Mosaic account of the World &c

"Of all the powers in Nature Heat is the chief" says Ld Bacon. Whoever reflects on the wonderful process of vegetation and of animation, will be convinced of its truth. But it has not been generally known & acknowledged that fire, or heat was the great and powerful agent producing, reducing, & renovating all the metals, & the various productions mineral bodies that lay under our feet. We shall see hereafter that it is fire, or heat that expands the seed & produces a plant; and that evolves the egg and produces ~~the~~ an animal.

We must do homage to Heraclitus of antient times who contended that fire was the prime agent, or principle of all things; for that water itself was full of fire; for, if fire be withdrawn ~~from~~ it turns to ice. It may appear strange, at first view, that Nature should make use of the same agent to create and to destroy; and that that w^c has only been looked upon as the consumer of things, should, in fact, be the very power which produces them! Yet so it is in respect to fire.

We s^d in our last lecture, that the fiery operations in the interior of the earth was not fortuitous, or accidental; but natural and regular operations. We consider them as chemical processes conducted by Nature for producing, changing and renovating the various materials of this globe. It is by the long continued process of heat that the woody & ochreous earths are slowly elaborated into the Diamond of Golconda.

If it were allowable to indulge in a poetical flight, says Chaptal, we might affirm that the element of Fire, so far from

far from being lost by the dispersion of the combustible principles of vegetables, becomes purified to form this precious stone, so eminently combustible; that Nature has been desirous of proving that the terms Destruction & Death are relative only to the imperfection of our senses; and that she is never more fruitful yn when we suppose her to be at the moment of extinction".

Dr Hutton has rendered it probable that one of the ends of Providence in placing an internal fire in the body of this Earth is by its irresistable expansion to throw up from the deep a mass of permanent land, for the purpose of maintaing plants & animals. He thinks, when there is a redundancy of fire it escapes by Volcanoes. Hence he observes that a Volcano is not made to frighten superstitious people into fits of piety & devotion, nor to overwhelm devoted cities with destruction. A Volcano should be considered as a spiraculum to the grand subterraneous Furnace, wisely directed to prevent more fatal accidents yn their own eruption. These spiracula prevent the unnecessary elevation of land, and moderate the effects of earthquakes

Whitehurst has advanced another theory; and Sir Wm Hamilton has obliged the world by his speculations on Volcanoes & Earthquakes, and by his curious attempt to ascertain the age of the world by the strata of lava; each stratum he supposes must have remained 1000 years before it could have produced vegetables. Twelve strata have already been discovered, wc makes our Earth, according to his theory, to have existed 12,000 years. Sir William's account of the effects of Earthquakes in Calabria, is :: a valuable piece of natural history. — In discussing philosophical subjects

We have thus, given you a sketch, or cursory view of the most celebrated theories of the Earth, and we are far from being sorry that we are delivered from the cloudy regions of con-
-jecture, and that we are emerging from "darkness" into mar
v-velous light." In discussing philosophical subjects, I hardly think it is fair to take shelter behind the impregnable bul-
-warks of holy scripture. Nevertheless I see no the impropriety of having recourse to the sacred writings, while their descriptions are consonant to what is deemed, at this day, sound philosophy. You doubtless anticipate our subject; and already perceive that we have reference to the account of the creation of the world by Moses. There is certainly no cosmogony, or birth of the world written by any ancient or modern, with so much simplicity, (modesty) & sublimity, as that given us by Moses; and although you have read it, or heard it read a thousand times, I will venture to repeat it, only extending or paraphrazing some of the passages in hopes of making it more clearly understood.

* In the beginning GOD created the heaven & the earth; and com.
-mentators tell us, that the text implies, made out of one common or primary matter. And the earth was without form & void. i.e without order, beauty, or furniture; the stamina, or principles of future pro-
-ductions, being all blended together, constituting what the heathen Philo-
-sophers & poets called chaos;- and darkness was upon the face of the deep; i e, deep waters wc surrounded the solid globe, occasioned by the dense vapours wc rested on the deep waters. And the Spirit of God moved upon the face of these deep waters; and made a violent

[* See Orton's exposition.]

agitation

*Plato, after describing the first act of creation, as related in our last lecture, says — But there was one exalted property w.c this material world could not receive viz Eternity, the essential attribute of the intellectual world, of w.c the visible was not susceptible. God gave it, however, something similar — He created Time, that moveable image of immoveable Eternity: time w.c incessantly begining & ending the circle of days & nights, & months & years, seems in its course, to know neither begining nor end, & to measure the duration of the sensible world, as eternity measures that of the intellectual: time w.c w.d have left no traces of its presence, had not visible signs been appointed to distinguish its fugitive parts, & to register its motions. — With this view the Supreme Being enkindled the Sun, & impelled him with the other Planets through the vast solitude of the Air, whence that Luminary inundates Heaven with its splendor! sheds his light on the paths of the Planets, & fixes the limits of the year, as the moon determines those of the months" — (see Barthol. Anacharsis)

agitation in order to (thin) and dissipate those vapours, & to seperate the fluid from the solid ~~mass~~ matter, of which, together with luminous & fiery particles, this chaos seems to have been compounded. In this state of utter darkness GOD said 'Let there be Light' and there was light; i.e the gross particles were dispelled, and allowed the Sun, already created, to illuminate & warm the earth. And then God equally divided the light from the darkness - By what means? By giving the earth its diurnal motion.—

And God said 'let there be a firmament; i.e an expansion or atmosphere, in the midst of the waters, and let it divide the waters from the waters; i.e the waters in the clouds from the waters upon the earth; so that part of the waters ascended by the agency of the Sun into the clouds, and part remained for the seas.

And God said, Let the waters under the heaven, wch at first equally overspread the Earth, be gathered together into one place, i.e kept within their appointed channels, or bed of the sea, and let the dry land appear, in the form of continents & Islands. —— And God said 'Let the Earth receive power to bring forth tender grass of itself, i.e without being sown, the herb yielding seed, and the fruit tree yielding fruit, after its kind, i.e its peculair or specific kind, whose seed is in itself upon the earth, so that it shall henceforth propagate its own species; and it was so— Finally God said 'Let there be Lights, i.e luminous bodies appearing in the firmament (of the heaven) to divide the day from the night; and let them be for signs, i.e marks of distinction between one portion of time and another, and for seasons, i.e to produce & distinguish spring and summer & autumn & winter, and for days & years; by their several motions to make

to make the days longer or shorter, to distinguish between day & day, month & month, year & year; and to shew how to compute time and it was so - and God saw that it was good, i.e that is agreeable to the model conceived in the Divine mind; a phrase exactly corresponding is used by Plato, when speaking of the first creation.

Now this account of the first creation is taken undoubtedly from the most ancient book in the world. It is remarkable that there is neither fable, metaphor or figure of speech in it; but a plain simple, but dignified narrative, without a single word, or sentence that shocks the understanding, or that passes one iota beyond credibility.

Now, should we attempt to theorize on this account of the first creation, I believe that facts & a sound philosophy would bear us up. Let us suppose, with Bishop Watson, that this terraqueous globe was not surrounded with any atmosphere, and that by an approach to the Sun, (or an increase of the sub-terraneous fires] it should become exposed to a heat four times greater than the medium heat of our summer (viz. 60°); What would follow? Why an atmos, or vapour sphere would be quickly formed around it. All the water on its surface, the juices of plants, animals & minerals, in a word, the attenuated particles of all terrestrial things would be raised up in the form of exhalation or vapour, and whilst that heat continued, they would be kept suspended in an elastic state, and would constitute just such an atmosphere as now surrounds our earth, w.c is a chaos of all things; only it would require a greater degree of heat than now exists to keep the particles from coalesing into one heterogeneous mass.

On the

On the contrary let us suppose, in the present state of the atmosphere, a very great degree of cold, that should continue unabated for any length of time: What would follow? Why all the water upon the surface of the earth would be changed into a solid transparent stone, wc. might be dug out of its quarry, & employed in building, as well as granite or marble. Nay farther the particles of air, would be brought closer together & even consolidate: And if we imagine the cold to be indefinitely encreased, what reason can there be against supposing says Bishop Watson, that the whole atmosphere wd. be reduced to a solid state, forming an heterogeneous crust upon the surface of the earth? Such a crust, supposing it to be as dense as marble, would be, by estimation about 12 feet thick. From this well grounded theory you will perceive that water, air, and even earth, are but variations of the same element, or primary matter, modified by heat, or the action of the Sun.

(See Watson's essays)

We find then, in the most unexceptionable accounts of the creation, wc. is that given us by Moses, that the atmosphere immediately succeeded the formation of light. Now if the effect of light was heat, then such particles of the shapeless chaos, as were capable of being ~~elevated~~ evaporated with that degree of heat, would be elevated in an elastic state, and a division or seperation would be made between the waters wc. were of a nature subtle enough to be converted, by that degree of heat, into an elastic fluid, constituting the Atmosphere; and the waters which could not be evaporated in that degree of heat,

but which

but which still remained covering the surface of the globe, and which was soon afterwards collected into one place, and denominated the seas, or ocean.

Newton favoured this hypothesis of the formation of our atmosphere by the heat derived from the Sun. He says, "I conceive the confused mass of vapours, air, and exhalations, which we commonly call the Atmosphere, to be nothing else but the particles of all sorts of bodies, of which this earth consists, seperated from one another, and kept at a distance by a principle of repulsion," (or heat).

I have said, and I repeat it, that I do not deem it fair, in discussing philosophical subjects, to take shelter behind the impregnable bulwarks of the sacred scriptures; nor to attempt to account for miraculous deeds of Deity by natural causes; I nevertheless maintain that it is, at least, pleasant to find some of the wonderful deeds recorded in the Bible, consonant to what is now deemed sound, experimental philosophy. The narrative of creation, by Moses is the most ~~[illegible]~~ agreeable to common sense, and is less incumbered with absurdities yt. any given us by the heathen poets or Philosophers, not even excepting Plato's, wch. so nearly resembles that of Moses, that many have supposed this celebrated Philosopher must have seen the mosaic book of Genesis, wch. appears to me as probable, as that Virgil had seen the book of Isaiah. —

Instead of imagining what the world has been, ~~rather~~ let us rather consider it as it ~~really~~ now is; and here it is remark-able, that it should appear so different to the eyes of dif-ferent beholders. The surface of this immense globe ex-hibits to our observation heights, depths, plains, seas, marshes, rivers, caverns, gulfs, volcanoes; and we can discover in the disposition of these objects neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, ~~minerals~~, stones, bitumens, sands, earths, waters, & matter of every kind; placed, as it were, by mere accident, and without any apparent design. Upon a nearer & more attentive in-spection, we discover sunk mountains, caverns, filled up; shat-tered rocks; whole countries swallowed up; new islands emerged from the ocean; heavy substances placed above light ones; hard bodies enclosed within soft ones: in a word, we find matter in every form; dry & humid; warm & cold; solid & brittle, blended in a chaos of confusion; w.c can be com-pared to nothing but a heap of rubish, or the ruins of a world." We have already remarked on Buffon's reluctance of admitting any thing like intelligence, or a preconceived design in the creation. With him it is all blind chance, or mere accident. "When I speak, said he, of the Creator, I only mean the energy of Nature, which results from the two great Laws of nature, attraction & impulse".

The surface of the globe, and its internal structure, as far as we know of it, appear to our view to exhibit a very different picture from that one rapidly sketched by the French Philosopher. We think we dis-cover design, even in those parts w.c Buffon considers to be mere "rubish".

We are taught to believe by Astronomers as well as Geographers that the terraqueous globe is not of a completely spherical form, but that it protuberates, or bulges out about the Equator, and that it is proportionably flattened at the poles. The surface of the globe is marked with considerable irregularities: In some places we find vast plains, intersected with hills & vallies: in others we find long chains of mountains, from whence proceed Rivers, wc after watering various countries, discharge themselves into the sea. Some writers carried by the imagination alone, back to that epoch when this globe issued from the hands of the Creator, contend, that these mountains are as old as the globe itself, while others suppose they were formed at the Deluge.

If you consult the artificial globe, you will see what a vast proportion of it is covered with water. There have not been wanting writers, who have found fault with Providence for committing a waste, by rendering so much of our globe useless, wc they assert, could be more economically filled up, by making more dry land! But, I believe, we could make it appear that these are but short sighted Naturalists; for there is, as we shall attempt to shew hereafter, an evaporation, or distillation, and circulation of water between the ocean, atmosphere, and Earth, chiefly for the sake of vegetation, so exact, that this too, like every thing else in Nature, which we understand, is dealt out by weight & measure, by HIM, who Isaiah says, hath measured the waters in the hollow of his hand, and the mountains in scales!! —

Let us now "break ground", and from viewing the surface of the Earth, let us see if we cannot give you an account of its contents. But this is not a very easy task. — A mus-quito, attempting to penetrate with his feeble probos cis the huge body of an Elephant, is no unapt simile, says Bishop Watson, of little man boring, with all his might, into the body of this globe! For in truth, he can hardly penetrate the hide, or crust of it, if by that name, we may dissignate those strata or layers, w^c are the residence of metals and other useful Fossils. —

You all know that the cavity formed by art in the earth for the extraction of metals, coal, or salt, is called a Mine The deepest mine, we have any account of is in Hungary. It is about 3,000 feet deep; w^c bears but a small proportion to the centre of the earth, w^c is, you know, about 4,000 miles: all that is deeper y^n 3,000 feet is dark conjecture. We may suppose with Kircher, that there is there one dreadful Vol-cano; or with Dr. Burnet, that there is one vast abyss of waters; - or with Whiston; - that there is a great sphere of hot iron; - or with Buffon, that the center of the Earth is filled with a huge globe of glass; or with some others, that there is an enormous magnet, or Loadstone; or — we may sup-pose — almost anything. We have no certain intelli-gents from these infernal regions, but what is brought us by Volcanoes. Instead of conjecturing therefore, let us listen to the report of facts, as delivered by the best Mine-ralogists.

The most common disposition of the layers or strata of the earth, wc lay one over another like the coats of an onion, is this; — The first is that light coat of blackish mold, wc is usually called garden-mold. This black-mold is formed from vegetables rotting upon the ground, especially their leaves. And as they draw more of their nourishment from the air & water than from the earth, it follows that they give more to the soil than they take from it. [The Roman roads, or high ways, of wc there are some remaining in France, & in England, are paved with flat stones, Dr Goldsmth says that he has observed some in Burgandy wc had a bed of this black-mold gathered over the pavement, of more than a foot thick, on which Trees of a considerable size were supported] If from this coat of garden-mold we cut down perpendicularly we most commonly find — gravel or sand; then clay or marl; then coal & in England chalk, then marbles, ores, sands, or gravel and these alternating, but growing more & more dense, the deeper their position; and the deeper we go these layers grow thicker & thicker. A well dug at Amsterdam of 230 feet, these substances were found in succession viz

7 feet of vegetable earth	10 — of sand
9 — of Turf	2 — of clay
9 — of soft clay	4 — of white sand
8 — of sand	1 — of soft earth
4 — of earth	14 — of sand
10 — of clay	8 — of clay mixed with sand
4 — of earth	4 — of sea sand mixed with shells,

then 102 feet of soft clay; and 31 feet of soft sand. But they do not lay exactly thus in every region, but vary considerably, even in the same district. —

Beside the perfect, the imperfect, & the Semi-metals, there are many things under the surface of the earth highly serviceable to man. There is coal, salt, sulphur, marbles, lime, antimony & several other medicines, not to mention paints, and materials for making glass & for potteries. These articles might, some may say, have been better placed on the surface of the earth, to be near at hand, and ready for the use of man, without the labor of digging into the earth for them. But then the vast quantity of them would almost cover the face of the earth & impede agriculture, whereas now our land is happily disincumbered from such troublesome furniture; and the surface of the earth disengaged from those embarrassments, wc. would otherwise have obstructed all husbandry & impeded the progress of vegetation, without a great supply of which neither man, nor the brute creation could subsist. —

[Des spectacle de la Nature]

Instead then of the confused heap of rubish, as it appeared to the prejudiced eyes of Count Buffon, let us see whether we cannot discern a design, or wise provision in the placing the various articles of the mineral kingdom.

We find the Metals, and a thousand other articles, wc. were designed ~~for~~ as a never failing treasure for the service of all succeeding ages, are carefully locked up in a vast Storehouse under our feet; where we are sure to find them, in all cases of great necessity. Not chance therefore, or accident, but we believe Providence has so directed it, that these articles are not buried at such a depth as to be inaccessible to civilized man; but has placed them at such

convenient

*The most celebrated works of art are not vast in proportion to the muscular strength of men, but in proportion to the perfection of their instruments. Without the science of mechanics, & the inventions of its machines, there could have been no great monuments of art existing. Without iron, says the Abbé Raynal, there can be no hammers, pincers, anvils, forges, saws nor axes; no works in metal, that can be looked at with approbation; no masonry, no carpenters or joiners work, no architecture, nor engraving or sculpture." Raynal's acc. of Mexico Vol. 3. 303.

convenient distances below the surface, as that the coat of earth above them should have a sufficient depth of soil as is suitable to produce vegetables, & yet not to be of such a thickness as to prevent his digging into those subterraneous magazines, where immense riches are deposited for his use. Here then is an example of Nature's Oeconomy, by means of which we enjoy a double advantage; and the same spot of Ground yields us vegetables for food; coal for fuel; metals for instruments; stone, or marbles for our habitations; antimony for medicine, and Salt for everything!

We said that these various articles of the mi-nerae or Fossil Kingdom were placed at such depths as to be accessible to civilized man; for the use of the metals and civilization go together — hand in hand. Those Nations, or Tribes who can not dig into the earth, & obtain iron ore, and who can not smelt & refine it are yet in a state of barbarism. But those who can smelt & refine it, and form it into instru-ments have emerged from that state, and risen into civilization. The Spaniards found the Mexicans and Peruvians half civilized; that is, they manufactured gold, silver & copper, but not iron. So true it is that the history of iron (w.c includes the magnet, or load stone, for that is a species of iron ore) — from its birth in the earth to its perfection, in its finest manufactury of Steel, is in fact the history of civilization. As soon as a people or nation know how to exalt iron into steel, and to make therewith hammers, ploughs nails swords & other weapons of war, they put themselves di-rectly in the rank of civilized nations. And if

You need not be told that steel is iron highly purified and refined so as to lose indeed half its weight in the operation. Beside exalting steel to a temper so as to make it nearly as hard as a diamond, by which some cutting instruments maintain an almost indestructable edge, it is of prime importance to mankind in the form of the mariners com-pass; for steel is capable of acquiring more of the mag-netic quality than simple iron; ~~hence~~ The mariners-compass cannot be made without needles of steel. Hence the brilliant exclamation of the British Lucretius

Hail adamantine Steel! magnetic Lord!
King of the prow, the ploughshare & the sword!
True to the pole, by thee the Pilot guides
His steady helm amid the struggling tides;
Braves with broad sail the immeasurable sea,
Cleaves the dark air, and asks no star but Thee!

[Darwin's Bot. Gard. p. 79]

* Incorrect —