ART. XIX.—"*The Anatomy of the Earth:*" *by Thomas Robinson, Rector of Ousby in Cumberland, 1694—with a Note on the Author.* By JOSEPH GREENOP.

Read at Carlisle, April 19th, 1904.

THIS quaint little work is the first of several books published on Natural Philosophy by Thomas Robinson, Rector of Ousby, Cumberland. Of Robinson's antecedents little seems to be known. He is given half a column in the Dictionary of National Biography, but the author seems to have depended upon the articles on Ousby, in Nicolson and Burn's *History of Cumberland and Westmoreland*, Hutchinson's *History of Cumberland*, and Jefferson's *History of Leath Ward*, for any account of him.

Referring to these authorities, I find that Nicolson and Burn mention him as Rector of Ousby, and in the list of the rectors of that parish he is given as Thomas Robinson, B.A.* Then follows a note, that he was author of "An Essay towards a Natural History of Westmoreland and Cumberland"; also that he was collated to the living by Bishop Rainbow.†

Hutchinson complains of the slight recognition of him by "our late county historians," apparently referring to the above.‡ He says:—

It is much to be regretted that in less than a single century, it has been found impossible, after a very diligent enquiry, to collect any considerable information of a former rector of this parish (Ousby), who, in his day, was a useful and valuable man, and whose works

* Jefferson, in his "History of Leath Ward," p. 257, says he was afterwards M.A.

† Edward Rainbow, D.D., Bishop of Carlisle 1664-1684.

‡ Hutchinson's "*History and Antiquities of Cumberland*," vol. i., pp. 224 and 225.

still reflect no ordinary credit on our county. The person here alluded to is the Rev. Thomas Robinson, who was the author, not only of the "*Natural History of Westmoreland and Cumberland*," but also of "*A Natural History of this World of Matter and this World of Life*," and the "*Anatomy of the Earth*." All these are uncommonly learned works, now become scarce, and it deserves to be noticed, how nearly many of his conjectures on sundry deep and difficult subjects, suggested almost in the infancy of experimental natural philosophy, coincide with the best received opinions of modern philosophers.

The Anatomy of the Earth, 4to, was published in 1694. It was printed for J. Newton, at the Three Pigeons in Fleet Street, and from the same publisher's advertisement in a later work by Robinson, the published price is given as sixpence. It can scarcely be called more than a pamphlet. The dedication is quaint—"To the Gentlemen Miners." It has been suggested that the "Gentlemen Miners" referred to, were the Royal Company who worked the Keswick mines. In the Calendar of State Papers, Domestic series, a copy of an indenture is given. This indenture, dated December 10, 1564, was made between the Queen (Elizabeth) on one part, and Thomas Thurland and Daniel Heckstetter on the other part, granting the latter the right to prospect for, and work minerals in this county. Thurland and Heckstetter discovered copper ore in Cumberland and worked the Keswick mines, and in these mines Robinson took the greatest interest.*

This pamphlet was followed by a more pretentious work, whose full title is as follows †—

New Observations on the Natural History of this World of Matter and this World of Life: In Two Parts. Being a Philosophical Discourse grounded upon the Mosaick System of the Creation, and the Flood.

To which are added:—Some Thoughts concerning Paradise, the Conflagration of the World, and a Treatise of Meteorology: with

* See the article on "The Colony of German Miners at Keswick," by J. F. Crosthwaite, F.S.A., in these *Transactions*, vi., pp. 344-354.

† A copy of this work is in the Jackson Library, Tullie House, Carlisle.

occasional remarks upon some late Theories, Conferences, and Essays.

By Thomas Robinson, Rector of Ousby, in Cumberland.

London:
Printed, for John Newton at the Three Pigeons, over against the Inner-Temple-Gate in Fleet Street, 1696.

It has two dedications; the first to "The Rev. Mr. William Nicolson, Arch-Deacon of Carlisle," and the second to "The Gentlemen Miners." It is 8vo., and was published at 2/6. The reference to Archdeacon Nicolson in this dedication introduces us to the "Pepys of the North," the distinguished Bishop Nicolson.* From his very interesting diary, published in these *Transactions* † we get many references to Robinson extending from 1685 to 1713. He seems to have visited Rose frequently, and the bishop refers several times to dining with Robinson at Ousby and meeting with him at friends' houses.

In 1709 he published ‡

An Essay towards a Natural History of Westmoreland and Cumberland, wherein an account is given of their several Mineral and Surface Productions, with some directions how to discover Minerals by the External and Adjacent Strata and Upper Covers, &c.; to which is annexed a Vindication of the Philosophical and Theological Paraphrases of the Mosaick System of the Creation, &c. By Thomas Robinson, Rector of Ousby in Cumberland. London: Printed by F. L. for W. Freeman at the Bible against the Middle-Temple-Gate in Fleet Street, 1709.

This was dedicated "To the Right Hon. Richard, Lord Viscount Lonsdale, Baron Lowther of Lowther." It was published in two parts, 8vo, and was sold at 3/-.

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* Archdeacon of Carlisle, 1682-1702: Bishop of Carlisle, 1702-1718.
† Vols. 1, 2, 3, 4, 5, New Series, edited by the Bishop of Barrow-in-Furness.
‡ A copy of this work is in the Jackson Library, Tullie House, Carlisle.

Thomas Robinson was rector of Ousby from 1672 to 1719. It is said of him that he was a warm encourager of village sports, especially football. On Sunday after service he presided at a kind of club at the Village Alehouse, where each member was not allowed to spend more than one penny. He is referred to as beloved and respected by his parishioners, and it is added that he was of a cheerful and convivial disposition and a man of humour.

He must have spent a considerable time in getting the facts and materials for his books together. Hutchinson says:—

Mr Robinson seems to have been much concerned in what he calls "The Inspection of Under-ground Projects of several kinds and Nature." The place of his habitation, under Cross Fell, where he says he had passed *thirty* years in the study of Subterranean Philosophy, was peculiarly favourable to such enquiries; and his abilities seem to have procured him many respectable friends and patrons, though it does not appear that he ever obtained any other preferment than this small rectory.

Robinson was concerned in the management of a colliery at Bolton in Cumberland belonging to the Duke of Somerset, and having sunk £150 in the venture, complained bitterly of the Duke's conduct with regard to him, as it would seem that the venture had not been successful.

Whilst searching in the Jackson Library, Tullie House, Carlisle, I came across a sermon published by him, entitled:—

A Sermon Against Prophane Cursing and Swearing, being a Charitable Admonition to her Majesty's Fleet. By T. Robinson, Rector of Ousby In Cumberland. "But above all things, my Brethren, swear not at all," &c.—James v., 12. London: Printed for W. Freeman, at the Bible against the Middle-Temple-Gate in Fleet Street, 1710.

The dedication is as follows:—"To the Ship's Company of her Majesty's Ship Panther, Captain John Trotter Commander."

Robinson, in opening the above, says:—

Gentlemen,

The many civilities I have received from you since I was your Chaplain have so much obliged me that I cannot make a better Return than by presenting you with this plain sermon against prophane swearing. [He continues, that he does so, not because swearing was common amongst them, in fact, he commends them for having discontinued the habit, but tells them that he does so because they must take heed lest they fall into the sin again; and concludes] I am now going to leave the charge I have had over your souls. But my prayers to heaven shall not be wanting for you and then you need not fear the power of France, nor the malice of hell.

From a reference in Bishop Nicolson's diary (Nov. 13, 1708) it would appear that his ventures in mining and literature had not been successful, and that he was in serious pecuniary difficulties, so that he had for a time to seek shelter in London. It was during this time, 1708-1710, that he had received the appointment as chaplain to the *Panther*, meantime holding the living of Ousby.

He is back in the north in 1711 as optimistic as ever, as from another note in the diary the bishop says (Oct. 25)—"Mr. Robinson on his way to the audit in expectance of £50 for his whimsical MS."

If little is known of Thomas Robinson, still less is known of his family. Unfortunately the oldest register of Ousby Church has been destroyed, so that it is impossible to trace any account of his family through that channel. Of the county historians, Hutchinson is the only one who mentions the subject:—Robinson, he tells us, had eight children, but he was unable to trace any of them. Referring again to Bishop Nicolson's diary, we find that the eldest son was at Egremont, and that another son, Will, was the bishop's godson. Mrs. Robinson was desirous of having this son placed with the bishop's brother, Joseph, apothecary of London.

For a further account of the eldest son, I am indebted to Mr. W. N. Thompson of St. Bees. It appears that his

name was Thomas, and that he was educated at Appleby School, and admitted a sizar at St. John's College, Cambridge, May 19, 1690, aet. 15.* He graduated B.A., in 1693, apparently going no further. He was presented to the Rectory of Egremont, 13th July, 1700, by the Duke of Somerset, and retained the living until 1737.† As Rector of Egremont he was ex-officio Governor of St. Bees' School, and attended for the first time in that capacity Nov. 13, 1701, and for the last time Oct. 9, 1730.‡

In conclusion, I introduce this little pamphlet, trusting that an interest may be awakened in some of our early Cumberland writers, and with the hope that further contributions may be made regarding them.

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* *St. John's College, Cambridge: Admissions, etc.*—Ed. by Prof. J. E. B. Mayor. Pt. ii., p. 120.

† Hutchinson's *Cumberland*: ii., p. 26.

‡ *Archbishop Grindal and his Grammar School of St. Bees:* by W. Jackson p. 54.

THE ANATOMY OF THE EARTH.

By *THO. ROBINSON*,
Rector of *Ousby* in *Cumberland*.

Ne miremur tam tardè erui quæ tam altè jacent.
Senec. Nat. Qu. *lib.* 1. *cap.* 30.

LONDON,
Printed for *J. Newton*, at the Three *Pigeons* in *Fleet-street*, 1694.

Licenced
January 12,
169¾.
EDWARD COOKE.

TO THE
GENTLEMEN MINERS.

Gentlemen.

I *Could not direct this small Treatise, unto a more suitable Patronage, than by devoting it to your Fraternity; the Contents of it, aiming at the more hidden, as well as visible Parts of the* EARTH. *And the Opportunities I have had, of being sometimes Underground, and the Curiosity of making that dark or occult Region, a Subject of Speculation, will, I hope, plead my Excuse, if I attempt Philosophically to describe those several Metals, Mines and Minerals, with the different Natures and Qualities of their Feeders, or Mineral Waters, which a Mechanick relates only by Rott: It is not out of any great conceit of these Notions, that I have been bold to make them publick, or Dedicate them to you; but out of a strong desire to set some greater Wits on work, to Improve the Subterranean Philosophy; and if these may but contribute to carry on that Design, and have a candid Acceptance, they will encourage me to carry on some further Projects I have in hand, which may be diverting atleast, if not profitable: I am, in the mean time,*

GENTLEMEN,

Your hearty Well-wisher
and humble Servant,

THO. ROBINSON

THE CONTENTS.

THE ANATOMY OF THE EARTH.

CHAP. I.

Of the Creation of Matter; *the reducing it into Form and Order; and the infusing a* Vital Spirit *into it.*

The first part that the Almighty created of this *Sublunary World* was *Matter;* which consisted of innumerable Particles of divers Figures and different Qualities, running a Reel in a dark Confusion. In this State they continued, bound up and hamper'd with a vast thick Fogg or Mist of a waterish substance, extending it self as far as the Moon's Vortex, until the *Spirit of God moved upon the Face of the Waters*, or (as the word in the *Hebrew* signifies) *sate on brood* on the rude Mass, and, by vital Heats and Incubations, did digest it into an orderly World: by whose infusing into it, and every part of it, a vital Spirit, it became a great Animal; having Skin, Flesh, Blood, Bones, Nerves, *&c.*

CHAP. II.

Of the Skin *of this Animal; the production of Living Creatures*, &c.

The Outer Coat and Surface of the Earth is its *skin*; which (being concocted and digested by the influence of the Sun's Beams, and having a *Plastick power* infused into it by the *Spirit of Nature*) became productive not onely of Grass, Trees, and other Vegetables, as the skins of other Animals naturally grow hairy; but, when it was in its full strength and vigour, it brought forth all kinds of Birds, Beasts and Serpents, as naturally as it now brings forth divers kinds of Insects, or, as the Skins of other Animals bring forth Lice.

For, the influence of the Sun (which the old Philosophers called the *Spirit of Nature*), striking upon the passive matter, did, by vertue of its plastick and vivisick Quality, modifie into such a Figure, as that it necessarily drew down (out of the lowest Sphere, of Life) the Seminal forms of all kinds of Vegetables; as a Load-stone draws Iron to it when it comes within the Sphere of Activity. Thus all sorts of Plants began first to peep out of the Earth, as Corn out of the Furrows; which, retaining Seed in themselves, did afterwards propagate their own Species by univocal Generation.

Again; by a Second influence of the Spirit of Nature, this same passive Matter (but now more enobled) drew down, by way of Sympathy, out of the second Sphere of Life, the Seminal forms of all Beasts, Birds, Fishes and Insects: which, by the power of their Loco-motive Faculties, began first to creep out of their Nests of Matter like young Birds with the Shells upon their heads; but, as their strength encreased, soon crawl'd abroad to feed on such other products of Nature as they found suitable for the support and gratifying of their sensitive Life.

Once more; the same Spirit of God or Nature did modifie Matter into a yet nobler Form; being not onely made capable of receiving the Vegetable and Sensitive Life, but fitted with Organs to entertain an Intellectual Soul: which, *Moses* tells us, *God breathed into it*; it being impossible for barely modify'd matter to bring down (by any Sympathy there could be betwixt them) a Soul out of the Intellectual Sphere to inform it. This excellent Creature God was pleas'd to make after his own Image—Spiritual and Immortal; capacitated not onely to be the Governour of this inferior World; but to serve him and adore him, his Creator.

The first Individuals of this noble Species were called *Adam* and *Eve*. Yet whether by *Adam* and *Eve* are meant single persons; or a whole Generation of Men and Women, which stock'd all the World at once; or, by *Adam* is to be understood onely the rational and Masculine Faculties of the Soul, and by *Eve* the Feminine and subservient, I leave to those who pretend to knowledge in mystical Philosophy. But perhaps (tho' *Moses* was certainly the greatest Philosopher that ever was in the World, and his account of the Creation be much *ad hominem*, yet) 'tis not safe to vary so far from the literal Sense of the Text. Onely; It may be urged, by way of Argument, that if Blackness be natural to the *Æthiopian*, and Whiteness to the *European*, they do not derive Original from one single Person: but, instead of that, it seems probable that the different Soyls, or various Modifications of Matter in several parts of the World, produced Men of different Colours and Complexions. Which may also be the reason why some kinds of Animals are, to this day, peculiar to their own several Countries: whence *Africa* breeds so many venemous Creatures, *Ireland* none; *Athens* Owls, *Crete* none; *Pontus* no Asses; *Scythia* no Swine, &c, and thousands of strange Beasts and Birds are proper to *America*, such as no *Greek*, *Roman or Hebrew* Author has ever mentioned, and of which some have thought it reasonable to doubt whether any of their great variety of *Species* ever came in *Noah's* Ark.

The Mountains and Planes being thus replenished with Grass, Plants and Fruit; the Forests with Beasts; the Air with Birds; and

the Seas and Rivers with Fish; *God cursed the Earth:* that is, so weakened its plastic power, that it could no longer *(propriomotu)* bring forth the more perfect and noble kinds of Creatures. But those inferior and imperfect Animals which we call *Insects* it still affords us, whenever the Matter is so modify'd, by the different degrees of heat, as to be capable of such Productions. Hence the several Months of the Year produce their several sort of Flyes; as *May*-flyes, *June*-flyes or Bracken-Clocks, and the like: Nay, every hour of the day hath its special kind of Flyes, as the heat increases or decreases.

Yea, and (possibly) its voluntary Productions do sometimes arise higher than these. For, in sinking of a Coal-Pit, I have found a large Toad in the closure of a stone near Three fathom under ground; where it could hardly have any other Generation than what was purely *Spontaneous*, being (as it should seem) produced out of a poysonous Matter enliven'd by the Subterranean-heat, and grown to that extraordinary Bulk it carry'd by a continual Attraction of pestilent Vapours, which abound in such dry open Stones as have lost their Feeders,

And as God made all the other Creatures, of an inferior Rank and Order, for the Use and Service of Man; so all these Monthly, Daily, and Hourly Productions of Insects, &c, are no less for his Benefit. For, as Toads and other venemous Animals suck up those poysonous Vapours, which, if dispersed through the Earth, would infect the Plants, and prove destructive of humane Health, if not of Life itself; so Flies and other Insects feed upon the Corruptions of the Air, which might otherwise contribute to the causing of many malignant Distempers.

CHAP. III.

Of the Fleshy-parts, *and Blood of the* Hair-Veins.

The *Fleshy-part* of the Earth is that which we call the *Grand-Cover* of it; which consists of Clay, Gravel, Sand, &c, and is fed and nourish'd with Water, as the Flesh of Man and Beasts is with Blood. So that those *Sand-bed-feeders*, and *Gravel-feeders*, which we meet with in this part, are to be esteemed as bearing the same Offices, and serving for the same Purposes, as the Blood in the *Hair-Veins* of Men.

Now, whenever this mighty Animal is wounded in the Skin or Fleshy-part, the Wounds are presently heal'd up by a Spirituous and Balsamick Ferment which circulates through all its Parts: in the same manner as Nature plays the Chirurgeon in the Bodies of other Living Creatures.

CHAP. IV.

Of the several Kinds of Metals *and* Minerals (*which are the* Bones *of this great Animal*) *their* Rise *and* Dibb, *&c.*

Under the Flesh lye the Bones, that is, Stones, Metals and Minerals: All which the Miners have reduced to seven *Genera* or Kinds, containing under them as many subordinate *Species* as there are either of Vegetables or Sensitives upon the Earth's Surface.

Stones are either *Noble* or *Ignoble:* whereof the Latter may be reckoned in three *Classes*, as being either of a Quality,

1. Terrene.
2. Unctuous and Pinguid.
3. Hot and Sulphureous.

Those of an Earthly Terrene Quality are of a round Grit, which will not calcine; and are either Red, White or Mixt. The *Red Stone* hath its Colour either from the *Day-Cover*, or from *Ruddle*, or from the *Iron-stone*; and these give the several Tinctures of Red, as Blood-red, Black-red, and Blewish-red. The White and Mixt are of the same Grit and Nature with the former: but, lying deeper, are better digested and stronger. All these lead to an *Iron-stone;* which is the Perfection, or Quintessence of 'em.

The second Class is of such Stones as will calcine, as *Lime-stone*, *Marble*, and *Chalk*; which are of a smaller Grit than those of the first kind. Under these lies often a grey Free-stone, mixed with Sulphur, and spangled with a kind of Oar: And, under this, a grey Metal; which turns quickly into another fat and black one, and immediately leads to *Coal*, the Perfection of this Sort of Stones.

Those of a *Fiery* and *Sulphureous* kind are those the Miners call *Rake stones;* being usually spangled with Sulphur, as the former are with Nitre: And these lead to Rakes or Veins of Oar, Gold, Silver, Lead, &c. All Stones of the same Grit claiming Affinity one with another, are nourished, and increase by an agreeable *Juxta*-position of Parts: So that, digging through the Day-cover, by the first Stone which lies true Dibb and Rise, you may easily discover what it will lead you to; whether *Coal*, *Iron*, or other *Metals*.

The more *Pretious* or *Noble Stones* differ in Quantity, Quality, Perspicuity, Softness, Hardness, Colour and Virtue, according to their several Temperaments and Modifications; and are reducible to three kinds, as being either,

1. Transparent.
2. Resplendent.
3. Opake.

The *Transparent* are Excrescences or Superfluities of Stones of a Fiery Nature; as Gums are of the natural Succus in several Trees of a hot Quality. The cause of their Transparency is their being of a watery substance *in esse primo;* and, by consequence, like Ice, wanting Colour: for the more colour'd any stone (even of the finest parts) is, the less transparent it must needs be; like Water tinctur'd with Black, Red and other Colours. The cause of their Hardness is their own natural heat meeting with the external heat of the Sun; which quickly ripens them into their several Degrees of Perfection.

The *Resplendent* are such as dart back and reflect Light with pleasure to the Beholder: and, in several of these, Nature may be well counterfeited by Art; as in the polishing of Marble, &c.

The most useful of all *Opake*-stones (which have the Honour to be esteemed precious) is the *Load-stone;* which is commonly found in Iron-Mines, as Cat-heads are in Stone-metals: And, as these are the Kernels and Quintessence of Stone-metals, so is the Load-stone of the Iron. 'Tis *Multum in parvo:* for in it the Spirits of the whole Mine concenter; whence, continually emitting their *Effluvia*, they attract Iron by Sympathy. For, as the Roots of Plants have an attractive Faculty whereby they suck in their proper Nourishment, so is this stone furnish'd with the powers of drawing in Iron as its proper *Pabulum.* These Spirits seizing on a small Needle rightly temper'd, will not suffer that light Body to rest (whilst 'tis placed on a point upon an even Ballance) till it stand full North and South; which is the natural position of the Load-stone, and all other Earthy Metals and Minerals that lye true.

Metals are either such as are,

1. Properly,
2. Improperly,

so called.

These latter are again divided into,

1. *Stone-Metal;* of a Nitrous and Saltish Quality; out of which Allum is drawn.
2. *Coal-Metal;* of a more Unctuous and Pinguid Nature.

Metals *properly so called*, are usually class'd under seven *Genera:* being differenc'd one from another as they have more of Water or Quicksilver in them, than of Earth or Sulphur; or *vice versâ.* For Sulphur is the Male-parent (having much Heat and Fire in it) and Quick-silver the Female, in the production of all Metals.

Those that have more of Quick-silver than Sulphur in their Temperament are Gold, Silver, Tin and Lead; and these are trans-

mutable, differing only in Degrees of Concoction. Brass or Copper, Iron and Steel, have more of Sulphur: Which, being either White or Yellow, makes all Metals of one or other of these two Colours. The intermedial Metals, or Minerals, which are neither true Metal nor Stone (but participate of the Nature and Qualities of both) are many: but the most principal of 'em are Salt, Nitre, Vitriol, Sulphur, Bitumen, Glass, Quicksilver, Sparr and Allum.

All Metals and Minerals (in their main Bodies) lye upon Flats, like Leaves in a Book or the pielings of an Onion; dibbing to the two Poles and rising towards the Æquator. From the latter part of this Rule there are indeed some Exceptions: As, 1. Where great Dykes incline them to the N.E. or N.W. 2. In flooded and broken Ground, upon the Skirts of great Mountains; where they lye confused with False and Counter-Dibbs, like Boards of Ice thrown upon the Banks of a River: which may probably be ascribed to the Devastations made by the General Deluge. 3. Upon the Coasts of the Sea or Main-Ocean; where they have their Dibb to the Sea, and Rise to the Shore: whereby Providence has not only design'd a Natural Concavity, fit to contain so large a Body of Water, but hath also wisely preserv'd the sweet Feeders (which circulate in the Viens of Metals and Minerals) from being corrupted and vitiated by the Intermixture of Salt-water.

CHAP. V.

Of Water and Mineral-feeders (*the Earth's* Blood) *the Original of* Springs, Hot Baths, *&c.*

In the Earth there is a constant Circulation of Water, as in other Animals of Blood; every particular Metal and Mineral having its proper Feeder, which, by thus circulating in it, preserves its Life, and carries in it the Spirit and Flavour of that kind to which it belongs: as may readily be distinguish'd, sometimes by the Tast; sometimes by the Colour; but most commonly by its Effects and Operations. Hence proceeds the great Variety of *Medicinal Waters*.

Whenever it so happens that several of these Feeders, of different and contrary Qualities, break from their natural Metals or Minerals, as, Sulphur, Allum-roch, Iron-stone, Coal, &c., aud meet together in one Stream, a struggle or contention immediately arises among them; and the hot Spirits of Sulphur, Bitumen, &c., being most Active and Vigorous, prevail usually over the cold Qualities of the other, and throw them into a boyling Ferment. And this is the true Cause of *Hot Baths*.

Here it will not be amiss to give some account of the Origin of *Springs*: which are neither the Off-spring of the Sea; nor are they occasion'd by Air condens'd in the Caverns of Mountains; nor are

they deriv'd from Rains or Dew; as several of the old Philosophers have variously guess'd and fancy'd. Which will be sufficiently apparent if we consider what follows. And,

1. That they do not come from the Sea is evident from the natural Dibb of Metals into the Sea and their Rise to the Shore; which makes it impossible for the Salt-water to penetrate them, or to break through those *Kells*, or thin Beds of tough Clay, which lye betwixt the several Metals, and preserve their Feeders from intermixing one with another. For, if we sink a Pit on the Sea-shore, and carry a Drift some hundreds of Yards under the Salt-water, we find still the natural Feeders of Coal or Stone without the least mixture of Salt.

2. If Springs were occasion'd by Air condens'd in the Bowels of Mountains, then in Summer they would over-flow and be more Rapid than in Winter. For, in Summer, under-ground Cold is more strong and piercing, and should (consequently) condense more Vapours, and so increase the Fountains: and, in Winter, the heat under-ground is more Active and Vigorous, and therefore ought (then most especially) to rarify the Vapours into Smoak and Mist, and thereby cause all Springs to be weak and feeble.

3. That they owe not their Original to the Dews or Rain should be (methinks) evident to the Eyes of all men; who will never be able to observe any of those which we call *Perennial Fountains* to flow either more or less upon the greatest Floods that happen. For the Rains (which are drawn up in Vapours, by the Sun's influence, from the Sea; and afterwards, being condens'd in the Air, drop down in Showers) do onely moisten and refresh the outward Skin and Surface of the Earth; and descend no further than is requisite for the necessary Sustenance of Plants, and for the supplying the common occasions of Man and other parts of the sensitive World.

It remains therefore that Fountains must have some other Original than has hitherto been assigned to them; and this (to me) appears no where more probably to be sought for than amongst the sweet Feeders of Quarries, Mines, *&c.*, which possibly will be further evidenced by the Discoveries that the next Chapter will afford us.

CHAP. VI.

Of the Tapping of Feeders; *Nature of Damp;* Firing *of Mountains, &c.*

Now tho' the most rapid Springs do break out and flow from the tops of the highest Mountains, and thence become the Heads of the greatest Rivers in the world, yet these Springs may be drawn down, and the Mountains tapp'd and dreign'd, by Cross-cutting (with a

Level-Drift) those Metals and Minerals, whose natural Feeders they are, and from whence they flow; and such Mountains, thus drawn dry, will fire of themselves. For the hot and fiery Spirits of Sulphur, together with the fat and unctuous ones of Bitumen and Coal (being now freed from the Shackles of the cool Feeders) uniting their forces, break out in Eruptions of Fire and Smoak; which has occasion'd all the wonders, we read off, at Mount *Ætna* and other flaming Mountains.

The Reason why Springs or Feeders break out more frequently, and flow more Rapidly, from the tops and skirts of Mountains, than from the plain and level Ground, is chiefly to be ascribed to the natural Position of Metals, *&c.* which on the Plains have an easier Dibb and Rise (in many places not exceeding a Yard at ten, upon the full Rise) and therefore very rarely, in such Grounds, appear at Day: whereas, on the Mountains, they commonly rise a Yard at two (sometimes a Yard at a Yard) and such a Rank rise must needs very quickly bring both them and their Feeders above ground. Besides, the height of the Mountains exposes them to the violence of Storms, Tempests and Thunder, which sometimes break their Veins: but these Accidents seldom happen on the Levels, where the Earth's Grand-cover shelters both Metals and Feeders from such violences. And thus, in our own Bodies, 'tis much easier to break a Vein in the Neck or Arm, where they lye nearest the Skin; than in the Buttocks, or any other such fleshy-part.

In the digging for Water 'tis observable that, as soon as we prick any Metal lying upon true Dibb and Rise, its Feeder will rise as high as the full Rise of that Metal; and if we dig through that into another Metal, we raise a second Feeder, which will rise a Degree higher in the Pit; and, by digging deep enough, we may bring the water to the Pit's mouth, which will save the Charge of Pumps.

Damps in Coaleries and other Mines proceed from the unctuous and fiery Spirits of Coal and Sulphur, which continually perspire out of the Coal-wall; and these, being gather'd into a Body, like so many dry Exhalations in the Belly of a great Cloud, discharge themselves in claps of Thunder, when fir'd either at a Candle, or by Clashing one against another. This the Coalyers call the *Fiery Damp:* and they usually discover its gathering together by the Candles burning blew, like flaming Brimstone, and the open Works being filled with the Smell of Sulphur. The way to prevent the Mischief of this Damp, is to hang a Grate of hot glowing Coals in the Middle of the Pit; which will presently draw and fire it, with little Damage or Danger.

Another *Damp* there is which proceeds from corrupt and stagnated Air; breaking forth out of old, crush'd and smother'd Works:

And this is usually either prevented or cured by sinking a Pit upon the old Works, and thirling into the New; whereby the Air easily circulates and purges itself.

A Third *Damp* is produced sometimes in the freshest Works by some part of the Air, being too close pent up in odd Corners, and wanting a free Communication with the rest of its Body; and this (though of the same Nature with that last mention'd, yet) has no offensive Smell, like the former, but insensibly and suddainly stifles the Work-men. All Dangers of this kind may be avoided, by being at the Charge of a sufficient Number of Air-pits and keeping the Thirlings clear and open.

Chap. VII.

Of Dykes, Rakes, Veins, Strings, *&c. which are the* Nerves, Sinews *and* Ligaments, *of this Animal.*

The Bones of the Earth, as well as those of the living Creatures that are bred and nourish'd by it, are bound together by Nerves and Sinews, and are moved by their proper Joynts: and these are they which are known to all Miners by the common Names of Dykes, Rakes, *&c.* And the natural Position of all these is from the Surface to the Center, dividing and cross-cutting all the flat Metals and Minerals.

Dykes are so called from Division or Inclosing: and these are either Greater or Lesser. The *Great Dykes* are such as inclose a whole Field of Metals or Minerals; and divide it from Fields of another Species. The *Lesser* divide Metals or Minerals, of the same kind, into several Partitions. The natural Use of both is to preserve the Feeders, and they may (not unduly) be compared to Knots in Grass or Corn; which strengthen it and preserve the Sap, wherein the Life of that Vegetable consists. For, whenever a Field of Coal breaks out upon the full Dib, it's commonly dead; till we cross-cut a Dyke, which preserves the Feeder or Life of it. Wherefore these *Dykes* (consisting of a Confusion of several Metals, mixt together irregularly, without any certain Dib or Rise) are to be esteem'd the *Joynts* of the Earth. *Rakes* are so called from raking through (or cross-cutting) of Metals and Minerals of the same Kind or Species. In the Middle of these there is always some mettalline vein or other, supported and secured by strong Sills or Sides: and this, when it abounds with any kind of rich Oar, is termed a *Quick-vein;* as, on the contrary, when it contains nothing but Spar or Sulphur, 'tis called a *Dead-vein*, or *Rake.*

The various Dispositions of these Rakes, their several Foldings and Turnings through almost every Part of the Earth's Body, shews that Nature has not only design'd them as proper *Matrixes* or *Beds*

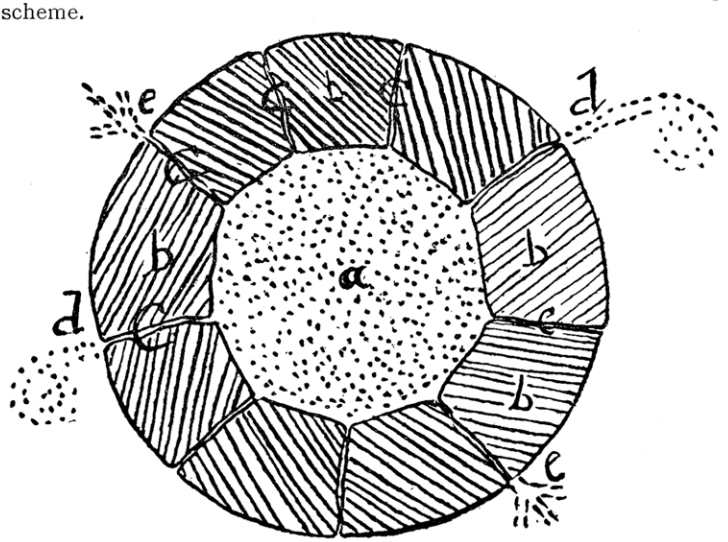
for the Production of the several Sorts of Metals: but did also intend them as Strengtheners and Binders of the whole Frame, serving the same Uses that Nerves, Muscles, *&c.* do in our own Bodies.

Chap. VIII.

A Description of the Belly of the Earth, and what it may be suppos'd to contain; with an Enquiry into the Causes of Hurricanes *and* Earth-quakes.

Though the Poets usually represent those Treasures of Nature, whence Riches and Metals are digg'd, as the innermost *Viscera Terrae;* yet Philosophers and Mathematicians, who consider how small a Proportion the deepest Shaft bears to the Diameter of the whole Earth, reflect on all the Works of Miners as Scratches rather in her Skin than Wounds in her Bowels. At least, the Advances that have hitherto been made cannot be imagin'd to reach beyond the fleshy Part: So that (as Mr Boyle and others have observ'd) the short Discoveries, which the imperfect Skill and Industry of Mankind have as yet arriv'd at, are nothing in comparison of what lies still hidden and in the Dark.

However, by that little which we have seen, we may be allowed to make a Conjecture at the Nature *of the things that are not seen.* But (especially) the natural Position of most Minerals, lying on a flat one above another, with a Dibb and Rise, must unavoidably incline us to believe that in the Middle of the Earth there is a vast Cavity or Hollow, of a Regular Multangular Figure: as in the following scheme.



Wherein we suppose the mighty Space about *a*, to be fill'd up with a crude, and undigested, Matter, endued with several different and contrary Qualities, which are in a continual Struggle and Contention among themselves. Above these we have the Crust, or fleshy Part of the Earth, made up of the several Leaves or Foldings of Stone, Minerals, *&c.* as at *b b b b*, together with the Dykes and Rakes (or Sinews and other Ligaments) at *c c c c*. Now, when in the Intestine War below, the Airy Particles prevail they break through the Joynts of the Earth in *Hurricanes*, as at *d d*. And when (on the contrary) the fiery Particles are predominant, they force their Passage the same way, as at *e e* causing thereby flaming Eruptions and *Earth-Quakes;* sometimes with that Violence as to break the very Ribbs of the Earth, swallowing up Houses and Towns. And these Convulsions are as natural to the Earth as Feavers, Agues and other Distempers, are to the Bodies of other Animals.

CHAP. IX.

The Reason of the Seas Ebbing *and* Flowing; *and the Nature and Causes of* Noah's Flood.

The End and Design of that constant and regular Motion of the Seas, which we call *Ebbing* and *Flowing*, is not only to preserve that vast Body of Water from Corruption; but also to produce a seething Heat and Fermentation, whereby Vapours and Mists are rais'd and sent abroad. These being afterwards drawn up, by the Sun's Influence, as high as the middle Region of the Air, they are there condens'd into Clouds: which swim upon the Air, until (sinking gradually by their own Weight) they again descend in showers.

The Cause of this *Ebbing* and *Flowing* is not to be ascribed to the Moon; nor to any other External Agent. For though it keeps time with the Moon's Motion in its Increase and Decrease; yet from hence it ought no more to be argu'd that the Moon contributes to the Sea's Motion, than 'tis reasonable to conclude that one Man is the Cause of another's Running, who runs the same Race with him Shoulder by Shoulder, and Foot by Foot.

The *Ebbing* therefore and *Flowing* of the Sea is its own natural Motion: which, being circular, would presently carry it round the Earth's Globe, were not its Strength lessen'd and impaired by being divided into the Upper and Lower-waters. Nevertheless; it endeavours twice in every Twenty Four Hours to complete its Motion, and overflow the Earth: but, wanting a Sufficiency of Strength, and being beaten back by the Banks of the Sea (occasion'd by the Dib of all Metals into it) 'tis as often forced to retreat.

Yet, if it should please God once more to unite the Upper and Lower-waters (as in the Days of *Noah*) they would again be able to perfect their natural and circular Motion; and so cause another Universal Deluge.

Chap. X.

Of the Diurnal Motion of the Earth.

As all other Creatures, that have in them a Principle of Life, have also a Principle of Motion and Self-activity; so has also this great Animal (the Earth) its natural Motion, whereby it turns round upon its own Center once in every twenty four Hours; exposing continually its cold Sides, to receive the warm Influence of the Sun, and the rest of Ætherial Bodies.

And it may be concluded, from Arguments of the greatest Probability, that this *Diurnal Motion of the Earth*, is caused by that vast Quantity of confus'd and undigested Matter, which is contained, and imprison'd in the *Belly of it:* For this Matter, consisting most of hot and fiery Particles, and such as are of an active and volatile Nature and Quality; which cannot rest, nor be fixed *in Loco*, must of necessity move in a regular and perpetual *Round or Circle*, by which Motion it may rationally be suppos'd, that they carry about with them the Shell, or Body of the Earth; and that the Violence, and Rapidity of their Motion, might not set the Earth on fire, God has hamper'd those brisk and active Particles, with others of a more dull, and heavy Nature.

And by thus ballancing and counterpoysing of those contrary *Qualities* of Heat and Cold, Siccity and Humidity, Gravitation and Levity, *The Motion of the Earth*, is not only made constant, regular, and uniform, but it is so firmly fixed upon its Center, that it is as impossible for it to move higher, or lower, as it is for the heaviest Rock to ascend, or the most nimble, and active Fire to descend.

Thus, as the Animal and Vital Spirits, which flow from the Heart, and by a constant Circulation through the *Veins*, *Nerves*, and *Arteries*, gives Life and Motion to our Bodies: So these subtile subterranean Spirits, whose principal Residence is in the *Center of the Earth*, diffusing themselves thoough the *Veins*, *Nerves*, *and Arteries* of it, gives not only motion to the whole Body; but by their vital Heat, ripens and digests those *Metals*, *Mines*, *and Minerals*, (which are the Constitutive parts of it) into their several Degrees, of Concoction, and Perfection.

That the Earth moves was the Opinion of some of the old Philosophers, as *Pythagoras*, *Democritus* and others: and that Hypothesis being reviv'd by *Copernicus*, is now agreed to by all (or most) of the

Moderns. And 'tis the more readily embraced, because 'tis not onely back'd with great strength of Reason (not to say Demonstration) but also removes the many gross Absurdities which clogg'd the contrary Opinion. For instance; what more ridiculous than to suppose the fix'd Stars to move (as Clavius computes the matter) no less than 176660 Miles in the 246th part of an hour? Or, what (on the other hand) more agreeable to common Sense than to believe that Divine Providence has communicated such a Motion to the Earth, as will most readily solve all the *Phænomena* of the Heavenly Bodies in their suppos'd Motions?

About the Earth would the Waters circulate; were not (as we have already observ'd) their strength and vigour abated by their Division. Round the Terraqueous Globe therefore moves the Aerial Region, or the Atmosphere; and, above that, the Moon: which is next Neighbour to this Animal, and its near Relation: being constituted of the same condens'd matter, but of a more cold and waterish Quality.

The Moon is indeed, in many particulars, very kind and Serviceable to the Earth. Not only by returning to it (at second hand) that Light, which itself does but borrow from the Sun; but also by repelling and beating down those Vapours and Exhalations which arise from the Sea, and thereby comforting and refreshing its weary and dry parts.

This cold Constitution of the Moon is the more discernable by us when she is in the Full. For then the Sun's *Globuli* of Light, being then darted back to us in a streight Line, bring with them some of the Moon's Moisture; in the same manner as a Tennis-Ball, rebounding from a whiten'd Wall, brings to our hand part of the Colour with it. And this is the Reason why we have the greatest Hoar-Frosts and Dews in the Full of the Moon; and why also, at that time, the moist Brains of such Madmen as (for that Reason) we call Lunatics are most undisturb'd.

Every of these particulars might be further enlarg'd on. Thus far the Reader is only presented with a rude Draught, and the first Lines of a New Hypothesis; which (if these Features take) may easily have its Proportions fill'd up, and be drawn at full length hereafter.

FINIS.

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THE END.
