D. (1809)

Theories of the Earth.

Democritus—[Burnet—Woodward—Whiston & Buffon] Plato

In our last Lecture we gave you the theories, or doctrine, of Thales, Heraclitus & Anaximenes. The first contended that water was the primary matter, or element out of which all things were made [some chemical Philosophers of the present day have contended that the water of the ocean is diminished in quantity, while the solid ground has encreased]. The second declared that Fire was the principle of all things; while the third, Anaximenes contradicted them both, and maintained that Air was the first materiae of creation.

We terminated our last Lecture with saying, that you might perhaps conclude that these Patriarchs of philosophy Thales, Heraclitus & Anaximenes had not left another powerful agent in all nature, wherewith to build a system yet Democritus of Abdera, who retired from the Society of men, and dwelt among the tombs, in order, more uninterruptedly to study Nature, built another, called the Corpuscular Philosophy, which by the help of Sir Isaac Newton, will probably stand the test of ages.

Democritus, was, it seems, next to Aristotle, the greatest naturae Philosopher of antiquity. He was so devoted to abstract studies, & so entirely absorbed in them, that a story was prevalent in his day, that, he voluntarily put his own eyes out, in order to meditate more profoundly. It appears:: that he flourished with great admiration & applause among the philosophers of his

of his own times; while the common people thought him mad, because he laughed at the follies of mankind, and at the farce of human life.

'Tis very difficult to give an epitomé of the system of Democritus, for all his writings are lost; and all our knowledge of his philosophy is collected from the manuscripts of others. From the scattered fragments of this extraordinary man, we learn that he proceeded only on principles & consequences, like the Geometricians; and that his diction was, if possible, more concise than that of Aristotle. The title of one of his Essays is this — "I speak of the Universe!" This appears to be the outlines of his system: —

"Having supposed an atom, or corpuscle of some dimension or figure, he attributed thereto one appetite, desire, tendency, or first motion simply; and, another comparatively; conceiving, or imagining, (at the same time) that all things naturally tended to the center of the Universe; those containing more matter falling faster to the center, & thereby removing such as contained less. [Here we have the first glimpse of the famous doctrine of gravitation: It is curious to remark that doctrines w.c appear, at one period of the world, astonishing, beyond all power of contradiction, yet shall sink & lie buried in the gulph of time, and shall then rise again in distant ages under the name of new discoveries.]

We should remember, however that what we translate atoms, were, according to the express declaration of Democritus, like no kind of thing w.c can fall under ~~used~~ the cognizance of the senses; for he pronounced them perfectly invisible, secret

secret, and concealed by nature. Atoms, said he, or seeds, and their virtue [for he supposed them to have an inherent virtue by which the could begin motion.] are neither like sparks of fire, drops of water, bubbles of air, grains of dust; nor even the fine part of spirit, or æther. Nor is their virtue [virtue is here used in its original sense, meaning vis, force, or secret energy; or that force in the system of the world that is opposed to the crushing power of gravitation] — Nor is their virtue either gravity or levity, heat or cold, density or rarity, hardness, or softness, as in the case of harder bodies. Nor is the natural motion of these "atoms" that of descent, or ascent, that of expansion & contraction; that of expulsion & connection, that of rotation, or any other motion of the larger bodies simply — yet — capable of them all: for in the bodies of these original atoms, or corpuscles are contained the elements of all bodies; and in their motion and virtue reside the beginning of all motions, and all virtues. [See Bacon]

May we not consider the philosophy of Democritus as "a light shining in a dark place"? — If the Philosophy of Democritus shrunk away under the fierce opposition of Aristotle, & the pompous declamation of Plato, it revived again in England, after a lapse of nearly 2000 years. We do not presume to say that Newton caught his first notion of gravitation from the philosophy of Democritus; or that Priestley's "physical points" can be traced to it, there is nevertheless that similarity in both, that the active mind of man cannot keep

from thinking of these antient doctrines, when he finds something so like them in the writings of these celebrated Englishmen.

It is not easy to conceive of the subtlety of Nature, without the supposition of that w.c Democritus calls "Atoms". It is remarkable that Sir Isaac Newton adopted the idea, and expressly says that it is highly probable that God in the beginning formed matter into solid, massy, impenetrable, moveable particles, or Atoms; of such sizes & figures, & with such other properties, & in such proportion to space, as most conduced to the end for which He formed them. And these primitive atoms, being solids are incomparably harder y.n any porous bodies compounded of them; even so hard as never to wear away; no ordinary power, says Newton being able to divide what God himself made one, in the first creation. While these atoms continue entire they may compose bodies of one & the same nature & texture in all ages; but should they move, the nature of things depending on them may be changed. And ∴ that nature may be lasting, the changes of corporeal things are to be placed in the various seperations, modifications, and new associations of these permanent & everlasting atoms or particles.

The learned & indefatigable Mr. Boyle, alluding to this theory of the great Newton thus sums up the leading principles of the corpuscular philosophy, w.c now flourishes under the name of the mechanical, or experimental philosophy.

1.st It supposes, says Mr Boyle, that there is but One, catholic or universal

universal matter, wc is an extended, impenetrable, and divisible substance, common to all bodies & capable of all forms. [How exactly does this conform to the doctrine of Aristotle & of Democritus.2]

2dly That this primary matter must have motion, in some, or all its assignable parts; and that this motion was given to it by the great Creator of all things, and that it has all manner of directions and tendences [Here we cannot but remark that Newton & Boyle are compelled to seek for the solution of the difficulty of accounting for the first motion in Omnipotence. They like the antients pronounced Cupid, or the first motion to have been without a known parent, for in assigning philosophical causes we always except the Deity.]

The doctrine of the fortuitous or random concourse of atoms has been deservedly ridiculed; because it involves the absurd, and disconsolate opinion of blind chance; Nevertheless it is not easy to conceive of the subtility of Nature without admitting the atoms of Democritus. Newton himself could not proceed without them. Before we quit Democritus, we would just observed to you that he furnished the antient Sceptics with all they have said against the testimony of the senses, wc may possibly have given rise to that very ingenious & elaborate work of Dean Berkley in this subject. —

You have doubtless been expecting that I would give you some account of the opinion of the sublime & eloquent Plato respecting the origin of all things. We should not do right to omit this elegant and celebrated Philosopher; neither should we be excused

excused in giving you so much from him as you could wish; because he is one of the most plausible & captivating writers among the Greeks. His style is luxurient, poetical & sublime. It shines so bright in every page, that we can scarcely examine it. There is as much difference between the writings of Plato & Aristotle, as there is there is between Euclid & Virgil. One is dry demonstration, while the other is nature & fable dressed out in all the splendor of exquisite poetry. We shall close our L. with a specimen of his Doctrine

Altho, Mt H. is one of the most pleasing occupations that can exercise the rational mind; and has this peculiar to it that no frequency of contemplation, closeness of inspection, or keeness of investigation ever brings weariness or disgust; yet these Lectures are not intended to amuse the imagination, and gratify the fancy. We offer to your view some pages in the Great Book of Nature, the study of which may be serviceable to you and to our country, especially in the line of Agriculture, Commerce and Medicine; and we have taken considerable pains to collect & arrange these theories & doctrines of the Antients, in order to save you that time & trouble which it would cost you in searching for them yourselves. Indeed your numerous duties & your time of life forbid even the attempt; and it supposes, a greater portion of previous knowledge than can be expected at your age &, under your circumstances even to attempt the collection & arrangement of antient and modern doctrines respecting the phenomena of Nature.

In the course of your Academical studies, you constantly meet with allusions to the doctrines of Thales, Heraclitus, Anaximenes, Democritus, Aristotle & Plato; and terminate your studies, and

perhaps

perhaps lives, without ever acquiring even a tolerable outline of the theories of these celebrated

Plato

Were I obliged, says Plato, to his surrounding disciples, to explain myself to the multitude, concerning the Great First Cause of all things, and the origin of the Universe; I should be compelled to speak in enigmas, or parables; but in these solatary places [for he was then at the foot of a mountain (or Cape Sunium) 4 miles from Athens], but in these solatary places, where I am only heard by GOD, and my friends, I shall have the satisfaction of speaking freely, and rendering a homage to truth.

The GOD w.c I declare unto you, is a God single, immutable and infinite; the center of all perfections; and the inexhaustible source of intelligence and being. Before he had created the Universe, before He had externally displayed his power, He was; for he had no beginning; He was in himself: He existed in the profundity of eternity.— No! (says he) my expressions do not correspond to the elevation of my ideas; nor my ideas to the sublimity of my subject.

Matter, equally eternal, subsisted in fearful fermentation, containing within itself the germs, or seeds of all things; [all evils] and agitated by impetuous motions w.c sought to unite its parts, and a destructive principle [or principles], w.c instantly seperated them: susceptible of every form, but incapable of retaining any: horror & discord wandered over its tumultuous waves.

From all eternity GOD by his infinite goodness, had decreed to create the Universe; according to the model ever present to his eyes; a model immutable & perfect. What-ever

Whatever in the Universe is the object of our senses; and all that escape their activity, was traced in a sublime manner, in the first plan: and as the Supreme Being conceives nothing but what is real, it may be said, that He had produced the world before He had rendered it visible. Thus from all eternity existed God, the author of all good; and matter the principle of all evil; and that model, according to which God had determined to reduce this unruly matter into order.

When the moment decreed for this great work arrived, the Eternal Wisdom issued His commands to Chaos; and instantly the whole mass was agitated by an exuberant or fructifying and hitherto unknown motion. Its parts, w.c had before been seperated, by an implacable hatred, discordance (or repulsion) hastened to unite and to enchain each other. [a figurative mode of expressing attraction] Fire, now for the first time, shone in the midst of darkness; and the air seperated itself from the Earth and from the waters: and these four newly created Elements were destined to form, or enter the composition of all bodies. To direct their motions God, who had prepared a soul, composed in part of the Divine Essence, and in part of material substance, clothed it with earth, the sea and the gross air, beyond which he extended the deserts of the Heavens. From this intelligent principle, [this Anima Mundi of the Stoics] placed in the center of the Universe, issue, as it were, rays of flame, w.c are more or less pure, as they are more or less distant from their center; w.c insinuate themselves into bodies, and animate their parts; and which, when arrived at the boundaries of the world, diffuse themselves over its circumference, and form all around it an orb, or crown of Light.

Scarcely says Plato, had this Universal Soul been plunged

into this Ocean of nt.

* Then the Author of all things addres's the ministering Spirits, or Genii, to whom he had confided the Government of this lower world!! Ye Gods! who owe to me your birth, listen to my com-mands! You, yourselves have not a title to immortality; but you may participate it, by the power of my will! It remains, to give per-fection to this grand whole, (or system) to fill with inhabitants, the Earth, the Sea & the air. Were these creatures to receive life immediately from Me, they w^d be exempt from the Empire of Death, & become equal to the Gods themselves. I therefore commit to you the care of producing them. Delegates of my Power! unite to perishable bodies, the spirit, or germ of immortality, w^c you shall receive of me. More especially form Beings, who may command over other Animals, & being subjected to you, live & encrease by your benefactions; and after their death, let them be united to you, & share in your happyness." —— Then was it decreed that mortals, capable of knowing & serving the Divinity should be born; — that virtue should consist in triumphing over the passions; and that the just, after death, should pass into the Stars; & there enjoy unalterable felicity; and that the vicious & unjust should be changed, or trans-migrated into the bodies of diff^t animals, & not restored to the primitive dignity of their existence, untill they have learnt to become obedient to the voice of reason!!" After these immutable Decrees, the Supreme Being, disseminated Souls in the Planets, & having commanded these inferior Gods to clothe them, successively wth mortal bodies, to provide for their wants, & govern them, He again retreated into his eternal repose!! ——

into this ocean of matter, w.c conceals it from our view, when it tried its strength, and several times shaking & rapidly turning on itself the mighty whole, it drew after it the entire or Solar System Universe obedient to its effects. The Supreme Being surveyed His work with pleasure, & having compared it with the model saw that "it was Good!"

But there was one exalted property which this material world could not receive, namely Eter-nity, the essential attribute of the intellectual world, of which the visible was not susceptible. God gave it: something similar: He created Time, that moveable image of immoveable eternity. Time w.c incessantly begining & ending the circle of days and nights, months & years, seems, in its course, to know neither begining nor end, and to measure the duration of the sensible world, as eternity measures that of the intellectual. Time, which would have left no traces of its presence, had not visible signs been appointed to distinguish its fugitive parts; and to register its motions. With this view the Supreme Being enkindled the Sun, and impelled him with the other Planets through the vast solitude of the air, whence that Luminary inun-dates Heaven with its splendor! sheds his light on the paths of the Planets, and fixes the limits of the year, (as the Moon determines those of the Months.) *

Then Plato describes the author of all things addressing the angels or Genii, to whom He had com-mitted/confided the government of the innumerable worlds. but we shall not rehearse it, lest you might receive this splendid, pious, and sublime effusion of a man of genius for Nat History — It may: bear a comment that is drawn from Nat History.

(* See Barthelemi's Anacharsis)

By the term Elements, we mean the first principles of which all bodies in the system of Nature is composed. These are supposed to be few in number, unchangeable in their nature, and by their combinations to produce that endless variety, w^h every where, and incessantly meet the observers eye. [See art. Element. Ency. Am.]

Democritus, Plato, and some other famous Philosophers of antiquity fixed the number of elements to four; these are Fire, Air, Earth & Water; each of which they imagined was naturally disposed to hold its own place in the Universe. Thus the Earth, as the heaviest, naturally tended towards the center, & occupied the lower parts; the water, as approaching next to it in gravity, was spread chiefly on the outside of the earth; the air, being more subtile & rare, occupied the middle place; while the fire, being still more subtile & active, receded to the greatest distance of all, and was supposed to compose the planets & stars. This system was extended to all the productions of nature. Thus Meteors, were supposed to be produced by from a combination of fire & air; animals of earth & water; and those that had warm bloods, a portion of the element of fire; and thus they went on, explaining some of the most striking qualities of the several productions of Nature, from the different proportions of the four elements they contained.

We must admit that there is some foundation for this doctrine of elementary bodies, there being some principles in Nature which appear to be exempt from change or decay; and which can be mixed or changed into different forms of matter. The inattentive observer would form a contrary opinion, when he considers the numerous tribes of Fossils, Plants & Animals, with the wonderful variety that appears among them. He would be apt to conclude, that

that Nature employs a vast variety of materials in producing such prodigious diversity. But if he patiently scrutinize into the origin of this apparent ~~variety~~ diversity, he will find that these bodies, w.c seem the most different from each other are at bottom nearly the same. Thus e.g. in the human body, the blood, chyle, milk, tears, bile, and indeed all the fluids of the body, together with all its different solids, are made out of the sober aliment of bread & water. All the various juices in a cow or horse, are made from grass & water, and all the various parts of every plant from water & the light of the Sun. (*)

Although this ancient system of the four elements is very beautiful, yet we in the present day have some doubts whether these four substances be really elementary bodies [Paracelsus & the chemists of his day speak of salt, sulphur, earth and mercury as the four elements of all bodies.]

We shall attempt to shew hereafter, that whatever the Elements are they must necessarily be, as Democritus said 2000 years ago invisible, or imperceptible by any of our senses; and we shall only observe now that Fire, or to speak more correctly, the [caloric] the fluid matter of heat, seems to be the primary, or original element; but we must not not risk puzzling your at this early period of our course with this element, nor with oxygen, or acidifying principle, or phlogiston spoken of by modern philosophers & chemists —; but shall leave those subjects for the present, and give you in our next Lecture the theories of four celebrated world builders.

[* See the article Element, & Chemistry N.o 26 in Encyclop. Amer.]