Individuals; as a good Dog
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by the foot will find out his Master, though not only several other Creatures, but several Men have passed that way. Unless we will groundlessly affirm, that those Particles are the *minima naturalia*, and that the Creature discerns them by their figure, or their different manner of motion.

A second Objection of *Brunnerus* (as I find him quoted in *Peyerus* his *Merycologia*) is this, *Si cuncta Animalium membra jam formata existant in ovo, &c.* If all the Members of Animals already formed do exist in the Egg, though for their smallness they escape our sight; I cannot conceive, how by the force of imagination alone in a pregnant Woman, can be produced sometimes Calves heads or feet, sometimes a Dog's face, or other monstrous Members; these productions being a certain and experimental proof, that the parts and members of Animals are formed and delineated originally in the Womb or Egg.

To this *Peyerus* replies, who then forms, who delineates such monsters? Shall we accuse God the Creator? But he is just, and doth not make enormous things: or will you blame Nature? That is the constant order and will of God, which never is deficient. Will you lay the fault upon the Plastick vertue or power residing in the Womb or Seed, and acting those things? But that

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is a *Chimæra*, it is nothing, it is an Idol. There remain two things to which the cause may justly be imputed, The *imagination of the Mother*, which may and doth oftentimes effect wonderful things in the Body of the tender *Embryon*; and *the Devil*. If you refuse to admit the former, you are obliged to accept the latter. And truly the Devil may, God so permitting, many ways abuse Men, and transfigure the young in the Womb, to punish the wicked and nefarious actions of degenerate Mankind indulging themselves in obscene imaginations, or preposterous and unnatural impurities and pollutions. But do these errors and enormities take away the order of Nature? by no means, for from what is rare and extraordinary and seldom happens, there is no consequence to be drawn. For though Monsters are sometimes born, nothing hinders but that we may still think, that the *Idea's* of the several *Fætus* may be præ-existent and latent in the Eggs; and the event may teach us, that those *Idea's* or *Embryo's* may by a violent cause be marred and deformed in the Womb; as Wax, though it be already figured, while it is soft is easily altered, and capable of receiving new impressions,

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But against this Answer we may thus plead in defence of *Brunnerus* ; As to what is said of the Devil, it seems to be but a shift or refuge to have recourse to when we are at a loss, and pinch't with an Argument ; as in the ancient Stage-plays, when they were put to a plunge, they were forced to bring in some *Σεῖς* *ὄτις* *μυχαῖς* to help them out. And as for the imagination of the Mother, strange it is, that that should have any influence at all upon the formation of the *Fœtus* ; the Mother not knowing any thing that's done in the Womb ; nor being conscious to her self of any power to form or act any thing there ; the *Fœtus* being an external thing to her, and no more a part of her, then an Egg is of the Hen that sits upon it, affording nothing to it but warmth and nourishment. And we see Eggs may be hatched by the artificial heat of an Oven, without the incubation of a Hen. But granting that the imagination of the Mother may transform the *Fœtus*, why may it not as well originally form it out of prepared matter ; and then what need of an Idea or minute Animalcule in the Seed ? But whatever may be said of Men, how come Monsters in Brutes, which according to *Peyserus* are meer Machines, and have no imagination or perception at all ?

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But not to lead the Reader into a Maze or Labyrinth, and leave him there, for my own part I must confess, that the Argument for the præexistence of the *Fætus's*, or their creation from the beginning, taken from the due number of Eggs that are in every Female from her first formation, and her being effete after they are spent, weighs very much with me, as I know not how to quit my self of it. And on the other hand, if those stories concerning Dogs and Serpents, &c. found in the wombs of Women be true (which are well attested) I acknowledge it very difficult, to give an Account how those Animals came to be bred or formed there. But I had rather confess my ignorance of the manner of the production of such præternatural and extraordinary things, then to permit it to have such influence upon me, as to remove me from so well-grounded an Opinion concerning the ordinary production of Animals in a natural way.

The being of a Plastick Nature subordinate to God, notwithstanding *Peyerus* makes an Idol of it, and charges those with Idolatry who do believe it, I am not afraid to admit: my Reasons for which I have given in another

* *Wisdom
of God in
the Crea-
tion.*

* Discourse, and shall not here repeat.

The new Opinion of Mr. *Lewenhoek*, that
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all Animals proceed from an Insect or Animalcule in the Male-sperm, among other Reasons, I am less inclinable to, because of the necessary loss of a multitude, I might say infinity, of them, which seems not agreeable to the Wisdom and Providence of Nature. For supposing every Male hath in him all the Animalcules that he shall or may eject; they may, for ought I know, amount to millions of millions, and so the greatest part of them must needs be lost. Nay, if we take but one Coit, there must, in uniparous Creatures at least, abundance be lost. But if we suppose the *Fœtus* to be originally in the Egg, it is not so. For the Eggs of all sorts of Creatures are so proportioned to the nature of the Animals, the time that they live, the time and number of their gestations, and the number they bring forth at all times, that they will much about suffice for the time the Creatures are fit to breed and nourish their young: so that they may, if need be, be all brought forth and come to perfection.

The End of the first Discourse.

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