

A SYSTEM
OF THE
CREATION OF OUR GLOBE,
OF THE
PLANETS,
AND THE
SUN OF OUR SYSTEM,

Founded on the First Chapter of Genesis, on the Geology of the Earth, and on Modern discoveries in that Science, and the Known Operations of the Laws of Nature,

AS PROVED BY THE DISCOVERIES OF
LAVOISIER,
AND OTHERS, IN PNEUMATIC CHEMISTRY, BY
M. ARAGO'S

ASTRONOMICAL DISCOVERIES LATELY MADE AT THE PARIS
OBSERVATORY: BY

PROFESSOR FARADAY'S

Recent lecture on "Further Researches in Magnetism," and other discoveries in Modern Astronomy.

THE NINTH EDITION, REVISED AND ENLARGED,
BY HENRY TAYLOR.

And containing the great discovery of the cause of the Magnetic variations of the Marine Compasses by the British Association of Great Britain.

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PREFACE

TO THE FIRST EDITION.

IN my endeavours to reconcile the present Geological appearances of our Earth, with the Mosaic account of Creation, the only certain means that appeared to me, were, the adoption of that construction of the first verse of Genesis, which I have stated in a part of this work, and it will be seen by an extract from the *Quarterly Review* of April last, inserted below, that this construction has been confirmed and sanctioned by the writings of Professor Buckland, Doctors Pusey and Chalmers, Bishop Gleig, and other eminent Divines. These authorities have removed the diffidence I had long felt to publish a different construction from what has hitherto prevailed.

The original manuscript of this work was composed between the years 1819 and 1825. The writings of the above reverend gentlemen were published, I believe, several years afterwards, and none of them had been perused by me until a few days since, when I met with the review of the Bridge-water Treatise of Dr. Buckland.

In the summer of 1829, I presented a prospectus of the work to Archdeacon Mountain, and to the Bishop of Quebec. The former kindly complimented me on it, and the latter recommended my publishing it in London, for which I was soon to embark. I arrived there in October of same year, and presented the prospectus to the Lord Bishop of London, from whom I received a note, by which he was pleased to commend the design of the work. I subsequently presented the prospectus to several of the principal Booksellers, who, on learning that the size of the work would be that of a pamphlet, informed me that the cost of advertising was so great that no pamphlet would pay it; and my circumstances preventing me from incurring that expense, I gave up the intention of publishing

In the mean time, a reverend gentleman of the name of Fairholme, was publishing a theological work connected with geology, and I enclosed to him a copy of the prospectus, and in a letter I received from him, dated October 14, 1833, he says,—“With regard to the creation of our earth or of the sun, and other members of the Solar System, I have neither found in the work of any writer, nor can I conceive the smallest grounds on which to form a consistent theory, nor indeed do I conceive that it belongs to the science of geology at all.” Scripture has given us no insight into it. The existing laws of nature are equally silent, *and yet, these laws must have existed from the beginning.*” He then assumes, “that the granite mass has been formed before the existence of organized beings, as their remains are never found in it,” an opinion which, I think, the reader will find answered in the body of the work; and the assertion, that neither Scripture nor the laws of nature give any insight into the creation, appeared to me so futile, that I have inserted the above extract, solely to prove that the system I had formed, had not, at the date of that letter, been *yet* made by any other writer.

By the following extract from the *Bridgewater Treatise* of the Rev. Doctor Buckland, published long since the date of Mr. Fairholm’s letter, it will be seen, *that* my construction of the 1st verse of Genesis, has been sanctioned and confirmed by the authorities mentioned above.

And having presented my prospectus to the persons above named, and also to the Royal Institution in Albemarle-street, London, in 1833, I consider it a duty to myself to claim the originating of that construction, by which the general appearance of *gradual deposition* in the geology of the earth, (whose diameter must, according to the modern geologists, have existed millions of years) will, as well as this supposed age, be *not* reconciled, and satisfactorily explained by the Mosaic account

* In this he was right, it belongs to the science of Cosmogony-

Extract from the Review of the Bridgewater Treatise.

“If there are any lovers of science yet ignorant of the extent and fertility of the field which Geology has laid open—of the intensity and variety of interest by which those who explore it are repaid—here is a work to astonish and delight them. If there are any persons yet deterred from the study of this fascinating science, by the once prevalent notion, that the facts, or theories, if you will, that it teaches, tend to weaken the belief in revealed religion, by their apparent inconsistency with the scriptural account of the creation of the globe.—*here*, in the work of a dignitary of the Church, writing *ex-cathedra*, from the head quarters of orthodoxy, they will find the amplest assurances that their impression is not merely erroneous, but the very reverse of the truth: for that while its discoveries are not in any degree at variance with the correct interpretation of the Mosaic narrative, there exists no science which can produce more powerful evidence in support of natural religion—none which will be found a more potent auxiliary to revelation, by exalting our conviction of the power, wisdom and goodness of the Creator.

Several hypotheses have been proposed, with a view of reconciling the phenomena of geology, with the brief account of creation which we find in the book of Genesis and others. It has been plausibly stated that the Six Days of Creation must, each of them be understood to imply, not as now, a single revolution of the globe, but some other cyclic period of unknown extent. Dr. Buckland, however, prefers that explanation which is supported by the high authority of Dr. Pusey, the Regius Professor of Hebrew in Oxford, and has the sanction of Dr. Chalmers, Bishop Gleig, and other eminent contemporary divines,—namely, that the phrase employed in the first verse of Genesis, ‘*In the beginning* God created the Heavens and the Earth,’ may refer to an epoch antecedent to the ‘first day,’ subsequently spoken of in the fifth verse, and that during this indefinite interval, comprising perhaps, millions and millions of years, all the physical operations disclosed by geology were going on. Many of the Fathers

quoted by Professor Pusey, appear to have thus interpreted the commencement of the sacred history, understanding from it, that a considerable interval took place between the *original creation of the universe*, related in the first verse and that series of events of which an account is given in the third and following verses.

‘Accordingly,’ says Professor Pusey, ‘in some old editions of the English Bible, where there are no divisions into verses, you actually find a break at the end of what is now the second verse; and in Luther’s Bible (Wittenburg, 1557) you have in addition, the figure 1 placed against the third verse, as being the beginning of the account of the creation on the first day. This is just the sort of confirmation which on wished for, because, though one would shrink from the impiety of bending the language of God’s Book to any other than its obvious meaning, we cannot help fearing lest we might be unconsciously influenced by the floating opinions of our own day, and therefore turn the more anxiously to those who explained Holy Scripture before these theories existed.’—*Note. p. 25.*

Thus all difficulty, arising from the immense antiquity of the Globe attested by Geology, is at once removed. The circumstances related in the succeeding verses must be understood as referring to those immediate changes by which the surface of the earth was prepared for the reception of man.—Just as the facts disclosed by astronomy, without detracting ought from the credit of the inspired historian, prove, that the sun, and moon, and planetary bodies must have existed previous to the fourth day, on which he first mentions them as ‘made,’ or *appointed* to serve the office of ‘signs and seasons, and days and years’; so Geology in no degree contradicts the real meaning of the text, by proclaiming the fact, that the air, the earth and the waters were peopled by living creatures for innumerable ages before the epoch in the world’s history—which the sacred historian alone contemplates.”

Under the sanction of this confirmation of the construction I had put on the first verse of Genesis, in my original manuscript, formed between 1819 and 1825

(and which is now greatly enlarged by the addition of the notes containing an account of the late geological discoveries, and observations upon them) I now present this work to the public of Canada, and conclude this preface with the sublime discription of Eternal Wisdom given us in the 8th chapter of Proverbs; which, I trust, will justly apply to the great additional light which the modern discoveries in pneumatic science have enabled me to confer on the Cosmogony of the Creation.

"The Lord possessed me in the beginning of his way, before his works of old.—v. 22.

"I was set up from everlasting, from the beginning, or ever the earth was."—v. 23. (Say before the combustion of the gases, as shown in this work.

"When *there were* no depths, I was brought forth; when *there were* no fountains abounding with water."—v. 24 (At the combustion of the Gases, as shown in this work.

"When he prepared the heavens I *was* there; when he set a compass upon the face of the depth."—v. 27 (After the combustion of the Gases, as shown in this work.

HENRY TAYLOR.

TORONTO, Nov. 22, 1836.

PREFACE

TO THE SECOND EDITION.

Since the printing of the first edition of this work, I have met with several publications of high scientific character, confirmative of the System of Creation I had ventured to offer to the world. Extracts from these will be found inserted in the body of, and in the notes to, this second edition.

Sharon Turner, in his Sacred History of the World, 1st. vol., page 375, says "Scientific men have traced the constituent substances of our globe to sixty or more simple bodies, which at present rank as elements, because they are not further decomposable, and these

appear to have constituted our primordial rocks; but there are abundant reasons for surmising, that they are not the primitive elements of material nature; and, therefore, until they can be resolved into the particles or substances which are so, we shall not attain those perceptions of the original composition of our multifarious earth, which will present the deciding and satisfactory truth. We must know what silica, alumina, magnesia, lime, carbon, iron, and other metals and primitive components of minerals intrinsically are, before we can actually discern the processes of the succession, the causations, the agencies, the laws and the principles on which the primary and secondary masses were originally formed. The acquisition of this further information would have been thought impossible in the last century; but human sagacity and industry are now exploring what is unknown, so perseveringly, and so successfully, that every month may bring us the information, that some diligent analyst, in some country or other, may be drawing from nature those great secrets of her primordial chemistry, which have hitherto been impervious and inaccessible."

Now, in the first edition of this work, we have given extracts from the writings of eminent botanists and chemists, in support of our theory, and to prove the power of the functions of vegetation to produce many of the substances above mentioned, and we have a right to conclude, that the remainder may equally well have been produced thereby, and by the animals of the primeval ocean, since *some* marine animals are well known to secrete the lime of which their shells are composed, and the islands formed by the coral insect equal in length one-eighth of the diameter of the earth. The basis of almost all the primary earths has lately been found by Sir Humphrey Davy to be metallic, and, in a subsequent part of this work, it will be seen from Sharon Turner's work, that several metals are produced by these functions of vegetation. If this power be allowed by scientific men to these functions of terrestrial vegetables, we certainly may, by the clearest rules of induction, believe they were also possessed by the

marine vegetable kingdom of the primeval oceans of Genesis,* and most likely in a higher degree, for the great end of producing the solid parts of the earth; and we have then a palpable way of accounting for these productions, namely, the continual labour of some species of the marine animals during life, and the deposition of the marine vegetable and animal kingdoms after death; and accordingly most of the geological bodies we are enabled to analyze are found to contain the same materials as the remains of vegetable and animal life afford.

If, therefore, this theory of the power of the vital functions of vegetation and animalization be sustained, we trust we shall have come to a sufficient knowledge of what "silica, alumina, magnesia, lime, carbon, iron, and the other metals and primitive compounds of the minerals intrinsically are;" for, if the functions of vegetable and animal life be allowed to have produced these substances in the oceanic waters of Genesis, they must have produced them from the elements which surrounded them, namely, oxygen, azote, hydrogen, caloric, light and electricity, blended together by the vital principle of the vegetable and animal, in proportions of vast variety, and by which variety the separate characteristics of these different substances have been produced; for, to show the wonderful effect of variety in the proportion of the elements of bodies, we find that oxygen and azote, combined in one proportion, form the atmosphere we breath and live in; but the same elements, combined in another proportion, produce the strong and deleterious acid aqua fortis or nitric acid. I cannot, therefore, but believe, that by our theory of the formations from the waters of Genesis, we shall be able, in Sharon Turner's own words, "actually to discern the processes of the succession, the causations, the agencies, the laws, and the principles on which the primary and secondary masses were originally formed," and that these processes will be brought to light by our theory of the earth.

* Sodium, one of the new metals discovered by Sir H. Davy, is contained in all marine vegetables.

To our construction of the true interpretation of the first verse of Genesis, we have given extracts from a recent publication of the celebrated Dr. Chalmers, who has adopted our construction of that verse. We also quote from Dr. Clarke's Commentaries in further confirmation of our construction of said verse.

In this edition we have the great satisfaction of giving the sanction of the opinion of Mr. Arago, one of the leading astronomers of the present day, to our System of the Creation, as far as regards the formation of the earth; first, by the condensation of its waters, from aqueous vapor, and the subsequent formation of its solid parts, and organic formations. We have, indeed, since the publication of the first edition of our work, received the verbal and written approbation of it from men of science, and competent judges in these Provinces; but, the confirmation of the System by so eminent philosopher of Europe, is peculiarly grateful.

I have in this edition ventured an idea of the design intended by the Creator, to be effected by the internal fires of the earth, namely, the end of hardening the geological bodies, which must originally have been deposited from the waters in a soft and humid state; and although we are accustomed to consider these fires solely in a terrific point of view, they may perhaps, be found to add one more indication of Divine Wisdom, in the final preparation of our globe, for sustaining the immense velocity, and unceasing continuity of its double motions through the regions of space.

At the close of our Theory of the Sun, and of the means of supplying the waste of his light and heat, we have added in this second edition, some observations on the ideas stated by Dr. Herschell, on the opaqueness of the sun, and on the spots that appear on or adjacent to his surface; and it will be for men of science, should our Theory meet their perusal, to form their own judgment thereon, and also, on the questions we have proposed to them on this subject.

In this edition, we have commented upon Dr. Buckland's opinion that vegetable and animal life did not exist previously to the transition or secondary

formations of the earth. And we trust to have shewn, that as all traces of shells and organic remains may be destroyed by a heat less than is required for the fusion of the rocks that had contained them, so, the *non existence* of life in the earlier periods of creation *cannot be sustained*; but that, as it is highly probable the internal fires were then much more frequent and extensive, so all appearances of the more ancient remains of vegetable and animal life must have been completely obliterated and destroyed. The recent discoveries of Sir Humphry Davy, in his galvanic Experiments on the primary earths, appear too, to confirm the probability of our theory. The granite mass is mostly composed of these primary earths, which he has found to consist of metallic bases, united to oxygen in a solid state. Now oxygen is one of the most abundant constituents of vegetable and animal life. The basis of several metals also, we trust to have shewn in our work, are the produce of the vegetable process. Mr. Good, in his Book of Nature, page 239, says, "I have already had occasion to observe that Albumen and Fibrine are substances formed by the action of the living principle, out of the common materials of the food, and that it is probable the *lime* found in the bones and other parts, is produced in the same manner."

Now, while it is allowed by all Geologists of modern date, that these *functions of life* have had so great a share in the formation of those parts of the geological bodies, which are accessible to our examination, we may, it appears to me, conclude, by reasonable induction, that the same mighty engine of formation has been employed from the "beginning" to construct the entire diameter and circumference of the earth, more especially as we know of no agencies equal to the vital functions and their deposits for producing formations, and I trust to have shewn also that the idea of the incandescence of the earth will not render this theory untenable.

In note 6th of this edition will be found an extract from Good's Book of Nature, in which the opinion of the immortal Newton is stated, on the subject of an

ethereal and clastic medium, pervading all space in the heavens; which opinion we consider as a strong confirmation of that part of our system relating to the mode by which the sun's waste of light and heat may be replenished.

I have now solely to present this second edition to the public, relying with confidence on their candid perusal of it; and hoping that I shall have at least gained one end, that of exalting the utility of the sciences on which I have formed this System of Creation, towards enabling us to discover more fully the wisdom of the First Cause in His creation.

In that part of the work which treats of the dissolution of the earth, we have stated an idea, that "the indestructibility of the laws of nature, and their eternal tendency to form new combinations of matter, offer a proof also, of the distinct destined existence, and of the immortality of the soul of man." If this induction be just, we may infer from our reason, that the soul is immortal, and it may perhaps offer consolatory confirmation of the revealed religion, that its promises are found consistent with our reasoning powers; and with the inductions of science. And I ardently hope, that this power of the sciences may tend to lead many of the rising generation to acquire a knowledge thereof, and a zeal for their future advancement, in furtherance of greater and glorious discoveries of the benevolent wisdom of our Creator.

HENRY TAYLOR.

QUEBEC, March, 1840.

PREFACE

TO THE THIRD EDITION.

SINCE the publication of the second edition of this work, I have found that the celebrated Hutton, as is stated by Keith, was of opinion, that all the geological bodies of the earth had been formed by "marine exuvia

or remains." It is satisfactory to have this part of the theory of the earth, (which, previous to my seeing his opinion, I had formed and presented to the world,) sanctioned by so great an authority.

But Hutton's Theory of the Earth, being adverse to the Mosaic account of the creation, he drew upon himself much obloquy from the supporters of it; and it is to be lamented that a due consideration of the first and second verse of Genesis had not occurred to him; as most probably, his sagacious mind would have discovered, how completely the explanation we have in our theory given of those verses, will give the length of time which, in the opinion of many geologists, the various formations of the globe require.

Many of the modern geologists, however, who had published their works previous to the Rev. Dr. Buckland's Bridgewater Treatise, in which the above construction of the first verse of Genesis is assumed, or who, having not yet sufficiently contemplated that construction, so as to adopt it themselves, and, probably, not willing to come into collision with the sacred writings; the segeologists, I say, have now abandoned the practice of forming any theory of the earth at all, and limit themselves to the collection of geological facts. Now, it appears to me, that if on a due consideration of the facts which botany, chemistry, pneumatics and geology present us with, it be conceived, that, by a just combination of these facts, we can by fair induction and analogy gain an insight into the most mysterious operations of nature, and of the laws which its omnipotent Creator may have established for these operations; there is then no just cause why such a combination of these scientific facts should not be attempted, there is no just reason why the human mind should be fettered in the profoundly interesting science of cosmogony more than in any other. There is not, perhaps, in the vast range of nature's works, one which excites in the mind a greater degree of mysterious wonder, than the inspection of the rocky formations of the earth. The perfect order in the movements of the heavenly bodies, their surprising distances and magnitudes, it is

true, are of a more grand and sublime description ; but the rocky formations belong to our own domain, and however some may call in question the vast distances and magnitudes of the heavenly bodies, yet, of the enormous depths, breadths and lengths of the formations of our earth, we have the direct evidences of sight and touch.

What are the agencies by which the Creator has formed these mysterious productions? is therefore the silent question which every close observer of nature asks himself. And, accordingly, numerous theories, not only of the crust of the earth, but of the earth itself, have long since been offered to mankind. Many of these, however, being founded only on the imaginative conceptions of ingenious men, have not maintained their ground. None of them, I believe, but Hutton, as before mentioned, and a few of the German geologists, have offered any tangible mode of formation which the Deity may have chosen, for the production of the entire body of the geological formations of the earth.

In the first paragraph of the preface to the first edition of this work, I have stated that my object in forming my construction of the first verse of Genesis, was to be enabled to reconcile the Mosaic account of creation with the time said by the modern geologists to be required for these formations ; having done this, my next wish was to enquire what physical laws the Creator had chosen to produce these formations ? By physical laws they are undoubtedly formed, as far as we have access to examine them ; and we have the powerful sanction of every part of nature to conclude, by analogy, that the entire diameter of the globe is equally so. By the 6th, 7th and 9th verses of the 1st of Genesis, we find the earth was covered by the waters until the time of the separation. We have therefore just right to conclude it was formed in those waters of Genesis ; and, accordingly, as stated by one of the best modern geologists, "Every part of the earth, every continent and every island, exhibits the phenomenon of marine productions."

Our theory is founded on these Scriptural and geological facts; and we have a confirmation of the competent powers of the vegetable and animal deposits and labours of the marine animals of the ocean to produce these formations of the earth, in the known and established fact, of an extent of land more than equal to one-eighth of the diameter of the earth, being formed by a few species of marine insects, for the Coral Islands and reefs of the Indian Sea and Pacific Ocean are 1,500 miles long by 60 or 70 broad.

In the course of my journeys through this Province, to offer my works for sale, I am happy to state, that a great majority of the people appear to be duly impressed with a belief in the sacred Scriptures; indeed I have met with some who seemed to think the Mosaic account creation required no support. These were, however, generally of persons unacquainted with the authenticated geological facts. It is unquestionable that many of the formations have been produced by *gradual* deposition from the waters, and must have required a period for that deposition immensely greater than that since the creation, being nearly 6,000 years.

Some modern geologists claim indeed millions of years for these formations of the crust of the earth; and, we trust, we can thoroughly satisfy these claims by the construction of the first verse of Genesis, now sanctioned by the eminent writers mentioned in the preface to the first edition.

We trust also to have presented a palpable clue to the discovery of the mode in which it may have pleased the Deity to have constructed the solid machinery of our globe. The vastness of this machinery is indeed calculated to strike the mind with awful wonder, but it is His work, and, as such, a fair subject for the study and discussion of His creatures, as the more it is examined the more profoundly will be exhibited His bounty and His wisdom. We trust to have shewn, that the theory of the existence of animal life, previous to the secondary formations, is tenable, and that the incandescence of the earth, as supposed by Dr. Buckland, does not overthrow it; and therefore, that we have a

right to say, with a great modern geologist, "That the causes at present in operation must have been producing the same effects in all preceding ages."

We conclude, therefore, that attempts to form a system of the creation, when based upon authenticated scientific facts, are allowable, and the more so, that in the present enlightened state of the world, these systems can be duly examined and their merits determined.

We have, in this edition, at the close of the theory of the sun's formation, given some account of Sir Richard Phillips' Theory of the cause of the Motions of the Heavenly Bodies. This theory offers an additional sanction to those which we have stated, in favour of our theory of the existence of gaseous media in the regions of space. But we are by no means prepared to join Sir Richard in his opinion against the Newtonian theory of gravitation and attraction. We conceive that these great laws of nature may still exist, and that they may be reconcilable to, and be assisted by, the gaseous media; and, as we have shewn in note 6th of second edition, Sir Isaac Newton himself suggests "the existence of an ethereal and gaseous medium pervading all space;" and perhaps the existence of this gaseous medium would serve to shew the physical cause of these principles of attraction and gravitation, and thereby account for their effects.

We have also inserted an extract from Sir John Herschell's Astronomy of last year, also sanctioning our idea of the supply of the sun's waste by gaseous matter; and it is with the greater satisfaction we give this extract from Sir John's work, that the late Doctor Herschell was of opinion that the sun might be habitable. Sir John has now declared his opinion, that "the sun's zodiacal light is part of that medium which resists the motion of comets, and is loaded with the materials of the tails of millions of them which may be slowly subsiding into the sun." These materials must of course be gaseous; now the combustion of gaseous matter is nothing but the union of the base of the gas with that of oxygen gas, without which no

combustion takes place, and the consequent extrication of the light and heat of this oxygen gas, by which we conclude, as per our theory, the waste of the sun's light and heat is replenished.

Accordingly Sir John, in another part of his work, states his opinion, that there is "an enormous heat in the sun."—Dr. Herschell, his late father, says, that the sun's luminous atmosphere is only 2,500 miles from the sun's surface.—That these admitted facts can be reconciled with his opinion of the sun being opaque and habitable, when under the influence of such enormous quantities of light and heat, appears to me totally contrary to all possibility.

In addition to these sanctions of the existence of an æriform medium in the regions of infinite space, we have the great satisfaction to refer the reader to our extract from Dr. Graham's Elements of Chemistry of last year, where he will find, that, from recent experiments of one of the most celebrated opticians and philosophers of the present day, Sir David Brewster, he concludes that the "sun's atmosphere must contain gaseous matter."

Several explanatory additions are made in the body of this edition, to which we ask leave to refer the reader, particularly to the elucidation of the theory of the formation of the earth.

We now present the third edition of this work to the public of United Canada, trusting that the System of Creation we had attempted to form will receive a considerable degree of sanction from the scientific authorities, discoveries, and observations we have now enlarged it with, and that it may be found to meet the approbation of scientific men of the present, and also serve as an instructive book for the rising generation.

THE AUTHOR.

MONTREAL, 1842

PREFACE

TO THE SIXTH EDITION.

In the third, fourth and fifth editions of this work, I have been enabled to shew sanctions of our theory of the sun's formation from two as eminent men of science as the present fertile age has produced, Sir David Brewster and the celebrated M. Arago, the French Astronomer. In the present edition I have the honour of adding what I consider a great sanction of our theory of the earth, by the late surprising discovery effected by the Earl of Rosse's six foot diameter telescope. And here I beg leave to say, I consider his Lordship as an honour to the nobility of the land, inasmuch as, with a mind superior to the common employment of wealth, he has soared above its ordinary gratifications, and given a high sanction to the pursuits of the sciences in general, and it is probable his telescope will extend the most sublime of them, that of Astronomy.

In my theory of the formation of the earth and planets, I started from the account we have of their formation in the waters of Genesis. By the modern discovery of the elementary composition of water, I shewed how the waters of Genesis must have been formed by the combustion of their elementary gases; and, reflecting on the stupendous quantity of light and heat which must have been evolved by that combustion, I founded my theory of the sun's formation on the belief that the most prominent and needful purpose to which that heat and light could be applied, was to form the suns of the planetary systems.

The author of the theory of Formation of the Nebular Hypothesis did not deign to derive its origin from Scriptural sources: it proceeded from the discovery of the nebulae in the regions of space by Sir Wm. Herschell. Then Laplace, the French Astronomer, grounded his theory of the formation of the Earth and Planets upon that nebular discovery. That discovery, as will be shewn in this sixth edition, has been dispro-

ved by the high powers of Lord Rosse's telescope; and it has, I am informed, been abandoned by its great upholder, Doctor Nichol. I therefore consider that our more humble hypothesis, grounded on the idea that the Deity has established laws in our own system (which, if discovered by due scientific research, are perfectly competent to account for all the phenomena of the earth's formation), is now entitled to the more consideration.

The present edition of this work will, I trust, be found greatly improved, by having most of the notes in the former editions transposed into the body of the work, by which the authorities we have quoted will be more directly brought before the reader, and prove a more powerful support of the system we have formed in the work.

In this edition we have shewn extracts from the addresses of Dr. Nichol and Dr. Scoresby, respecting the nebular hypothesis mentioned above. Lord Rosse has disproved the existenee of the nebulae in the constellation Orion; but there remain great numbers of them in other regions of space, and one chief purpose of this sixth edition, is the carrying out of our System of Creation into those regions, because we hope to be able to shew, by natural results of this system, what the probable design of these nebulae is, and more especially what are the *real* purposes of the comets in the vast domains of creation.

The theory of the sun's formation, of this work, having been sanctioned by the eminent philosophers above mentioned, our intention to carry out our system with the view just stated, cannot be considered presumptuous. We cannot, indeed, be assured of the success of our attempt, which we leave to a discerning public to determine upon; but of this we are certain, that if the theory of the sun's formation, which we have presented to the world, be ultimately confirmed, the natural, and perhaps unavoidable, result of that system, will sanction our conception of those purposes which the nebulae are intended to effect; and as to the real purposes we have assigned to the comets, we are happy to have the sanction of the immortal Newton

in respect of them.—If we recollect aright, Sir Isaac Newton has said that one of the motions of the heavenly bodies could not be continued without the direct interposition of the Deity and we have also to add, that a like most important result will follow, if our theory of the sun's formation be ultimately adopted by the scientific world, namely: that we shall have proved the necessity of the existence of a continual and present act of creation of elementary matter by the "Great First Cause," which act of present creation must be totally independent of the existing laws of nature; and we have now to refer the reader of the present edition to the Appendix, containing its extra matter at the end of the work, for our explanation of this important subject.

Since writing the above, I have been favoured with a sight of that most valuable work called *Cosmos*, or *Sketch of a Physical Description of the Universe*, by Alex. Von Humboldt, from which I am happy to give an extract confirming Arago's discovery of the gaseous nature of the sun, first noticed in our fourth edition. For this extract, see page 29 of Appendix No. II., sixth edition.

I now conclude the preface to the sixth edition of this work, with my acknowledgements to the Canadian public for the patronage bestowed by them on the former editions: and as our System is now carried out into a more extended sphere, I trust the present edition may be found equally worthy of public favour; and as the following extract from the *Cosmos* contains a powerful display of the advantages of scientific information, I beg leave to present it to the public:—

"I take pleasure in persuading myself that it is possible for scientific subjects to be presented in language grave, dignified, and yet animated, and that those who are able to escape occasionally from the restricted circle of the ordinary duties of life, and regret to find that they have so long remained strangers to nature, may have opened to them access to one of the noblest enjoyments which the activity of the rational faculties can afford to man. The study of general natural knowledge awakens in us, as it were, perceptions which had long lain dormant: we enter into a more intimate communion with the external world, and no longer remain without interest and sympathy for that which at once promotes the industrial progress and intellectual ennoblement of man."—*Cosmos*, vol. 1, p. 35.

THE AUTHOR.

A SYSTEM

OF THE

CREATION OF OUR GLOBE, &c.

Addison has remarked with equal piety and truth that the creation was a perpetual feast to the mind of a good man.

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THE reader will have received some idea of the purpose of the science of Geology, from the preface to the former editions of this work; and in order to exhibit to the Canadian public the practical utility of this science, we extract from a late Geological work of some merit, namely, "Elements of Geology for popular use," by Charles A. Lee, M. D., of New York, his statement of this utility. In the first paragraph of his preface he says—"No department of the natural sciences possesses greater interest or leads to more important practical results, than that of Geology. Of late years, it has attracted almost universal attention, not only from the fascinating wonders it discloses, but also from its obvious and extensive application to the economical purposes of life. Of such importance has it been regarded, that many of our State Legislatures, as well as the General Government, have authorized geological surveys to be made, in order that the natural resources of the country may be brought to light and fully developed. \* \* \*

Already have these surveys contributed millions in value to the productive industry of the land, and every year their importance is more and more demonstrated and acknowledged."

Many of the influential men in the Hon. Legislature of this Province have honoured me with their subscriptions to my work, and I am happy to observe that a liberal sum has since been appropriated by it, for a geological survey of the Province, which I have no doubt, if performed with diligence and zeal, may discover great sources of industry and wealth for it.

I now proceed to give an account of the theory which the late discoveries of this and other sciences have suggested to me of the geological formation of our globe, and of the system of creation I had formed.

In the year of our Lord 1819, I returned to the land of my birth, the Canadas, after an absence of nigh forty years in England and Nova Scotia, during which, I had undergone great misfortunes in an extensive line of mercantile business.

The pleasing sensations I felt on this return to my native country, may have been experienced by many; the intensity with which I felt them, may have been occasioned by so long an absence; and having now, as it were, fallen into the calm and pure resort of nature, the woods of Lower Canada, I was never more happy than in the study of her works. From early youth I had been fond of the science of chemistry; and now, some books of geology fell into my hands: with them I frequently compared the appearances I met with in my walks, which, being in unison with these books, gradually confirmed me in the opinion, that our earth was originally formed in a fluid, and was deposited from it.

In the treatise on chemistry by professor Chaptal, I found an account of the chaotic system of creation of the ancients, by which it is supposed, that the chaotic mixture, being formed, the various substances were attracted to each other, by the laws of mutual affinity, and precipitated.

On frequent reflection, however, on this theory, and contrasting it with the general state of the depositions of the earth in strata and laminae, it appeared to me to be totally insufficient to account for these appearances: had a chaotic mixture been formed by the Creator, containing in solution all the various geological bodies, and had nothing more been required for their formation, than the operation of their affinities and attractions, these must have taken place immediately, and they would be found in homogenous and exclusive masses, according to their various affinities and gravities: but the formations are generally found

in alternate layers and laminæ of frequently mixed substances, and this too without coincidence with the laws of gravity, and bear the certain marks, not only of being deposited from a fluid, but also, of a gradual and mixed deposition, at periods probably of immense distance from each other. This reflection led me to conceive that these depositions were gradually produced by some permanent and continually operating cause.

In the above mentioned work of Chaptal, I had found and been much struck with, the beautiful and interesting theory he has given of the formation of the various primitive earths, and many salts, metals and mineral substances, by the processes of vegetation, which are found on the decomposition of those vegetables by analysis and combustion: I was also aware, that vast tracts of the earth are formed by vegetable, animal and marine depositions, and being one day occupied in reading attentively the account of the creation in the first chapter of Genesis, the waters therein mentioned forced themselves strongly on my attention and repeated consideration, until at last the idea grew upon me, that the geological bodies of the earth were, somehow or other, *produced in these waters.*

That the earth was formed in a fluid, I now felt thoroughly convinced of; that a great part of its crust consisted of vegetable and animal depositions, even almost to the tops of the highest mountains, as stated by geologists, seemed to me a proof, that these marine vegetables and animals must have previously existed in waters which produced these depositary remains; and, as no inundation or deluge is sufficient to account for these universal appearances of the formations in the earth; therefore, the waters or oceans mentioned in the first of Genesis appeared to me the only and the truest sources by which we *can* account for them.

During my reading and reflections on this subject, and previously to my determining to form a Theory of the Creation, Archdeacon Paley's Evidences of Natural Religion fell into my hands, in which the atheistical doctrines of chance, and also, the notions



of Buffon, of the earth's formation by a fragment knocked off by a comet from the sun, is related, and commented on, by the Archdeacon.

I shall, therefore, previously to advancing any thing more on the System of Creation I had gradually formed in my own mind, beg leave to make some observations on those doctrines of chance formation, and thus endeavour to clear the way for a system, I trust, more consistent with reason and with our religion.

“ Amongst inanimate substances (says Paley in p. 63 of his *Theology of Nature, or Evidences of Natural Religion*) a clod, a pebble, a liquid drop, *might be*; but never was a watch, a telescope, or organized body of any kind, answering a valuable purpose by a complicated mechanism, the effect of chance; in no assignable instance hath such a thing existed without intention some where.”

Now, it appears to me very singular, that Paley, after, having so clearly exposed the absurdity of this theory of chance, should have thus conceded the possibility of a *clod*, a *pebble*, or a *liquid drop*, being the product of it; a clod is a piece or part of the earth; a pebble is a fragment of some rock rounded by the waters; a liquid drop is a part of those waters. The same cause then, that produced the earth and seas, produced also the clod, pebble, and drop.

But can there be any doubt that the earth itself contains marks of design and intelligence? That all its vegetables and animals contain marks of design, *he* has proved; now, we cannot refuse the same evidence of design in the formation of the earth and seas, if it were *solely* as a *matrix* or habitation for those plants and animals; and, among the evidences of design which these last exhibit, I beg leave to mention one which, I believe, has escaped the observation of the Archdeacon—it is the *amazing varieties* exhibited in every species of these plants and animals. Had they been solely the offspring of a “blind conatus,” there would, probably, have been but one species of each of them; but their vast varieties show a master and designing hand to have directed their formation. The evi-

dence of design which the earth exhibits, is not confined to its own formation; this evidence is much more strong, when we find and consider it as part of a system of planets revolving in known periods round a central sun, whose light and heat are evidently the *intended* sustainers of the life and enjoyments of the plants and inhabitants existing on this family of planets.

It is also stated in page 92 of the above work, that Buffon considers the Planets to have been "shivered off the sun by some stroke of a comet." Paley adds, "that he never could see the difference between the antiquated 'System of Atoms,' and Buffon's 'Organic Molecules:,'" and that "this philosopher having made a planet, by knocking off from the sun a piece of melted glass, in consequence of the stroke of a comet, and having set it in motion by the same stroke, both round its own axis and the sun, finds his next difficulty to be how to bring plants and animals upon it," &c.

Now, as to the solid parts of the earth; allowing glass to be composed of a variety of materials, yet I believe no part of the interior of the earth is discovered to be vitreous, except in the vicinity of volcanic mountains, or where these have previously existed. How then has this glass, of which Buffon supposes the earth to have been formed; how has it been metamorphosed into the vast variety of mineral products which geology discovers to us? The internal substance of the earth down to its centre, is supposed to be granite, or bodies of greater density; and neither granite, nor the more external formations bear any resemblance to vitreous or volcanic matter.

But, if even the solid part of our earth, will not support such a theory, how are we to account by it for its waters? Is it in the midst of the molten glass of a burning-sun we are to look for them? Water, however, is said to constitute three-fourths of the earth's surface, and the total inability of this theory or supposition, to account for its production, appears to me

decisive against its foundation in reality. (*Vide 1st and 2d paragraph of Note 1, in Appendix.*) Buffon's theory has also been completely refuted by the undoubted astronomical fact, that if the planets were struck off from the sun, they must, in every revolution have returned to the sun again.

I shall now notice the opinions on Chance or Atheism, as causes to account for the productions of nature in our globe.

The Organic Molecules of Buffon are thus stated by Paley, in page 427 of the above work, *Evidences of Natural Religion*, namely, "we are to suppose the universe replenished with particles endowed, with life, but without organization of their own, and endowed, also, with a tendency to marshal themselves into organized forms.

It appears to me almost impossible that the author of this doctrine, if it be Buffon, could rest satisfied with this cause of Creation; because, although it should be allowed that these particles of life could infuse themselves into organized bodies, we naturally inquire, how came these particles themselves into the universe? This is the secret, undiscoverable without allowing an "unknown cause." If Buffon would account for the existence of these particles by chance, I say, that from the time of their finding their way into these Molecules or organized forms, there is so much, and so constantly exhibited in every one of these forms what we call, in plain language, intelligence, and design to produce good and wise ends; that the term chance in the sense in which it would be employed by these Atheistical writers, completely comprehends intelligence and design, for these are found inseparable from these organized forms; therefore, the doctrine of chance, instead of confuting, proves the existence of an unknown creating cause.

Were the term chance to be understood merely in the common acceptation of the term, as existing, for instance, in many of the events of life, it will still always be considered as too impotent to account for the productions of nature, because it is, *not* in the

nature of the human mind to rest satisfied with this absurd idea of creation.

Now, therefore, to finish with this, and with the notion of the planets being knocked off from the sun: to account for their creation thereby, without an intelligent Creator, I must say, I feel it to be a daring thing of this or any writer, to have attempted the overthrow of the established opinions of all Christian nations, as set forth in the Scriptures, handed down to us from the people whom it appears to me, were chosen by the design of Heaven, to preserve mankind in the faith and worship of one Creator; and which are, I believe supported in their principal facts by the immortal Newton, in his System of the Universe, and were certainly believed by him.

Previous to thus presuming to overthrow this sacred religion, it appears to me, this author should have formed a system less replete with absurdity, but fortunately too much so, to produce extensively any evil effects. Christians, in general, are fixed in their notions of the true cause of all they see, taste, and feel around them, and of their own existence. The Jewish nation was taught by a religion which, from the days of Adam, had been followed by mankind, — a belief in one Almighty Creator of all things. This belief had nearly, however, disappeared from the earth in succeeding ages. Men, enervated by the effects of those hot climates, and sunk in consequent sensuality, were tempted to throw off the wholesome restraints of a pure religion, and gradually fell into an idolatry, whose ministers, probably, permitted these sensual habits, to confirm their own power over these people. The Jews, alone, had preserved the worship of one Almighty Creator, until their posterity, after the deliverance from Egyptian bondage, had sunk into the same idolatrous practices as their forefathers.

And here I beg leave to observe, that this repeated defection of the Jews, and of the rest of mankind, from the worship of one God, appears to me a strong proof that *Deism alone*, in its purest state, is not sufficient to prevent mankind from falling into idolatrous

worship. But, the Saviour promised in the Scriptures by the inspired writers, arose at length to astonish mankind, and to bring them back for ever from that idolatry to a religion which alone is worthy of the highest degree of intelligence to which the mind of man can arrive: a religion which, while it allows him the most extended use of that intelligence in the contemplation of the works of Creation, teaches him, also, to be contented with the limits which appear to be fixed to it; (and being convinced of the existence of an Almighty Protector,) to feel the glowing pleasure of the adoration of Him, to be among his purest and most comforting sensations.

These cheering feelings of the heart and mind, cold and joyless Atheism is void of, and thereby its errors are proved; because the almost universal feeling of these emotions, and their cultivation by nations who have at all risen above idolatrous worship, is a proof that these emotions come from the hands of Nature and Reason, and they appear to form the links of a chain which connects this with a future state of existence.

The supporters of the doctrine of chance, however, disdaining to be contented with the Scriptural account of Creation, have formed various wild and futile notions to account for it, in order, no doubt, to seek for distinction by opposing the generally received doctrines; but finding, as I trust to have shewn, the total *impotence of chance*, of APPETENCIES PRINCIPLES OF ORDER, POSSIBLE COMBINATIONS OF MATERIAL FORMS, and of LAWS OF NATURE, &c. &c., to satisfy the inquiring mind of man, they have been obliged to conclude with telling us, "that neither they nor we know anything about the matter. (*Vide page 7, of Paley's Theology.*)

But at that very point, where they have thus found themselves stopt in the extension of their enquiries, is seen "the God whom we worship." There, where this proud, but false philosophy finds its ignorance begin to darken it, we have the clear and powerful light of the true religion to illuminate us, and to teach us to

rest satisfied with the impenetrable veil which its Author has been pleased to fix between Himself and His creatures in this stage of existence.

On a par with these doctrines of chance-creation is the idea of the materiality of the *Human Soul*; and previous to dismissing this part of the subject I beg leave of the reader to offer some observations on this doctrine of Materiality.

The materialist supposes, that all the powers of the mind of man result from his *organization* alone. It follows then, as a natural consequence, that when this organization is destroyed, the mind is destroyed along with it. Materialism, then, necessarily leads us to a disbelief in a future state.

Now, in no part of Nature do we find faculties bestowed, which are not, generally, productive of certain purposes to these parts: therefore, if man were destined solely for existence on this earth; if his thoughts were solely the effects of the organization of his frame; is it not probable his thoughts would have been confined to the actual sphere of his destined existence? Would he not have been unable to form those high imaginations and hopes of eternal happiness in more perfect regions?

For, if we may reason from the vast body of evidence in her works, Nature does nothing, and bestows nothing, in vain; she never appears to act with deception; therefore she would not have given to men of all ages and nations those hopes of future happiness, merely to disappoint them. "I am positive I have a soul," said Laurence Sterne, "nor shall all the books with which Materialists have pestered the world, ever convince me to the contrary.

The vast powers of intellect and of science, by which man has been enabled to observe and to trace so exactly the astonishing systems of the heavenly bodies; those high passions and thoughts of future bliss which he is thereby led to hope for, in some such regions, partake too much of the nature of Spirit to suffer us to think they are solely produced by a more perfect organization than is bestowed on the horse, the mule, or the ass.

It, moreover, has been proved by the anatomy of the brain of the ourang outang, an animal approaching nearer to the human species than any other, that its brain exactly resembles that of the human species; and it is said, "It is surprising this resemblance is productive of so few advantages; the tongue and all the organs of the voice are similar, and yet the animal is dumb; the brain is formed in the same manner, and yet the creature wants reason; an EVIDENT PROOF [as Buffon finely observes] that *no arrangement of matter will give mind*, and that the body, how nicely soever formed, is formed to very limited ends, when there is not infused a *soul to direct its operations*;" and I am the more happy in giving this quotation, as it shews that Buffon has indeed the redeeming quality of not acceding to, but of disproving, this degrading doctrine of Materiality. We feel less surpris'd at the invention of such a doctrine, when we are inform'd who are its abettors or authors. Persons who, in the practice of their art, having been long habituated to dissections of the human body, have thereby become more apt to form their notions from their eyes than from the reflections of their minds, have sought to make the world believe, that the superiority of the mind of man over other animals, arose merely from a more perfect organization of the brain; and such an assertion reminds us of the Alchemists, who sought for the Philosophers' Stone in some of the most loathsome objects of nature. Had the Materialists watched and studied the operations of their own hearts and minds, in the hours of calm contemplation; had they allowed these parts of their frames to exert a due influence over their opinions, they would, probably, have felt the force of the great poet's assertion, "Tis the DIVINITY which stirs within us."

They may, indeed, have carried their anatomical science and skill to that exact point where body meets spirit; they may have discovered the precious matrix in which this "immortal spirit" is destined at present to reside; but they would not thus have presumed to degrade its nature and its future destiny.

In fine, this material doctrine of the mind may well

be said to savour too much of the *shop*; and no well cultivated mind can, I think, for a moment assent to so degrading a doctrine; and I shall conclude this subject with an observation I have made on the separate existence of mind from body.—When two persons converse together, the ideas of their minds pass from the organs of speech, through the air intervening between the two persons; in this passage, therefore, *an emanation of mind exists separate from the body from whence it came*. It is conveyed, indeed, by the vibrations of the particles of air it passes through, but it certainly has, during that period, an existence separate from the body and organs it proceeded from. An emanation of mind, therefore, can exist separate from its matrix, and in a form of matter entirely different from what it emanated from. Is it then not possible to conceive, that mind itself could be endowed with existence in the æiform state, as well as in the solid?

I now resume the narration of the course of thought which has led me to form the present attempt at a theory of the creation of our system, and, by analogy, of the other systems of the heavenly bodies.

Being, as before stated, convinced that the earth had been originally formed in water, the inquiry, then, naturally suggested itself, what waters we had any historical account of which could produce this effect? The chaotic liquor of the ancients, I trust to have proved, is incompetent to account for the general geological appearances, and therefore fails. The waters of the deluge can only account for certain changes in the earth's surface, which they may have occasioned, and which, no doubt, give proofs of the reality of that deluge. But the proofs of formation in a fluid, reach far below the possible effects of an inundation which lasted only one year. The vast masses of marine depositions must have required numerous ages to accumulate, and even the granite mass gives proofs of formation or of alteration in a fluid, by the crystals and heterogeneous substances it consists of; and this stupendous mass, which is supposed to form the whole interior of the globe, must have required a correspondent time for that formation.



To shew that it is not without good cause, we in this work, attempt to vindicate the mosaic account of creation, and, by our explanation of the first verse of Genesis, to account for the immense period of time required by the modern geologists, we extract the following note from a late work on geology:—"Although the world is not eternal, it is nevertheless very ancient, and, in calculating all the time that was required for the formation of the numerous beds which the globe presents to us, for the life and reproduction of all the animals and vegetables whose remains it contains, according to the time employed for the actual formations whose duration we know, we are forced to admit that the world is at least 300,000 years old,"—*Bouée's Geol. Populaire, page 7, Paris, 1833.*

The only waters, therefore, with which history furnishes us to account for these phenomena, are certainly the waters of Genesis, *Genesis, chapter 1st, verse 9th*: "And God said, Let the waters under the firmament be gathered together into one place, and let the dry land appear, and it was so." I then proceeded to inquire if the Scriptural account of these waters would warrant the conclusion, that the earth was formed in them by the deposition of the strata and other rocks which the latest discoveries in the science of Geology have pronounced it to consist of.

After a long and mature consideration, I conceived that the first verse of Genesis, "In the beginning, God created the heavens and the earth," will not only warrant the above conclusion; but, perhaps, also a like formation of all the planets and suns of other systems, by the highly natural causes and effects of those laws, which the latest discoveries of geology and pneumatic chemistry have found to exist.

I further considered, that if the Scriptural account of creation could thus be reconciled to those discoveries; if the geology of the whole earth could thus be brought in proof of the reality and necessary existence of those waters; the doubts of the unbeliever might yield to it, and the authority of Scripture acquire new force.

"In the beginning, God created the heavens and the

earth." Now, the term "beginning" points to *no specific point of time*; and I have therefore conceived it may have been *ages* previous to the time of the separation of the earth from the waters, as mentioned in the ensuing verses; and that, during *these ages*, the earth was gradually forming in these waters. By this explanation, we shall be able to account for any length of time which the formation of the globe may have required.

Doctor Chalmers, in his *Natural Theology*, published in 1836, page 250, says, "We shall advert once more to the Mosaic account of the creation, more especially as the reconciliation of this history with the indefinite antiquity of the globe, seems not impossible, and *that*, without the infliction of any violence on the literalities of the record."—He then narrates the two first verses of 1st of Genesis, and adds, "Now, let it be supposed that the work of the first day, in the Mosaic account, begins with the 'Spirit of God moving on the face of the waters.' The detailed history of creation, in the 1st chapter of Genesis, begins, with the middle of the second verse, and what precedes might be understood as an introductory sentence, by which we are most appositely told that God created all things at first, and that afterwards, at what interval of time is not specified, the earth lapsed into a chaos, from the darkness and disorder of which the present system of economy was made to arise. By this hypothesis, neither the first verse nor the first half of the second, forms any part of the narration of the first day's operation, the whole forming a preparatory sentence disclosing to us the initial act of creation, at some remote and undefined period; and the chaotic state of the world at the commencement of those successive acts of creative power, by which out of rude and undigested materials the present harmony of nature was ushered into being. Between the initial act and the details of Genesis, the world, for aught we know, might have been the theatre of many revolutions, the traces of which geology may yet investigate, and to which, in fact, she has constantly appealed, as the vestiges of so many successive conti-

ments which have now passed away. The whole speculation has offered a vain triumph to infidelity, seeing first, that the historical evidence of scripture is quite untouched by this pretended discovery of science, and that even should it turn out to be a substantial discovery, they do not come into collision with the narrative of Moses. Should, in particular, the explanation we now offer be sustained, this would, permit an indefinite scope to the conjectures of Geology, and without undue liberty to the 1st chapter of Genesis."

Thus, Doctor Chalmers has confirmed, in the year 1836, the explanation of the first verse of Genesis, we had, as stated above, formed in 1825. But with his idea of the earth lapsing into a chaos we do not at all agree; on the contrary, there is strong reason to believe, that from "the beginning, the undeviating design was carrying on, of the formation of the solid parts of the earth in the waters of Genesis, as stated in our theory; and this the 9th verse shews; for the earth having been duly formed by the continued depositions of the waters, was separated from them as appears by that verse.

In further confirmation of the construction we have put upon the first verse of Genesis, it will be found, that the Rev. Dr. Adam Clarke, in his commentaries on the scriptures, says, in commenting on this verse, that the true translation of it from the Hebrew is 'In the beginning God created *the elements or substance*, to form the Heavens and the Earth.'

Yet it is to be observed, that a great part of mankind have, perhaps, received the erroneous idea from their infancy, "that the world was made out of nothing." Now Doctor Chalmers, in a late publication of his, on Astronomy, says that "no part of the scriptures asserts that the world was made out of nothing." Modern science has proved that most of the liquids and solids of the vegetable kingdom are formed, in great part, of gaseous bodies; and the very clays and sands we walk on, which were formerly considered mere earths, have been proved by Sir Humphrey Davy's experiments in galvanism to consist, in great part, of oxygen, which

must be combined with the bases of these earths in a solid state.

But for the origin of the elementary gases, of whose composition or origin we are yet ignorant, we must refer to a creating cause.

By the famous discoveries of Black, Priestly, Lavoisier, and other chemists and philosophers, a new world has been disclosed to us. The constituent part of three-fourths of the globe, water, which was formerly considered as an element of creation has by these discoveries been proved to consist of two separate bodies, oxygen and hydrogen. Our atmosphere itself, the common air, is no longer to be considered as one of these elements: it is composed of the oxygen and the azotic gases; but neither oxygen nor hydrogen, nor azote, have ever been obtained separate, in a liquid state, They have yet been found only in the form of gases, that is, combined with light and caloric. By the combustion of hydrogen or inflammable gas in oxygen gas, the caloric and light of the latter escapes, and water is formed, in a quantity exactly corresponding with the weight of the gases employed in the combustion; and the same water may again be decomposed, and returned into the state of the gases it was composed of. This, therefore, being incontrovertibly proved,—for all philosophical chemists are now agreed upon the fact,—it follows, that the waters of the *Universe* recorded in Genesis, must have been formed by the combustion of these gases; it follows, that if any part of these waters are composed of them, every part must; and, therefore, that the Deity, having first called these gases into existence, *did*, either by the power of electricity, the blaze, of comets, or some other means, ignite the hydrogen gas, which, by its combustion in the oxygen gas, of which the empyreal atmosphere may have been partly composed, produced the *Universal waters of Genesis*. That the Oceanic waters must have been formed by combustion is proved by the fact that these elementary gases, Oxygen and Hydrogen, may be kept together for any length of time, and form no water without combustion.

These waters of Genesis must have been thus first produced in a state of vapour, which, condensing into a liquid form would, by laws of attraction, form the Universal Ocean, (the matrix of our earth, and planets of our system.) The vast body of heat and light disengaged from this immense combustion, may have formed the Sun of our system, which, by the laws of its gravity and attraction, assumed its place in the centre of it, as we shall attempt to show in the Theory of the Sun's formation.

In the *Montreal Herald*, of 13th Sept., 1838, the following notice appeared:—"Encke's comet begins to be talked of. This comet, which completes its revolution in 1200 days, will be visible in the ensuing autumn. It will be in its perihelion, or part of its orbit nearest the sun, on the 14th December; about the same period it will be nearest the earth. It is (says Mr. Arago) a vast nebulousity, 64,000 times larger in volume than the earth; yet, such is the tenuity of its substance, than in 1795, Sir Wm. Hershell was able to discover through its mass a star of the 20th magnitude. It must be an *embryo Planet, not yet reduced from vapor to a liquid globose volume afterwards to be converted into an ocean and earth, and organic formations.*"

Here, then is a complete confirmation (as far as the opinion and judgment of Mr. Arago will go with men of science) of the theory of the possible formation of our ocean, earth and organic formations which we have in this work ventured to present to the world. Mr. Arago is one of the leading astronomers of the present day.

We have now to inquire in what way, and by what laws the Creator produced, from these waters, all the solid parts of our earth? To form the ground-work of our reasoning on this subject, we shall advert to, and consider attentively, the accounts of the geologists of the marine strata and productions found in the bowels of the earth, and the experiments and opinions of some eminent chemists upon the nature and products of the processes of vegetation.

"The levels," says Cuvier, one of the most eminent

geologists of the present day, "on which marine productions are now found, are far above the level of the ocean, and at heights to which the sea could not reach by the action of any known cause. Every part of the earth, every continent, and every island, exhibits the same phenomenon. The traces of revolution become more apparent, when we ascend a little higher, and approach nearer to the great chains of mountains. Beds of shells are still found here, but not of the same species as those in less elevated regions. When we ascend to greater elevations, and advance to the summits of the highest mountains, remains of marine animals grow more rare, and at length disappear entirely; but the chrySTALLIZATION, and many other characters of these rocks, shew them to have been *formed in a fluid*, &c. It is impossible, therefore, to deny, that the waters of the sea have formerly, and for a great length of time, covered those masses of matter which now constitute our highest mountains; and further, that for a long time these waters did not support any living thing."

This last sentence is the only one from which our Theory differs, as will be shown subsequently on the authority of Mr. Lyell.

Thus we have the evidence of geology, that every part of the earth contains marine remains: and that even the summits of the highest mountains, where these marine depositions cease to be found, give yet evidence of *formation by fluidity*.

That these marine remains are not found in these summits may, I think, be satisfactorily accounted for; Many remains are found in the same forms as when they contained the living animals; but on taking them up, they crumble into impalpable powder.

The summits, therefore, of these mountains, have probably contained these marine remains in previous ages; but being contiguous to the earth's surface, have, by the joint action of the air and rains, lost their organization, been converted into their component substances, and been incorporated with other mineral, metallic, or earthy bodies.—Thus, all marble, lime-

stone, and chalk, are found to consist of precisely the *same materials* as every marine shell; all are formed of lime and carbonic acid; and it is therefore evident, that when the masses of shells shall be so far acted upon by the moisture of the earth, rains, internal fires, and mineral *solvents*, as to lose their forms, and be converted into powder; that these agents, acting on and percolating through them in various degrees, will reduce them into beds of chalk, or lime-stone, or marble, and, I think it not improbable, the chalk and lime-stone formations of the earth have been, in the course of ages, formed in this manner.—This idea I have seen confirmed by Mr. John Wesley, in his “Survey of the Wisdom of God in the Creation.” He says, in vol. 2d. page 256, “Chalk is no more than the ruins of sea shells, and lime-stones consist of the same bodies cemented together by stoney matter.” Again “where the tree falls there it lays,” says the Proverb. Any person who has seen and noticed the aboriginal forests of the earth, will have observed these trees in various stages of decay, many of them reduced to a state of dust or earth; and these causes, in the course of time, form hills and hillocks. In accounting for the origin of peat earth and morasses of black soil in Britain, a late writer has therefore very properly, I think, assigned their origin to arise from the gradual falling and decay of trees in ancient times, which, falling in marshy or swampy places, have decayed and acquired their black colour. In a great many parts of America, it is well known, large tracts of land are found in this state, being covered by masses of black earth of various degrees of consistence, from two to eight feet deep; the subsoil frequently clay. In an article lately published in one of the English papers, there is an account, confirming the opinion, that part of the coast of Australia, in the South Seas, has been entirely formed by the manure of birds called the *Petrel*, found there in such astonishing quantities, that flocks of them are seen to cover a vast extent of the atmosphere for days together.

These facts, therefore, offer corroborating testimony,

that large tracts of the earth can, and have been formed by the depositions of vegetables and animals.

In a geological work lately published in England, we have the following account of the order of succession of the different layers of rocks which compose the crust of the earth :—

INSTANCES WHERE FOUND.

- |                                                                                                                       |   |                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------|
| A. Vegetable soil.                                                                                                    | } | Mouth of the Thames, and other Rivers.                                             |
| B. Sand, Clay, Gravel, with bones of same species as now exist.                                                       |   |                                                                                    |
| C. Deep beds of Gravel, large loose blocks of Sand, all containing bones of animals belonging to species now extinct. | } | Surface of many parts of England, and especially the east and south western parts. |

TERTIARY STRATA.

- |                                                                                                                                           |   |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------|
| D. Sand, Clay, Pebbles, beds of Sand, white Sandstone, many sea Shells, bones of extinct species of animals.                              | } | Hampstead Heath, Bagshot Heath, coast of Suffolk and Norfolk, the stone of which Windsor Castle is built. |
| E. Alternations of Lime Stone, containing fresh water Shells, Clays of different qualities, and Lime stone containing marine Shells.      |   |                                                                                                           |
| F. Thick beds of Clay, many Sea Shells, beds of Lime Stone, remains of extinct species of plants and fruits, land and amphibious animals. | } | Many places round London, and a great part of Essex and North-East of Kent, Isle of Sheppy.               |

SECONDARY STRATA.

- |                                                                |   |                                                                                |
|----------------------------------------------------------------|---|--------------------------------------------------------------------------------|
| G. Chalk with Flints.<br>Do. without do.                       | } | Dover Cliffs, Brighton Hertfordshire, Flamborough Head, in Yorkshire, England. |
| H. A. Chalk Marle.<br>B. Green Sand.<br>C. Thick beds of Clay. |   |                                                                                |
| D. Yellow Sand, with beds of Iron.                             | } | Neighbourhood of Hastings, in the Isle of Parbeck,                             |
|                                                                |   |                                                                                |



In an account of the geological appearances from the Lands' End, in England, towards the vicinity of London, the following facts are stated :

The principal groups of secondary rocks, from the primary strata to the Chalk group, form the upper or more recent members of the division.

The Chalk group, the Oolite group, the Red Marle group, the Coal group, the Mountain Lime Stone group, the old Red Sand Stone group, the Graiwacke group, are of the following thicknesses :

Mountain Lime Stone group, 900 feet thick.

Old Red Sand Stone group, 1,500 feet thick.

Coal group, 1,700 feet thick,

Red Marle group contains mines of salt and marbles, alabaster and magnesia, with marine skeletons: its thickness in 2,100 feet.

The Oolite group contains about twelve alternations of subordinate beds or systems of beds, consisting of Lime Stones of different qualities, and of Clays: their united thicknesses being about 2,600 feet, of which 1,100 are formed of two beds of Clay of five and 600 feet each. The whole groups contain a vast abundance of *animal remains, almost exclusively marine.*

The Chalk group is separated from the Oolite group by several beds of Sands, Clays, and Sand stones, and including them, is 1,900 feet thick. It extends from Flamborough Head, in Yorkshire, to Weymouth. The whole group *abounds in organic remains* of the same classes as Winford in the Oolite group. The above groups make 10,700 feet.

Thus it appears, that both the Tertia and Secondary formations of the earth, contain vast masses of the remains of marine productions, many of them belonging to species now extinct. Many of these latter are said to be of enormous sizes.

The Coal formations must probably have been produced by the decomposition of marine vegetables, as they reach far too much below the surface of the earth to suppose them to be formed by those of a terrestrial species.

The seams of Coal which lay below the Secondary

formations at least, must, in my humble opinion, have been formed by depositions from the marine plants and animals, before the separation of Genesis, as I cannot conceive that the vast masses which constitute the Secondary rocks can have been produced solely by any Deluge or Inundation.

Phillips, in his Geology, p. 158, says, "The Coal measures contain neither reptiles, birds, nor mammalia. Now, had the coal been produced by land floods or rivers, and deposited where the measures are found, they *must* have contained reptiles, birds and mammalia. The ferns also found in these measures, are from 40 to 50 feet long, and as Phillips says, are quite unlike terrestrial ferns, which do not grow now more than four or five feet. No effect of climate could occasion so great a difference. Therefore, they probably were *marine ferns*, grown in the depths of the ocean of Genesis. In Sharon Turner's "Sacred History," vol. 1, page 169, in a note, it is said "Linnæus has only three kinds of marine plants, *fuci*, *centenas*, and *ulves*. But Lamoureux has shewn, that they have several natural families: he proves that the hydrophytes have a more complicated anatomy than has been known. He divides them into six families. Lamoureux has remarked, that the basin of the Atlantic to 40 degrees north, has a marked vegetation; so has the West Sea of the Indies, comprising the Gulf of Mexico, likewise the vast coast of South America, the Indian Ocean and its Gulfs, and the shores of New Holland. The Mediterranean has also a vegetation peculiar to itself, and extending to the Black Sea."\*—*Bull. Univers.* 1800.

Now then, to refer to the words of Cuvier, "the Levels on which marine productions are now found, are far above the level of the ocean, and at heights to which the sea could not reach by the action of any known cause."

To what cause can we then ascribe this phenomenon, but to the substantial, plain and simple one, the original formation of the earth: all its geological appear-

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\* See also Note to 4th Edition, in the Appendix No. 2.

rances give evidence of formation in a fluid. Of no waters have we any record sufficient to account for these facts, save the waters recorded in Genesis. These, therefore, forcibly press themselves on our attention, and appear perfectly competent to clear up all these phenomena of Creation.

But water alone, that is, holding no extraneous substances in solution, either partial or complete, *deposits nothing*. All its depositions are found to proceed from extraneous bodies. The petrifying power of certain waters, of which such fabulous opinions have formerly existed, is solely owing to the deposition of earths or salts it had previously dissolved, completely or partially.

We shall, therefore, proceed to state our humble conceptions of those laws of nature, which the Creator may have chosen for the gradual formation of our earth in the waters of Genesis, on the groundwork mentioned above, regarding the 1st verse of the 1st chapter of that book.

GENESIS, 1st chap. 1st verse.—“In the beginning God created the heavens and the earth.”

I wish first to premise, that, as I consider this Scriptural account of Creation to be the only one by which we can, naturally and reasonably, account for the geological phenomena of our earth; so, the only thing in which I differ from the, hitherto, received opinions of that Creation is, in the construction (which from a desire to account for these phenomena, and to reconcile them with the Scriptural accounts,) I have put upon the meaning of this first verse of Genesis.

As before observed, I had, in the course of these studies of nature, been led by them, and by reading and reflection, gradually to come to such a construction of that verse as the following:—That the term “the beginning,” *pointing to no specific time*, may refer to numerous ages previous to the separation of the waters from the waters mentioned in the 6th, 7th, and 9th, verses; and I moreover consider, that every man hath a perfect right to form such a construction of the Word of God as his understanding, after mature reflection on

His works, and a diligent study of them may lead him to; and more especially when his design is good, when he conceives he is thereby not only adding weight and authority to these Scriptures, by bringing the evidence of the geology of every part of the globe to their confirmation, but, perhaps, silencing thereby the infidelity of the sceptic, and, as he may hope, exhibiting, in a stronger light, the power, wisdom, and glory of his Creator.

In the 2d verse of Genesis it is said, "And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters."

By this verse, it would appear, the earth was completely covered by the waters; otherwise, the Spirit would have been recorded as having also moved upon the land; and the 9th verse is confirmatory of this circumstance, for it says, "and God said, Let the waters under the heavens be gathered together unto one place, and let the dry *land* appear: and it was so." This event, then, I consider to have happened many ages after the time of the first verse; which verse, I further consider, to point exactly to that period to which the Psalmist David, in Psalm cii., 25th verse, refers, "Thou, Lord, in the beginning hast laid the *foundations of the earth*;" and I consider this foundation to have been the formation of the aqueous globe of our theory,—the universal waters of Genesis.

We now proceed to our statement:—

The sea, or globe of water, mentioned above to have been formed by those gases which the modern discoveries in pneumatic chemistry prove all water to be formed of, and being destined by the Creator to produce habitable earth or land, we shall conceive this aqueous globe to have been endowed by Him for that purpose, with amazing prolific powers of life, both of the vegetable and animal nature.

The remains of many of those marine animals, whose skeletons have been lately discovered in the earth, of a species never known to have inhabited our

seas, are of gigantic stature and dimensions, as compared with those of any existing species.

The marine shells, the chalks, and lime-stone formations, which I consider to have been produced, as above observed, by the gradual disintegration of these shells in the course of sufficient ages; the vast coal formations, also prove, the amazing masses of animal and vegetable life, which we shall now suppose, according to our theory, to have existed in those waters of Genesis; and for proofs of which we accordingly refer our readers to the geological statements in the preceding pages.

To account further for the primary earths, lime, siliceous sand, sand-stones, flints, gravels, clays or aluminous earths, terra ponderosa, magnesian earths, salt formations, metals, mineral substances of *all kinds*, and the rocks and other substances composed of them and of the primary earths; we shall now proceed to a statement of those experiments, opinions and theories, which have been performed and maintained by several eminent chemical philosophers on this important head.

In the treatise on Chemistry by Professor Chaptal, mentioned in page 23, the following facts are stated to have resulted from the analysis made by him of certain vegetables:—

“The herb *Patience* affords sulphur; vegetables, in their analysis, likewise present us with certain metals, as iron, gold, and manganese. The iron forms nearly one-twelfth of the ashes of hard-wood. It may be extracted by the magnet; but it is seldom in a naked state, but is combined with the acids of vegetation. The iron is not imbibed from the earth, but is FORMED BY THE VEGETATIVE PROCESS. Lime, constantly enough, forms *seven-tenths* of the fixed residue of vegetable incineration, usually combined with the carbonic acid. Next to lime, alumine is the most abundant earth in vegetables; and next magnesia. Siliceous earth likewise exists, but less abundantly; less common of all is barytes or terra ponderosa.”

As an evident and sufficient proof that all the products of vegetables are produced by the water, and,

perhaps, the air, necessary for their growth, I extract also the following observation of Professor Chaptal:— “It appears proved by Van Helmont, that vegetables can live and grow with only air and water. He planted a willow weighing 59 lbs., and watered it with *distilled water* five years. It increased to 169 lbs., the earth it was grown in lost *only two ounces.*” If one vegetable be thus proved to acquire its growth from water and air, the strong probability is, that, as Chaptal says, “all others do,” and, by the uniformity of the laws of nature, we may conclude this law applies generally to the vegetative process.

It is true that Sir H. Davy states, in page 12, of his Lecture on “Agricultural Chemistry,” that the result of Von Helmont’s experiment was shewn to be fallacious; but that the true use of water was unknown till 1785, when Mr. Cavendish made the discovery, that it was a compound of two elastic gases, inflammable gas or hydrogen, and vital gas or oxygen.

Now, although Van Helmont was ignorant of this discovery, the fact he proved is still maintained, that water is the great source of nourishment of plants. In vain would any of the modern discoveries be brought forth to invalidate this great fact, since the vegetation of every part of the earth demonstrates it. In the thickest and largest forests, the aboriginal woods of the earth, no sensible diminution of the soil is observable, though under the operation of so vast a vegetation—whence then can the products of it be obtained but from the surrounding elements of water and air?

In fact, Sir Humphrey allows, in page 211 of same work, that “when pure water only is absorbed by the roots of plants, the fluid, in passing into the leaves, will probably have greater power to absorb carbonic acid gas from the atmosphere; when the water is saturated with carbonic acid gas, some of this substance may be given off by the leaves, but a part of it likewise is always decomposed, which has been proved by the experiments of M. Sennebier.”

Now, carbon appears to be the great *solidifying principle* of vegetables. The other principles are found

to be oxygen, hydrogen, and azote, all of which are obtained by the vegetative process from waters and the atmosphere. Accordingly, in page 259 of the same work, Sir Humphrey states, "It is evident, from the analysis of woody fibre, by M. M. Guay Lussac and Thenard, (which shews that it consists principally of the elements of *water* and *carbon*, the carbon in larger quantities than in the other vegetable compounds), that any process," &c. Again he says, in page 211, "Many plants that grow upon rocks or soils, containing no carbonic matter, can only be supposed to acquire their *charcoal* from the carbonic acid gas of the atmosphere; and the leaf may be considered, at the same time, as an organ of absorption, and an organ in which the sap may undergo different chemical changes." \*

I shall here extract from the same work part of page 281, relating to the formations of the principles of vegetables by the vegetative process. M. Schrader and Mr. Braconnot, from a series of distinct investigations, have arrived at the same conclusions. They state, that "different seed sown in fine sand, sulphur and metallic oxyds, and supplied only with *atmospheric air* and *water*, produced healthy plants, which, by analysis, yielded various earthy and saline matters, which either were not contained in the seeds, or the material in which they grew, or which were contained in much smaller quantities in the seed; and hence they conclude, they must have been formed from air or water, in consequence of the *agencies of the living organs* of the plants." These experiments are therefore confirmative of that stated in the work, performed by Von Helmont on the willow.

In page 282, Sir Humphrey gives an experiment he made with oats to ascertain whether any siliceous earth would be formed in the process of vegetation, but

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\* Now the carbonic acid gas that is formed in our atmosphere does not exceed two per cent, and I think it highly probable, therefore, that carbon itself is formed in the vegetable by the vegetative process, from the surrounding elements, oxygen, azote, hydrogen, light, heat and electricity; which idea is supported by Sharon Turner.

he adds, "the oats grew very feebly, and began to be yellow before any flowers formed; that the entire plants were burned and their ashes compared with those from an equal weight of grains of oats; less siliceous earth was given by the plants than by the grains, but their ashes yielded much more carbonate of lime.

That *there was less siliceous earth*, I attribute to the circumstance of the husk of the oats being thrown off in germination, and this is the part which most abounds in silicon."

Thus it appears, by his own experiment, *some silicon* was actually obtained by the vegetative process from the air and the water; and had the growth of the oats in his experiment come to perfection, the quantity would probably have been much greater. Moreover, in page 162, he allows that plants consume very small portions of earth; whence then can the trees of woods and forests derive their growth but from water and air?

Thus, although Sir Humphrey Davy supposes, but does not assert, the fact, that these earths are taken up by the vegetation from the soils around them; yet, as he does, in another part of his writings admit, that all substances, before entering the tubes of vegetable in nutrition, must be reduced to a state of complete solution in a liquid before that absorption can take place; and as it is well known that argillaceous earth, or alumine, silix or sand, and magnesia, are almost insoluble in water, and that lime is only soluble in very small quantities; I have therefore concluded, that such a perfect and sufficient solution, as Davy admits to be necessary, is impracticable; and, therefore, that the assertion (grounded on the forementioned experiments, by Chaptal and Van Helmont, namely, that these earths, metals and minerals, are *really and entirely* the products of the vegetative process) is much more probable; and I am the more confirmed in this probability, by the following facts, and reasoning upon them:—

1st. As oxygen, we know, exists in a solid state in all its oxydes, so it is, not impossible that the basis of these oxydes, the metals, and several of the primary earths, may be formed by the vegetative process, as



the French Geologist, Chaptal, asserts, " to replace the constant waste that takes place of the crust of the earth by the rains, streams and rivers "

One hundred pounds of lead is, I believe, found, by calcination or oxydation, to augment in weight to one hundred and ten pounds, thus absorbing ten pounds of *solid oxygen* from the oxygenous gas of the atmosphere, which can be recovered by deoxydation. Pit-coal, contains a great quantity of hydrogen, most probably in a solid state ; Pot-ash has yielded to Sir Humphrey Davy a metallic button ; and is therefore an oxyde, and also contains oxygen in a solid state.

2d The Schisti, or Slate Mountains, are said also to be formed by the decomposition of vegetables, and the coal formations, also, to consist of the residue of vegetables, probably charred by a close heat, and must therefore, be formed of the carbon and constituent gases of those vegetables. If such dense substances can be thus, in part, compounded of gaseous substances, there is an equal probability that the gases separated by the vegetative processes from the air and water necessary to their nutrition, may compose the primary earths, salts, minerals and metallic substances obtained from them by decomposition or incineration ; and I think it not improbable that future experiments may prove, that all the primitive earths, metals and mineral substances, are composed of the primary elements, as we are now philosophically bound to consider them, OXYGEN, HYDROGEN, and CARBON combined in proportions innumerable as those products themselves, and from which variety of proportion they receive their distinctive characteristic.

It is true, that only some of the earths and none of the metals have yet been decomposed, and are therefore considered as simple substances. Carbon, however, which would appear to be the chief *solidifying principle* of the vegetative process, is well known to be susceptible of receiving the gaseous state by combination with oxygen into carbonic acid gas. If any method should ever be discovered of separating the oxygen from this carbonic acid gas, the carbon would

be found again in its solid state.\* Chlorine gas also, when united with hydrogen by congelation, is found by a late discovery to assume the solid state, in the shape of crystals more than one inch long. This modern experiment is of great importance, as it proves that two gaseous bodies can, by their combination, form a solid one.†

As I have often repeated, also, in the body of this work and in the notes, all the metallic oxydes and several of the earths and alkalies must contain a great quantity of oxygen in a *solid* state.

The most dense nature of bodies, therefore, is no proof that they may not be composed of æriform substance; and a vast and most important field of discovery is, probably, yet reserved for pneumatic chemistry, namely, the separation of the gases from the caloric, and the light which retains them in that form, and the obtaining *their bases in the solid state*. As a proof of the vast importance of *such a discovery*, we now suggest, that the nutritive parts of the vegetable and animal kingdom must be composed (if our theory in the foregoing work be well-founded) of the solid bases of those gases; the discovery, therefore, of obtaining these bases separate from their heat and light, may possibly offer a mode of forming *nutritive matter* not yet known to mankind.

Several of the gases have lately been condensed into liquids and solids, by compression; and, in the present lamented state of potatoe cultivation, the idea here suggested of obtaining the bases of the gases, may be found worthy the attention of the chemists.

The idea of the unelementary nature of the metals is sanctioned by Dr. Thomson in his Atomic Chemistry, entitled, "An attempt to establish the first principles of Chemistry." In page 35, vol. 1, he says, "I am of opi-

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\* This has been done by the action of potassium on carbonic acid gas.

† Carbonic acid gas has lately been condensed by the pressure of a certain number of atmospheres into a solid body; and the new metal, ammonium, discovered by Sir H. Davy, is composed of the bases of the hydrogen and nitrogen gases.

nion we are not at present acquainted with any truly simple bodies. All our simple bodies are most probably compounds, and many of them may be afterwards decomposed, and reduced to more simple principles, by the future labours of chemists."

3d. As an important and additional proof that the process of vegetation *certainly* generates and produces one of the most abundant and most dense primary earths in nature, namely, silex, siliceous earth, or, as I shall call it, the sandy principle, I extract the following from the Elements of the Science of Botany, by the celebrated and indefatigable Linnæus:—

"In many parts of the East Indies, there has long been a medicine in high repute, called '*Tabasheer*', obtained from a substance found in the hollow stem of the bamboo. It has undergone a chemical examination, and proved to be an earthy substance, principally of a flinty nature; this substance is also found in the bamboo in England. In the hot-house of Dr. Pitcairn, in Islington, subsequently to this time, there was found in one of the joints of a bamboo which grew there, a solid pebble, about the size of a pea. The pebble was of an irregular form, of a dark brown or black internally: it was reddish brown, of a close dull texture, much like some martial siliceous stones. In one corner were shining particles, which appeared to be crystals, but too minute to be distinguished by the microscope. This substance was so hard as to cut glass. The cuticle or exterior covering of straw, has also a portion of matter in its composition, from which, when burnt, it makes an exquisitely fine powder for giving the last polish to marble, a use to which it has been employed from time immemorial, without the principle being philosophically known. In the great heat in the East Indies, it is not uncommon for large tracts of reeds to be set on fire on their motion by the wind, which I conjecture must arise from the flinty substance of their leaves rubbing against each other. These facts cannot avoid presenting to the mind at one view the boundless laws of nature. While a simple vegetable is secreting the most *volatile and evanescent*

*perfumes*, it also secretes a substance which is an *ingredient in the primeval mountains of the globe.*"

These facts, which have produced the assent of this Prince of Botanists, to the formation of a first rate primary earth, by the process of vegetation, are, I think, sufficient proofs, in conjunction with those above stated, that all the primary earths, the metals, and mineral substances, and, of course, all the rocks compounded of them have been originally formed by the processes of vegetation and animalization.

It may, perhaps, be thought by some, that allowing the processes of vegetation and animalization in the waters of Genesis to have produced, by their decomposition, all the materials of the geological productions, yet, that the quantity of deposition required to form the earth would be more than (they conceive) could be produced by the vegetables and animals of these seas or waters. But one single fact, which I shall mention from an ingenious publication, "On the *animals and monsters* of our oceans," will, perhaps, satisfy their doubts on this head. It is stated in that publication, "the offspring of *one single herring*, being suffered to remain unmolested in the sea for twenty years alone, would produce more than sufficient to form, in bulk, *ten* such globes as we inhabit;" and if, according to the system I have offered, it be conceded that the design of the waters of Genesis was to form and produce the earth by these depositions, we may reasonably presume, that vegetable and animal life were abundantly prolific to produce that end. Reckoning a herring to produce 30,000 eggs, the produce of the females, in two generations only, would be 6,750,450,000,000 of herrings.\*

I here insert some observations on the composition of the granite mass, which is supposed by some geologists to form the internal parts of the earth, or framework of the globe.

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\* The geometrical progression of each subsequent generation will be found by dividing the previous one in two, multiplying the half by 30,000, and then always adding the other half to the amount found, and so on to the twentieth generation, and I have no doubt the product of the twentieth generation would fully verify the author's assertion.

This mass is composed of the assemblage, some times in thick, sometimes in very thin laminæ of various kinds of mineral substances, such as quartz, mica, feldspar, &c., all of which substances, again, are composed of the various *primary* earths, lime, magnesia, silice, alumine, barytes or terra ponderosa. The granite mass, then, is ultimately compounded of these primary earths, most of which we have shewn to be produced by the decomposition of vegetables and animals; and that this mass has been originally formed in, and deposited from, a fluid, appears to me proved by the crystals of quartz, minute scales of mica, and its appearance of so fine a granular structure, and more especially by the visible layers and laminæ dispersed throughout that texture. I have counted above twenty layers of a white substance, in a fragment of granite or gneiss a foot square. Gneiss is a stratified granite.

Had the granite mass not been formed by the gradual decay, decomposition, and depositions of marine vegetables and animals, as we have stated in the theory of Creation; had its materials been formed at once in the waters of Genesis, the various substances composing it (the mass) would have united according to their mutual affinities, and been precipitated according to the laws of their gravity in vast homogeneous masses; but the visible deposition of part of it in layers and laminæ, seems to confirm the opinion of their having been deposited in the course, perhaps, of numerous ages, from the decomposition and depositions of vegetable and animal life. And though we should allow, with the Huttonians, that the crystalline appearance of this and other primordial rocks may be produced by the internal fires, yet this will not inform us, nor account at all, for the original production of their elementary particles.

Now, although, from the more ancient formation of the granite mass, few instances of visible vegetable or animal remains are found in its interior, yet, as we know that water of itself deposits nothing, but what it has held in previous solution, either partial or complete, and as we know of no other source, from which the substance of this solution could be derived in the

waters of Genesis, but from vegetable and animal decomposition, and as we have seen, by the foregoing theory and data, that vegetable and animal decomposition affords the materials of which the granite mass is composed, I trust we are warranted in the conclusion, that having been deposited and lain many ages previous to the deposition of the secondary and tertiary strata, and *that*, in a state of moisture, all its vegetable and animal organization has been destroyed from that cause, and from compression, internal heats, and the volcanic fires of the earth; and that this granite mass has been produced by the same means, which appear to have been chosen by the Creator, for the construction of the more external parts of the globe: namely, the generation, decay, death, decomposition, and depositions of the vegetables and animals of the waters of Genesis.

Accordingly we find, in the review of the third edition of Lyell's Principles of Geology, it is stated, that "the experiments of Watt prove that a rock need not be perfectly melted in order that a re-arrangement of its component particles should take place, and a more crystalline structure ensue."—We may easily suppose, therefore, [says Mr. Lyell,] "that *all traces of shells and other organic remains* may be destroyed, and that new chemical combinations may arise, and, according to these views, gneiss and mica schisti may be nothing more than micaceous and argillaceous stones altered by heat, and certainly, in their mode of stratification and lamination, they correspond most exactly.—Granular quartz may have been derived from siliceous sandstone, compact quartz from the same. Clay slate may be altered shale; and shale appears to be clay, subjected to great pressure. Granular marble has probably originated in the form of ordinary lime stone, having, in many instances, been *replete with shells and corals now obliterated*, while calcareous sands and marles have been changed into impure chrySTALLINE lime-stones."

I have chiefly made the above extract from Mr. Lyell's work, in answer to the objection stated in the preface of my theory, made by Mr. Fairholme, regarding

the granite mass; and I trust it will prove, that although this granite mass contains at present no organic remains, yet it may have contained them originally, and they may have been destroyed by the heats, fires, and consequent change or fusion the mass has undergone from those fires, or perhaps from electricity. In fine, I must here repeat, that I find no cause, after the perusal of the latest works on geology, to vary from the theory of Creation I now venture to present. On the contrary, I find several of the German Geologists have adopted the same opinion, namely, "that vegetable and animal life have been the cause of the production of the solid portion of the earth." The eminent geologist, Hutton, was of the same opinion.

I, therefore, adhere to the opinion I have stated, that the discoveries of the marine organic remains will be satisfactorily explained by our theory, and the necessity precluded of supposing the earth more ancient, since the separation of the waters, than by the Mosaic account; and I now conclude with an observation from Sharon Turner's "Sacred History of the World." "Therefore," he says, "it appears to me most probable, that whenever the *right theory* of the fabrication of the earth, and the era and succession of its organized beings shall be discovered, it will be found to be compatible with the Mosaic cosmogony, in its most natural signification."

Happy should I be, if the theory I am now presenting to the world, should, in its estimation, be found to approximate to this description.

The late discoveries in geology of Baron Cuvier, Lyell, and Buckland and others, as they comprise not more than a few miles of the depth of the earth, (being a mere fractional part of its diameter,) do not in the least invalidate the theory I have formed, which comprises the entire of that diameter. I, however, repeat and extend here the observations I have made already.

*First.* That Baron Cuvier, in his computation of the distance of time, namely, 5, or 6,000 years, (at which he places the date of his revolution as the result,) does not state by what comparison or scale he

arrived at his decision ; and it is difficult to conceive any scale he *could* have had, except a known quantity or depth of deposition from rivers or lakes, in a given time. If this, however, be the source on which he has founded his computation, I cannot but consider it a very insufficient one.—The power of deposition of lakes or rivers could no more be compared to the quantum of that power possessed by the waters of a deluge, or by the primeval oceans, than the currents of those rivers or lakes could be to the almost inconceivable force of the waters of a deluge overwhelming a great part of the earth, which must have been the case when the waters of Genesis, 9th verse, were gathering together.

I should therefore humbly suggest the query, whether the period, at which these fossil remains of the bones of terrestrial animals were deposited, may ascend no higher than the time of the Deluge of Noah ; and whether the circumstances of no human bones being found in the particular place of these discoveries, has been owing to those parts not being then inhabited by our species ?

Or, *secondly*, allowing him to be correct as to the period of 5, or 6,000 years' at which he dates his revolution, and which, as he says, " has buried and caused to disappear the countries formerly inhabited by man, and the species of animals now most known, that, contrariwise, it has left the bottom of the former sea dry, and has formed on it the countries now inhabited." I would ask, is not this period, which agrees very nearly with the time of the separation of the waters by the Mosaic account, equally well accounted for by *that* separation, and, therefore, instead of the countries formerly inhabited by man " having been then buried and caused to disappear," shall we not rather say, that the earth was *then separated from the seas* in which it had, according to our theory of Creation, been formed, and that soon after this period of the separation, *Man was created* ?

This theory will also account equally for the present appearance of those marine deposits and organic remains now found at the greatest depths of the earth to which



mankind have yet penetrated. All these marine exuvieæ and organic remains, and the strata under which they are deposited, are satisfactorily accounted for by the construction of the 1st verse of Genesis we have formed, as the basis of the theory of the foregoing treatise; and which construction has since been sanctioned by the eminent geologists and writers already specified.

I shall here add some observations on the Review of Lyell's Principles of Geology, of April, 1835, on the subject of the antiquity of Mount *Ætna*. "It is thus," it is said "that volcanic formations confirm the evidence afforded by the sedimentary strata of the immense antiquity and lengthened duration of even the most recent geological æras." But is it not probable that the eruptions of *Ætna* were much more frequent for ages after the time of its first eruption than what they have been since? Is it not probable the causes which produced that first eruption have since been greatly diminished by the numerous flowings of lava? According to the force of the cause, so must have been the number and frequency of those eruptions, and their frequency at first cannot be estimated by the eruptions which have happened in our times. The age of this mountain may, therefore be very far less than a computation formed on the frequency of deposits of its late eruptions would make it. The eruptions, also, may have begun for ages before the mountain emerged from the waters of Genesis, and these sub-aqueous eruptions been deposited before the separation of those waters.

It remains now to offer some observations on the Salt formations of the earth.

These formations offer strong evidence of our theory of the waters of Genesis. The salt, occasionally called common salt, sea salt, or marine salt, is entirely a creature of the ocean; no terrestrial vegetable that I know of has ever produced it, except when growing nigh the salt water.

These vast formations, found in various parts of the earth, must have unquestionably originated from saline waters; and one way in which the separation of the

salt from the water, which held it in solution, may be accounted for is, that parts of these seas have been swallowed up by earthquakes or volcanoes, and their waters exsiccated by internal fires: or, that these parts of the seas have, by some revolution, been separated, and not being replenished by any rivers, have been gradually dried up by the sun.

But I should suppose the quantity of salt produced by these accidental causes would not nigh amount to the vast salt formations of our earth.— Some intentional operation of Providence is more likely to have been the cause of producing an article so indispensable for the use of man ; and I therefore conceive, it is more probable that these formations have derived their origin from the decomposition of vast deposition of the marine plants of the waters of Genesis. These must have contained this salt in abundance, as do the marine plants of our seas, and the other products of their decomposition have united, according to their affinities, to form other geological bodies.

These marine plants must have contained sodium ; and the marine acid, to form the sea salt, has probably been produced by the decomposition of sea water, as hydrogen is said to be the basis of that acid. Sodium has the property of decomposing water, and, according to Good, in his Book of Nature, “ the gills of fish have it also.” Or, if we adopt the analysis of sea salt by Sir H. Davy, the chlorine (being entirely a produce of the ocean) has entered into combination with the sodium to form the chloride of it.

The substances, iodine, bromé, and above all, silicon, lately discovered, will probably ere long throw much light on the productive powers of marine substances by combustion. Iodine, at the heat of 212, becomes a violet-coloured gas. It forms an active acid by uniting to hydrogen.—Brome is a dense liquid, and forms an orange-coloured gas by a gentle heat.

Silicon is procured from silica, or the earth of flints, by the action of potassium: it appears as a dark fawn-coloured powder, which is *inflammable*, and which produces silica, or the “ sandy principle,” by combustion.

This silicon has been, in a part of this work, proved to be the offspring of the vegetative process. It *decomposes water and acids*. And here, therefore, we have some insight into the means by which nature has produced all the sands of the earth and the rocks composed of *siliceous* matter, namely, by the union of the silicon with the oxygen of the decomposed water, probably after the decomposition of the vegetable matter containing that silicon.

Sodium, also, a metal lately discovered by Sir H. Davy, is obtained from soda, the basis of common sea salt. This is, therefore, entirely a marine production. The sodium is stated by Sir Humphrey to be so very combustible that when thrown upon water it swims on its surface, hisses violently, and dissolves; and that silica, or earth of flints, probably contains two proportions of oxygen and one of silicon.

As a further proof of the production of siliceous earth, by the process of vegetation, we insert the following extract from Sir Humphrey Davy's admirable Lectures on Agricultural Chemistry. In page 54, he says, on the epidermis of plants, "In the reeds, grasses, canes, and the plants having hollow stalks, it is of great use and is exceedingly strong, and in the microscope seems composed of a kind of glassy net work, which is principally *siliceous earth*, and in the rattan, the epidermis contains a sufficient quantity of flint to give light when struck by steel, or two pieces rubbed together produce sparks" It is known, also, that the silicified seeds of the chara, a plant which grows at the bottom of lakes, abound in the flints of Aurillac, in France.

In Evans's Agriculture, printed at Montreal, it is said, page 51, "The ashes of stalks of wheat gathered a month before the flowering, and having some of the radical leaves withered, contained 12 parts of silica and 65 of alkaline salts in 100 parts. At the period of the wheat flowering, and when most of the leaves were withered, the ashes contained 32 parts of silica and only 54 of alkaline salts.' Thus, at one period the straw contains 12 parts, and at another 32 parts silica, and

this just at the time the plant is coming to its full growth. Now, if this silica, had been taken up from the soil by the roots of the plant, it would be absorbed by them in the same quantity at all times, and equally diffused through the straw ; but if, as by our theory, the vital functions of the vegetable form the earths just as they require them, the above most singular fact will be thereby accounted for.\*

Thus it appears that the latest discoveries of the celebrated chemist Sir Humphrey Davy, confirm the existence of the siliceous earth in vegetables. In fine, having had an opportunity of perusing the best and most modern works on the geology of our earth, I must here state that they serve to confirm my opinion stated in the theory of this work, that the processes of vegetation and animalization in the waters of Genesis, or universal Ocean, are the most highly natural, and reasonable means, by which we can account for the original formation of the geological bodies ; and that these having at that origin been deposited in horizontal strata, have since been subjected to innumerable convulsions, elevations, and disruptions by internal fires, or the electric power, and consequently to great chemical changes in their component parts, is beyond a doubt, and which the present appearance of almost every part of the crust of the earth confirms. It is therefore, probable that the metallic and mineral geological bodies may be combinations of the principles of vegetable and animal life deposited, as stated above in our theory ; which combinations have been effected by the fires, or heats of the internal parts of the earth, and the joint action of chemical affinities. In fine, the vegetable and animal kingdoms are already discovered,

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\* It is also to be observed, in confirmation of our theory, that as it generally happens the rains are more abundant in the yearly parts of the seasons, more silica would be dissolved by them, than at the time of flowering, whereas the above experiment proves that nigh three times more silica is formed in the plants at this period ; and I consider that this is a complete proof that (notwithstanding Liebig's opinion, that the earths are taken up from the soils) the silica of wheat is actually formed by the process of vegetation.

by analysis, to be reducible to the elementary principles oxygen, hydrogen, carbon, azote, and perhaps heat, light and electricity; and I think it probable, the mineral kingdom will, ere long, exhibit, the same result. For who would have believed fifty years since, that from silica or the earth of flints, a combustible substance would be produced, reproducing silica or the sandy principle by its combustion, and consequent union with oxygen? And, in fact, all the primary earths are now found to be oxyds containing oxygen as a component principle in a solid state.

In corroboration of our statement of the power of the vegetative functions to produce the primary earths, we have now to add a statement from Sharon Turner. In his "Sacred History of the World," vol. 1st, page 93, he says,—“Vegetables have even some relation with the Mineral Kingdom; for they not only form the carbon they contain, but some have been found to have copper particles”; (and in a note it is said) “That copper exists in a great number of vegetables, was announced in 1817.—Mr. Targeau found five millogrammes of copper in a killograme of grey quinquina, eight in Martinico coffee, and nearly eight in wheat.” (Bull. Univ. p. 139) He continues, “And several vegetables secrete flint and likewise sulphur. as in our common corn;” (and in a note it is said) “Sulphur exists in combination with different basses in wheat, barley, rye, oats, maize, millet, and rice.” (Lindsay’s Nat. Bot. p. 103.) Mr. Turner continues, “We may add iron and gold also, for both of these have been found in vegetables.”

And in page 393, in a note it is said, “The energy and even creative agency of the living principle of plants appear in its power of converting material particles into other substances. Experiments on vegetables seem to prove that the solid matter which entered into their composition in the more advanced period of their growth, must, in part at least, have been produced by some action of the vital powers and could not have been obtained ab. extra.”—Bul Physic, p. 307, and Dr. Thompson’s Ch.

In the Edinburgh Review of Buckland's Bridgewater Treatise, the following extract appears from that work : " It is marvellous that mankind have gone on for so many centuries in ignorance of the fact, which is now fully proved, that no small part of the present surface of the earth is derived from the remains of animals that constituted the population of ancient seas. Many extensive plains and massive mountains form, as it were, the great charnel house of preceding generations, in which the petrified exuviae of extinct races of vegetables and animals are piled up, into stupendous monuments of life and death, during almost immeasurable periods of past time."

Mr. Ehrenberg, an eminent Naturalist, has, since Dr. Buckland's Treatise, discovered by the microscope the existence of fossil animalculæ, or infusorial organic remains, which form extensive strata of tripoly or polleschiefer (polishing slate) at Franzenbad, in Bohemia. The animals belong to the genus Bacularia, and inhabit siliceous shells, the accumulation of which form the strata of polishing slate. The size of one of these animalculæ is the three hundredth part of an inch. Yet, notwithstanding the conviction which Dr. Buckland so forcibly expresses, of the vast profusion of vegetable and animal life which must have existed in the ancient seas, and which could be no other than the waters or ocean of Genesis, to which the Doctor agrees, by the extract from the Bridgewater Treatise, (see page 5 of our preface to first edition), yet, notwithstanding this, he gives an opinion, in another part of that treatise, that animal life did not exist previous to the formation of those strata of the earth where their remains are first found; namely, the transition or secondary formations. We have given above Mr. Lyall's opinion, " that all traces of shells and other organic remains may be destroyed in rocks, by a heat not amounting to fusion." If our system of the formation of the solid parts of our globe, by the primeval deposition of vegetable and animal remains, be approved, it will perhaps shew, that internal heats and fires, generated by the gases and metals of these remains, were

much more frequent in those early periods of the world than at present. It is, therefore, no proof that vegetable and animal life did not exist prior to the transition formations and during the primary, to say, that their organic remains are not found there: an immensely less heat than that which must have been occasioned by the subterranean fires of the earth, previous to the separation of Genesis, would be sufficient to destroy all traces of organic remains, and to produce a chrystalline structure and new chemical combinations, as we find them at the present day. This objection, then, to the pre-existence of animal and vegetable life, because no present remains are found in the primary strata, is not, in my opinion, tenable. A great argument of the modern geologists is, "that the causes at present in operation, must have been producing the same effects in preceding ages." Therefore, by a parity of reasoning, conceiving the design of the Creator to have been, to produce the whole circumference and diameter of our globe, by the instrumentality of those natural causes and laws which we now see every where in operation, we infer, that the races of vegetable and animal life were continually employed for that end, since the formation of the primeval ocean of Genesis, as stated in our system; and, that these races were competent thereto, the present formation of a large tract of the earth by even a few species of marine insects, evidently proves; and it also proves, that the Deity could not have chosen, from among the laws of nature he had created, so energetic an agent of production since even electricity, though much more sudden and violent in its effects, has not the continuity of the agencies of life. The coral insect alone has produced, as shewn in this work, an extent of land equal in length to one eighth of the diameter of our globe, and still continues its operations; and it is even the opinion of some geologists, that another continent will, in time, be formed in these seas by means of these insects.

Doctor Buckland allows that some geologists are of opinion that fossil remains may have existed in the

primary formations, and all traces of them may have been obliterated by the internal fires; but he appears himself to think (and gives a quotation, I believe, from another writer) that the incandescence of the earth was, during the primary formations, so great, that no animals could have existed in the ocean.

Now, if our theory be well founded, that the same mighty energy of formation which has produced so large a part of the crust of the earth, (namely, the labours of the marine animals during life, and their depositions and those of the marine vegetables after death); if we allow that these same most powerful causes may have produced all the formations of the earth through its entire diameter, the incandescence during the primary formations will not render this theory untenable. By this theory, we account for the production of the internal fires, by the ignition of inflammable gases, and the metallic bases resulting from the decomposition of the vegetable and animal remains that had been deposited in the oceanic waters and attracted to a centre by the laws of gravity and pressure.

When a sufficient thickness of mass of these remains was thus accumulated, these internal fires would then be generated by the ignition of the inflammable matter of their remains, and, during the existence of these volcanic fires, an incandescence might have been produced over a great part of the earth, which, for a time, would destroy the animals of the ocean near it; but, as these fires could last *only* until the inflammable matter that generated them was consumed, when that took place, the (then) crust of the earth would be cooled down by the waters of the ocean, and future depositions of remains would take place, until again collected in sufficient thickness to reproduce internal fires and incandescence; when the same refrigeration must, in time, have taken place, all the fuel of these fires being again consumed.

In fact, this incandescence may, perhaps, account for a geological phenomenon stated by geologists, that entire genera of marine animals appear to have existed



at certain depths and have disappeared in subsequent strata, when other genera and species have succeeded them. May this not have happened by the sudden destruction of these genera by the incandescence, and the reproduction or reappearance of other genera when the refrigeration, as above described, had taken place?

But, further, if Doctor Buckland assents to the entire account of creation contained in the 1st chapter of Genesis, which he may well do, after agreeing that its first verse will account for all the wonders lately discovered by geology; in this case it will be seen that in our concluding note, we have shewn that, by the 7th verse, the waters of Genesis existed *above* the firmament, even allowing this word to mean the atmosphere, as thought by some writers.

In this universal ocean, by our theory we conceive the earth and planets to have been formed; and we know, from the 9th verse, the earth and its oceans were separated from these waters at the six days of the Mosaic account. This universal ocean must, therefore, be of perhaps, illimitable extent, and it is not possible that the incandescence of one, or even all the planets, could have more than casually, and for a time, (as we have attempted to explain), prevented the depositions and construction of the primary formations by the vegetable and animal kingdoms of this universal ocean.—Heat always tends to an equilibrium; water is a great conductor, or at least an absorber, of heat, and the waters of this universal ocean would be continually flowing over the earth, then forming in it, until the equilibrium and consequent refrigeration was effected.

We now return to the course of our theory on the earth's formation.

Vast tracts of the interior of the earth have, as above, been shewn to consist of the shells and remain of marine animals. The chalk and limestone formations, I trust to have shewn, have also resulted from the same remains; and also, that the coal formations have been produced by the residue of marine vegetables and a charring heat as well as the schisti or slate

mountains. As, therefore, the proofs narrated in the foregoing pages are, I trust, sufficient to prove that every part of the earth has been formed in a fluid; that many parts are visibly the remains of vegetable and animal decomposition, and that most of the geological bodies are resolvable into the elements of vegetable and animal life; we now arrive at our theory of the formation of the solid bodies, namely, THAT THE PROCESSES OF VEGETATION AND OF ANIMALIZATION, WERE THE MACHINERY CHOSEN BY THE FIRST CAUSE FOR GRADUALLY PRODUCING, IN THE COURSE OF SUFFICIENT AGES, IN THE WATERS OF GENESIS, THE VARIOUS GENERATIONS OF VEGETABLE AND ANIMAL LIFE; WHICH, BY THEIR GROWTH, DECAY, THEIR DEATH, DECOMPOSITIONS, DEPOSITIONS, AND THE LABOURS OF SOME SPECIES OF THESE ANIMALS, HAVE PRODUCED ALL THE GEOLOGICAL BODIES OF WHICH OUR EARTH IS COMPOSED. These bodies, as they were depositing, have been attracted towards the centre of the aqueous globe by the great and universal law of attraction, and before and since the separation have, by the effects of internal fires, convulsions, or the electric power, acquired their present appearances.

Now, in support of our theory of the earth, we add the following observations:—The law of gravity, or attraction, would necessarily occasion a vast pressure towards the centre of the aqueous globe, of all the particles of the geological bodies *as they formed*. The vegetable and animal remains of which they were formed, as stated above, would pass through various stages of fermentation—When a sufficient depth of deposition was formed, heat, inflammable and other gases, would be thereby generated; and these internal fires must have been in operation, pending many of the ages required for the formation of the entire diameter of the earth, in the waters of Genesis. Hence must have arisen, long before the separation of these waters, not only internal changes in the forms and original composition of the congregated masses of the geological bodies, but also numerous commotions in the interior parts, which have produced probably

many of the mountains, and must certainly have produced those depressions on the surface of the earth, which served to form the beds of the original oceans or seas at the time of the separation of the waters.

These internal fires of the earth, though at first sight they appear to us the effects of accidental causes, will probably be found to be an instance of the designing wisdom of the Author of nature.— The deposition from the ocean, which, by our theory, have formed the earth, must have been originally deposited in a soft state. By the continued pressure of the subsequent geological particles towards the centre, they would no doubt acquire a degree of solidity ; but perhaps the operation of these fires was required, to give them sufficient hardness to resist the powerful action of the rapid motions of the earth. These fires are, at the present day, considered by the first geologists to be occasioned by water coming into contact with the metallic basis of the primary earths, by which the water is decomposed and combustion ensues ; and in this case an absorption of oxygen by these basis must take place and their bulk be greatly increased, and this may have been designed by the Creator for enlarging the bulk of the earth. The electric agency, also, has probably had great influence in these internal changes, both previous to and since the time of the separation.

On the subject of the internal and external changes, I wish now to call the reader's attention to the ingenious and profound researches of Mr. Cuvier in geology. It appears that, as the result of these researches, he comes to the conclusion, "that if any thing be proved by the geology of the earth, it is, that a great revolution took place on it from 5 to 6,000 years ago," antecedent, too, to the existence of man on those parts, at least, of the earth, for he is said to have proved, that no vestige or organic remains of the human species have ever been discovered among the remains of the other animals found among the strata or deposits he treats of.

The period at which he states this revolution to have taken place, agrees very nearly with the Scriptural

account of the separation of the waters of Genesis. We know, therefore, that man did not *then* exist. We have, in concurrence of the opinion of this great revolution, Plato's account of his Atalanta, supposed to be the extent now covered by the Atlantic ocean, which, according to Plato's opinion, was formerly dry land.

That it is possible such revolutions may have taken place since the creation, is not to be doubted. The oceans may, in the course of time, have worn away those boundaries that have prevented their overflowing extensive tracts of the earth, or the power of earthquakes, or volcanic fire, may have produced a disruption and carried away the barriers of the ocean: It is, however, to be observed, that it is singular this opinion of Cuvier's is not supported by any account in the Scriptures. Had such a great convulsion taken place soon after the creation, is it not probable some oral tradition would have reached the time of Moses, or other Scriptural writers, just as we have handed down to us the account of the deluge of Noah ?

It were to be wished, therefore, that this eminent geologist had turned his attention to the waters of Genesis, as, I cannot but think, he would have therein found a more plain and easy solution of the phenomena he has so ably developed. The few miles of strata containing the remains on which he treats would, probably, have been deposited by these waters in a very limited period, previous to the separation of those waters of Genesis; which would satisfactorily account for the non-appearance of any organic remains of the human species in these strata, because it had not at that period been *yet created*; and it would equally well account for those fossil and organic remains of the marine animals he had found in those strata; and the vast period of time, namely, millions of years, he and the other late geologists conceive these strata have required for formation, would be also accounted for.

In fine, there is good and powerful reason to believe that the account of the creation must have been delivered to Moses by Divine inspiration.—It is not likely that he, of his own ideas, or even from any traditionary

account, could, in those times, have possessed that extension of thought that would have enabled him to frame such a system, or to form the conception that the earth was produced in a globe of water.

That it has been so formed, has not been discovered by science until the present day, nigh 6,000 years after its separation from these waters; and, as I have said in the body of this work, we have no historical account of *any but* the waters of Genesis, to which we can refer the phenomena of the earth, so I trust to have proved, that the best discoveries in geology and pneumatics are calculated to shew the real and necessary existence of those waters, and to add new force to the authenticity and authority of the holy Scriptures

It is, moreover, to be observed, that Cuvier gives us no scale, by which he has decided on the time of this revolution to have been 5 or 6,000 years; and it is very difficult to conceive what data he *could* have. The time taken by rivers or lakes to form deposits of a known thickness would avail him nothing, as their power of deposition could not be compared to that of such a deluge. May it not, therefore, be possible that the revolution he refers to may have been that of the deluge of Noah, in parts of the earth not inhabited by the human species?

Thus, by our construction of the first verse of Genesis, it would appear that the present actual state of the geological bodies, their frequent chrySTALLIZATION, and their gradual depositions in strata and laminae, can be reconciled to the Scriptural account. That chrySTALLIZATION and these strata and laminae must, according to the evidence of our senses, have required numerous ages for their formation and deposition. By the supposition that the time of the first verse was antecedent to the six days of the separation, the time required for these depositions is obtained, and they are satisfactorily accounted for; and, also, their having the appearance of *gradual* deposition, which they present to us. As it would appear, therefore, that the Creator has formed the earth by those natural laws we find every where established, we shall now, with humility, suggest, that

the true meaning of the 4th Commandment is, that in six days the Lord *prepared* the earth for the use of its inhabitants.

By the experiments of celebrated chemists, and more particularly by the authority of Linnæus, we trust to have proved a considerable number of the primary earths and metals to have been formed by the vegetative process of terrestrial vegetables.—But conceiving according to the theory in the foregoing treatise, that it was the design of the Creator to produce the geological bodies by the instrumentality of the processes of vegetable and animal life, the labours of many species of these animals and their decay, death, and deposition, we may conceive also, that the marine vegetables of the universal waters of Genesis were endowed with much more various and abundant powers for the production of the geological bodies than we have even found in the terrestrial vegetables. This superior power of production would be necessary to produce the design intended, and the same remark will apply to the marine animals of those waters.

As it is very remarkable, that no mention is made in the first chapter of Genesis of the creation of any of the *marine plants of the ocean*, I will conclude this part of the subject with an observation on that remarkable circumstance, namely, that it appears to me indicative of the possible truth of the theory I have presumed to offer, that the first verse of Genesis refers to a *preparatory process of the creation*, totally distinct in its time and nature from the separation of the waters and the primeval appearance of the dry land, as recorded in the ensuing verses, which took place in the six days, at the separation of the waters recorded in Genesis, first chapter. Because, the creation of the vast body of the marine plants (required for the purpose of nutriment for the marine animals of those waters, who, by their death, decay, and depositions, formed part of the machinery for the Creator for producing the earth,) having taken place at the beginning, as in the first verse, (being the *preparatory process* of the creation, by which the dry land was, in subsequent

ages, to be produced,) there was no need that mention should be made of *their* creation at the period of the separation, when the land animals and vegetables were brought into being; for, and because, these marine plants were included in the record of the first verse, "In the beginning," &c.

I have, since the printing of the second edition of this work, had opportunities of reading the most modern geological publications, and finding therein no cause whatever to vary from the theory of the earth I had formed, I now proceed, in this sixth edition, to the

#### ELUCIDATION OF THAT THEORY.

The mosaic account, by the 1st, 2nd, 6th, and 7th verses of the first chapter of Genesis, shews us that our earth was first created in the waters or universal ocean; and by the 9th and 10th verses, we learn that "the waters under the heavens were gathered together, and the land made to appear."

We have shewn that this part of the Scriptural account of creation is confirmed by the concurrent observations of the best and most modern geologists. Indubitable proofs in every part of the crust of the earth, shew it to have been "formed in a fluid:" and I trust the following elucidation of our theory will tend to shew that such has been the case through its entire diameter.

By this theory, we account for the formation of the entire diameter and circumference of the earth by the continued depositions which have taken place in the oceanic waters of Genesis from the "beginning" as per first verse, which depositions have been formed by the vegetable and animal kingdoms, and by the constant labours of various species of the animals of that universal ocean, as shewn at full length in the foregoing pages of this work.

In Lee's Elements of Geology, (New York, 1840,) page 171, it is said,—“The Pacific Ocean abounds in coral to the thirtieth degree of latitude on each side of the equator; so also do the Arabian and Persian Gulfs. On the east coast of New Holland is a reef, 350 miles in

length, and between that country and New Guinea, there is a chain of coral 700 miles long. The Maldivas, in the Indian Ocean, are coral reefs extending 430 geographical miles north and south. These are circular islets, the largest being 50 miles in diameter, the centre of each being a lagoon from fifteen to twenty fathoms deep; and on the outside of each island, at the distance of two or three miles, there is a coral reef, immediately outside of which the water is generally more than 150 fathoms deep."

The following cut will serve to illustrate the general shape and formations of these islands :—



Thus, a tract, nigh equal in length to one-fourth of the diameter of the earth, has been formed by a few species of insects alone. The vegetable and animal depositions of the ocean of Genesis, then, were first attracted to a centre by the universal law of gravitation, and there formed the nucleus or centre of the earth.\* This nucleus being continually augmented in bulk by

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\* It may be proper to explain how the primitive races of the vegetable tribes may have been supported before the nucleus was formed. There are many aquatic plants which take no root in the earth at all, but grow and float in the water. There is a species of the fig-tree in the Edinburgh Botanic Garden, which has grown for twelve years, suspended in the air and moistened with water; we have therefore a right to conclude, that if some species of land plants have this power, many of the first created marine plants of the ocean of Genesis would have it also. In fact, many marine plants of the present seas grow on the rocks, and must consequently derive their nourishment from the water. But it is possible that, until the nucleus was formed, the primitive marine animals may have found their nourishment in the waters, for the microscope shews us that every drop of water contains myriads of the insect tribes. We know, also, that the gills of fish decompose water, by which they would obtain two of the elements of all vegetables—oxygen and hydrogen.



the unceasing depositions of the ocean, until a great depth of the vegetable and animal remains were accumulated, internal heats and fires would be thereby generated, which would last until the combustible matter deposited was consumed. The fires would then cease, until another sufficient depth of fresh depositions took place. The fermentation of these would again produce heat, fires and incandescence, until again the combustible matter last deposited was consumed. The remains, after these combustions, would of course be incombustible, and would consist of all the primary earths, sands, clay, lime, magnesia, &c., and of the calces or oxydes of the various metallic and mineral substances contained in the original depositions of matter above stated.

These alternate depositions from the ocean, must have continued to generate these periodic fires, pending the whole time required for the formation of the diameter of the earth, that is, until the separation of the "dry land" from the "waters" took place, as mentioned in Genesis, first chapter, and 9th verse. The depth or thickness of the depositions required to produce each of these periodic fires, it is impossible to form any certain idea of. It may have required many miles of depth of deposits, as they would contain carbonic, sulphureous, oily, gaseous, earthy, saline and metallic matter mixed; but it is well known that it requires but a small depth of vegetable matter alone, being moist, and heated by fermentation, to produce ignition. A common hay-stack is often fired by the spontaneous ignition of its hydrogen.

Thus, according to this theory, we see that the internal fires of our earth at the present day, at least as far as they have been occasioned by the above original causes, cannot extend so near the centre of the earth, because the periodic fires, above stated, would consume all the inflammable matter at certain periods after it was deposited; each periodic fire would consume the combustible matter deposited from the ocean since the previous fire, and, after each conflagration the parts of

the earth then formed must have remained in the state of incombustible calces, to form its rocks.

This Theory will perhaps also account for that singular phenomenon in geology, of entire genera of marine animals disappearing at different depths in the earth. The incandescence had destroyed these genera, and it was not until the (then) surface of the earth was cooled sufficiently by the waters of the ocean of Genesis, between the times of the periodic fires, that fresh genera of animals could approach it. These fresh genera then approached it, and, as they terminated the time of their existence, their remains went with the other depositions, to augment the growth of the earth's bulk, and so on continually, until the separation of the land from the waters.

The reader will here observe, that although by the above causes of the primitive fires having ceased to exist, and the residue of them being matter in a calcified or oxydized form, except indeed the matter of the last depositions of the ocean of Genesis, (which may be one of the causes of the present volcanic fires), that therefore no central fire, arising from these primary causes, can exist; yet we do not mean to deny, that subsequent causes of fire may have, and are perhaps even now taking place.

The electric fluid, as is proved by late discoveries of Sir H. Davy, on the primary earths, (of which the oxydized matter of the above conflagrations would mainly consist,) is capable of decomposing these primary earths and water also. It is possible, therefore, combustion might be generated, even in the oxydes to which the original deposits were reduced. Thus, in the opinion of many geologists, there is a central fire in the earth.

Mr. Lee, in his *Elements of Geology*, page 53, says,—"From the result of all the observations hitherto made, we may safely conclude that the temperature of the earth increases as we descend, at the rate of one degree for every eight fathoms, consequently, at a depth short of a hundred miles, the materials of the globe are in a state of incandescence."

Now, though I agree that, from the cause above assigned, the (electric fluid) internal fires might possibly be regenerated from the oxydized remains of the primordial fires, yet I should conceive these subsequent fires are more likely to be partial than general. I conceive that the intention of the Deity was, by the means of the primordial fires, to prepare and harden the geological bodies, to produce chemical decompositions and recombinations of numerous useful substances, to increase the cohesion of these geological bodies, to enable them to sustain their rapid and powerful motions in the heavens, to elevate the mountains, to diversify the earth's surface, and give mankind the use of their mineral products; and I do not conceive these ends would be obtained, were the whole interior of the earth in a state of fusion from a hundred miles below the surface. The increasing heat of the earth, as we proceed downwards, can be equally well accounted for, by supposing the present fires to be occasioned by the more recent depositions of combustible matter from the oceanic waters of Genesis, which are still in a state of combustion,

And there is one corroborative circumstance of this stated by Archdeacon Paley, in page 388 of his *Theology of Nature*, namely, that "by a comparative calculation with the force of attraction of a rock of granite, the earth was said to have twice the density of that rock; or about five times that of water," which could not be the case if the earth were nearly all liquid fire; for, deducting the 100 miles of crust from the diameter of the earth, near 8,000, would leave an ocean of fire 7,800 miles deep. An idea so contrary to the ordinary course and wisdom of nature, appears to me preposterous.\*

I shall now make a few observations on the time that may have been required, according to our theory of deposition from the oceanic waters, to form the whole diameter of the earth.

We have shewn, in page 60 of the present edition, the power of geometrical progression in two genera-

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\* See pages 8 and 9, Appendix No. II.

tions of herrings, and that in twenty years of generation, a mass of matter could be produced, equal to *ten of our globes*, that is, allowing these generations to be undisturbed. Now that must have been the case in the oceanic waters of Genesis. In our seas, immense numbers are annually abstracted from the ocean by the fisheries. Not so in the primeval ocean : there was no abstraction of matter there whatever. The labours of the Zoophytes and other marine animals, we infer, according to the opinion of the modern geologists, have been also "going on in all former ages as at present," and would be another immense source of geological formation.

It has been stated by some geologists, that the sedimentary rocks have taken a million of years in their formation. That is, no doubt, grounded on the supposition that past volcanic action and convulsion have been the same as at present. I trust, however, to have shewn, in our theory, that volcanic and convulsive forces must have been immensely greater and more frequent in the primeval ages ; and I believe that a million of years ago, if the globe were then in being, there was detritus enough, arising from that volcanic action, to produce a million times the masses of rock that any "causes now in operation" could do, and am more confirmed in this opinion, from the vast difference that must have then existed in the tenacity of the formations, compared with their present state.

Whatever length of period, however, might have been actually employed, we trust we can give it by our explanation of the first verse of Genesis ; but we are not of opinion that the laws for the formations of the globe have required any such immense periods of time as is supposed by some geologists. Their comparative scale of formation, drawn from the present actual formations, is totally inadequate. How, for instance, could the power of deposition of lakes or rivers of the present state of the world be compared with the mighty force of the oceans of the globe, at the time of the separation of the waters of Genesis, rushing over the newly-formed earth with inconceivable impetuosity ?

I trust that, by the above elucidation, the reader will completely comprehend our theory of the formation of the solid parts of our earth, by the powerful and vital agencies which, we humbly conceive, the Deity may have employed to effect this wonderful purpose.

We wish now to make some observations on a most singular production, which we have fallen in with since the publication of the second edition of this work : this is Mr. Mantell's " Wonders of Geology." In page 400, vol. 1st. under the head of Geological Mutations, he says, " I will embody these inductions in a more impressive form, by employing the metaphor of an Arabic writer, and imagining some higher intelligence from another sphere, to describe the physical mutations of which he may be supposed to have taken cognizance from the period when the forests of Portland were flourishing, to the present time. 'Countless ages, ere man was created,' he might say, ' I visited these regions of the earth, and beheld a beautiful country of vast extent, diversified by hill and dale, with its rivulets, streams and mighty rivers, flowing through fertile plains and palms, ferns and forest of coniferous trees clothed its surface ; and I saw monsters of the reptile tribes, so huge, that nothing among existing races can compare with them, basking on the banks of the rivers and roaming through its forests, while in its fens were sporting thousands of crocodiles and turtles, winged reptiles of strange forms shared with birds the dominion of the air, and the waters teemed with fishes, shells and crustacea : and, after a lapse of many ages, I again revisited the earth, and the country, with its innumerable dragon forms, and its tropical fruits, all had disappeared, and the ocean had usurped their place, and the waters teemed with nautili, ammonites, and the cephalopoda of races now extinct, and innumerable fishes and marine reptiles ; and thousands of centuries rolled by, and I returned, and lo ! the ocean was gone, and the dry land had again appeared, and it was covered with groves and forests, but they were wholly different in character from those of the vanished country of the *Iguanodon*.' "

This very poetical effusion appears indeed every way worthy to be associated with the Arabian Tales. Countles ages, thousands of centuries, and other epochs stated in these "wonders," are tolerably latitudinary periods, even for fairy tales. It is remarkable, too, that although the author writes so highly of Dr. Buckland, as a great geologist, he has never mentioned the explanation of the first verse of Genesis, which the Doctor has adopted in his Bridgewater Treatise, purposely to account for these great periods of geological mutation. At the same time, Mr. Mantell affects to say, that geology, rightly understood, does not confute the Scriptures, or, at least, the purest piety. He, at the same time, would entirely set aside, as by the above extract, the account given by Moses, that the earth, since the separation of the waters in Genesis, has existed only 5,800 years. Now, if this important part of the Bible is not founded on fact, what an argument would mankind have for disbelieving the remainder? But, fortunately, even these "wonders of geology" cannot effect this. For, first, I verily believe that the carboniferous formations offer sufficient evidence that they were produced before the separation in the universal ocean of Genesis; I believe that these immense club mosses, these arborescent ferns, \* so immensely, larger than any of the present 'day, were marine; for I can never believe that any difference of climate could make such immense difference in the size of the plants. In examining coal, (that is not including lignites or brown coal,) in any part of the, earth we find no traces of woody fibre, which, had it been formed of terrestrial trees, would probably have been apparent. Coal appears more likely to have been formed of some soft pulpy matter, such as seaweed, and to have acquired its present appearance by great heat and

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\* Lee, in his Elementary Geology, page 67, says, "In treating on the coal formations, vegetables also, which are now mere herbs, then attained the size of large trees, as, for example, ferns, which, though they now attain the height of a few feet at the most, then grew as large as our tallest trees."

pressure, and decomposition. This opinion of the marine formation of coal is supported by Mr. Maletrenck.

In Sullivan's View of Nature, letter 38, page 109, Mr. Maletrenck, in treating on the origin of coal, says,—“ But this is a subject which we must examine more closely. Vegetables, as I have said, have been considered as the cause of the formation of pit-coal. A few forests, however, buried in the earth, are not sufficient to form the masses of coals which exist in its bowels. A *greater cause*, more proportioned to the magnitude of the effect, is required, and we find it only in that *prodigious quantity of vegetable matter which grows in the seas*, and is increased by the immense masses which are carried down by the rivers; these masses are agitated and broken down by the waves, and afterwards covered by argillicious or calcareous earth, and are decomposed. Nor is it more difficult to conceive how these masses of marine and other vegetables may form the greater part of the coal, than that shells should form the greater part of the globe. The direct proofs, in support of this theory, are the presence of aquatic and marine substances. The soils which contain coal are generally of schistus and grit; and as the formation of pyrites, as well as that of coal, comes from decomposition of vegetable and animal substances, (for sulphur has been proved to exist naturally in vegetables, and animals), all pit-coal is more or less pyritous, so that we may consider pit-coal as a mixture of pyrites, schistus, and bitumen.”

Mr. Maletrenck thus supports our idea of the origin of coal in the secondary formations. I have to add, as a further support of this theory, that all coal contains ammonia or its elements. Now terrestrial trees or vegetables will not account for this ingredient of coal. We know, moreover, that the remains of immense masses of animals must have been deposited in the oceans. The remains of whales, sharks, salmon, and all other fish, many species of which, I believe, are seldom found in the earth fossilized, must have been deposited somewhere in the ocean, and it appears

probable that coal has derived its ammonia from these sources. At all events, terrestrial vegetables alone will not account for it, for they do not afford one of its elements, azote.

"The coal beds at Johnstone, in Scotland, and those in the Creuzot, in Burgundy, are some of them, respectively, thirty and fifty feet in thickness, while in the forests of our temperate zones, the carbon contained in the trees growing over a certain area would hardly suffice, in the space of a hundred years, to cover it with more than a stratum of seven French lines in thickness." \*

But, whether time and further observation will prove these opinions, correct or not, still the story of the "beautiful country of the Iguanodon" can be accounted for without overthrowing the narration of Moses. Volcanic action, as I have shewn above, must have been immensely more active before the separation, and pending the subaqueous formation of earth in the ocean of Genesis, than at present. It is possible, therefore, that some mountainous countries may have been elevated above the surface of the waters long previous to the separation of the entire "dry land of Genesis," and that these mountainous countries may have been tenanted by these reptile tribes, and covered by these immense palms, coniferous ferns, club mosses, fine rivers, lakes, &c. for many ages previous to the separation, when the great bulk of the land was made to "appear," and thus the Mosaic account will be yet maintained in its integrity, notwithstanding the existence of the beautiful country of the "Iguanodon."

In the preceding system of the creation which I have ventured to form, and to which I was determined, as observed above, on reading the ideas stated by Archdeacon Paley to have been promulgated to the world by Buffon and other philosophers, I have made some remarks on the assertion, or supposition of Buffon, that

\* From the *cosmos* of Baron Humboldt, Vol. 1st page 284.

NOTE.—"Here then is a great support of our theory of the formation of coal from the marine vegetable deposits of the Ocean or waters of Genesis.



the globe we inhabit was formed by the stroke of a comet knocking off from the sun (as stated by Paley) a piece of molten glass, and I trust to have shewn the great improbability and absurdity of this. Such a supposition would lead us to believe, that the creation of our planetary system was not the gift of an all bountiful Creator, but merely the effect of chance ; and if I have proceeded to any severe reflections on its irreligious tendency, I trust I am warranted therein by the opinions given by Paley, of this doctrine being founded on atheistical principles ; that is, if I understand it, denying the agency of a Supreme Ruler of the universe in the works of nature.

An opinion so contrary to all our natural feelings of religion, it appeared to me the duty of every man to refute, whose understanding should dictate to him the errors of such a system ; and I hope to have shewn, that, as it is completely unsatisfactory to the mind of man, in the highest state of its acquirements, so it never can be productive of general assent ; and, in the following compendium of my theory of the sun's formation, I shall re-advert to the above supposition of Buffon :—

#### THEORY OF THE SUN'S FORMATION.

As the great discoveries in pneumatic chemistry, made during the last fifty or sixty years, may not be known to many of my readers, I here subjoin a short account of them. About the beginning of that period, Mr. Black, of Edinburgh, first discovered that the change of lime-stone into lime, by burning, was nothing more than the extrication of its carbonic acid gas from the lime-stone, by the heat employed. This discovery excited the attention of chemical philosophers to æri-form bodies, and Mr. Black's name will be venerable as long as the science is cultivated. A few years afterwards, Mr. Cavendish discovered the highly important fact, that water was composed of the basis of the two gases, oxygen and hydrogen, which was further proved by the experiments of Dr. Priestly, and the exact composition of water was finally confirmed by the accurate

analysis of Lavoisier and other French chemists, who, having decomposed the water into its elementary gases, reproduced it by the ignition of the same gases; and finding, by repeated experiments, the weight of the water always equal to the gases produced, and vice versa, that the gases employed to form the water always produced an equal weight of it. Subsequent chemists have verified these results, and it is now universally allowed, that all water consists of one part of hydrogen, and eight parts of oxygen, by weight.

Our atmosphere has been found to be composed of eighty parts of mephitic or azotic gas, and of twenty parts of oxygen gas. These three gases, oxygen, hydrogen and azote, which may be called primary, have since been discovered by chemists in almost every part of the vegetable, animal and mineral kingdoms, in which also a great variety of compound gases are discovered every year.

I now proceed, with due humility, to present to the reader a compendium of the ideas stated in page 40 on the sun's formation, at the time the primordial waters of Genesis were created, according to the construction I have put on the first verse of first chapter of Genesis, by the combustion of hydrogen or oxygen, or other combustible gases, created by the first cause, as stated in page 40 of this work. I have presumed that those gases were ignited by the electric fluid, by the blaze of comets, or other igneous bodies, and that the extrication of the light and heat, (formed by the combustion of these gases, in order to produce the formation of the aqueous globe, destined thereafter to originate the earth and the other planets of our system,) that the light and heat, so extricated have formed the body of our sun, which forms the centre of the system, by the laws of his *gravity and attraction*.

If I recollect right, heat and light have not as yet been discovered to have weight; but our means of ascertaining this by experiment, in the usual way, is very dubious. The bulk of a grain of heat or light

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\* See Note 1 to Second Edition, at the end of this work.

may, perhaps, be sufficient to fill a house; therefore we could, perhaps, not ascertain the fact; but heat and light are certainly sensible bodies, and therefore must have weight. Heat expands and increases the dimensions of the hardest bodies in an astonishing manner. Light is said to travel from the sun at the rate of twelve millions of miles a minute, and also penetrates the most dense substances. Although, therefore, the weight of these subtle agents be infinitely less than any other bodies we know of, they are, probably, subject to the same laws of attraction and gravity.—We may therefore conceive, that the heat and light extricated from the combustion of these æriform substances, in the formation of the primordial waters, would unite and ascend, by the laws of their gravity and attraction, or by an original impulse of the Creator, † to their position in the regions of infinite space, and form there the body of our sun, and that the planets, as they were formed, and were projected by the projectile force, became subject to its attractive influences.

Whether this attraction be effected by an inherent power of the sun, or, that it may be owing in part to the influence of the vast stream of æriform substance passing towards him, to supply him with fuel, I shall presently consider. I shall, however, previously make some remarks, in addition to those offered above, on the idea, of Buffon, of molten glass having formed our earth and the planets of our system. It is, I consider, impossible to conceive that glass could exist in the stupendous heat of the sun's fire.

† As light is known to exist in two separate states, namely, latent and active, and as we are told, in the 3d verse of Genesis, "Darkness was on the face of the deep," it is probable the light evolved in the combustion of the gases was diffused through the regions of space in its latent form, and was not elicited into its active and visible state until the time of the 3d verse; and it is remarkable, that the first operation of Deity, at the time of the separation, was the evolution of light in its active and visible state, and the collection of it into one vast focus, the sun of our system, as by the 4th verse. And I am happy to think that our theory of the formation of light, by the combustion of the gases, will serve to remove a frequent objection to the Mosaic account, namely, the existence of light before the sun is said to be formed in the first chapter of Genesis.

Glass is formed in our planet of siliceous earth and pot-ash. The former we have before proved, on the authority of Linnæus, to be composed by the vegetable process; its parts are therefore formed of the gases which the vegetable extracts from the water and air it imbibes for its nutrition. The latter (pot-ash) has also yielded to Sir A. Davy a metallic button. It is therefore an oxyde, and must contain much oxygen. Siliceous earth and pot-ash, the component parts of glass, are then mostly composed of æriform substance. We know that the diamond, which is probably much more dense than siliceous earth, has been volatilized in part by burning lenses, or by streams of oxygen gas in a state of ignition. What can these heats be in comparison to the sun's fire? Perhaps as an atom to a world.

I trust, therefore, it is more consistent with the sacred documents we have had handed down to us by our religion,—with the operations of nature we are enabled to examine—with the admirable simplicity and order of the laws by which the First Cause hath directed the operations of that nature—to believe, *that having first formed the principles which, in the present state of our knowledge, we must call elementary*, He proceeded, by the combination of these principles, by combustion, to form the waters which were destined thereafter to produce our earth and planets.

It is indeed possible that these elements, oxygen, hydrogen and azote, may be compounded of other final elements of much greater energy than themselves, but the rules of science forbid us to consider *that* as the fact, until we have, found it by experiment. We have therefore, only to carry our knowledge of these principles into our reflections on the construction of our system, and with humility, praise and adoration, to conceive, that as most, or all, the geological bodies we have analyzed, are found to consist of these principles, they may have been those with which the First Cause, with amazing skill and effect, has operated the wonderful system of creation He hath bestowed on us.

In the contemplation of this creation, and of the recent discoveries in pneumatic chemistry, I trust to have shewn the possibility that our sun may have been formed at the time of the formation of the primordial waters of Genesis ; and as before stated, I have considered the other planets of our systems, and their moons, to have been formed in the same manner, at the time when, by the creative mandate, the combustion of the gasses took place, and which I consider to be meant and recorded by the 1st verse of 1st chap. of Genesis. So I likewise conceive that our sun was formed at the same time, by the vast body of heat and light disengaged by the stupendous combustion, and that having found his position in the regions of infinite space, according to the laws of his nature, he exerted his attractive influences on the planets of our system, of which he became the centre.

We have now to consider by what laws the vast waste of the heat and light of the sun is replenished ; and as our conceptions thereon will be found in some degree at variance with the hitherto received ideas of the nature of the spaces between the sun and planets, and the regions of infinite space, and bear also considerably on the nature of the sun's influence on those planets, we shall first make some observations on the

#### ATTRACTION OF MATTER.

It is said by philosophers that all bodies are attracted to the earth's centre : all bodies thrown into the air from the earth descend to the earth's surface when the propelling force is spent, and when the body is arrested by the atmosphere through which it passes. It is said by Paley, page 449 of his natural Theology, that "One principle of gravitation causes a stone to drop towards the earth, and the moon to whirl round it ; one law of attraction carries all the different planets round the sun." This, he says, philosophers demonstrate ; and at page 388 he adds, "Calculations were made some years ago of the mean density of the earth, by comparing the force of its attraction with the force of the attraction of a rock of granite, the bulk of which could

be ascertained, and the upshot of the calculation was, that the earth, upon an average through its whole sphere, was twice the density of granite, or about five times that of water."

Now, respecting the principle of attraction, I have to remark, that in chemistry we know with certainty that particles of matter have a mutual and elective attraction called affinity. When an acid is united with a metal into a neutral salt by this attraction, it may be separated from it by any substance with which the acid or its particles have a greater affinity. Thus, if iron, or its oxydes, be dissolved in sulphuric acid, it forms green vitriol, commonly called copperas; but by adding an alkali to the solution, the iron precipitates, and a neutral salt is formed of the sulphuric acid and the alkali.

In a lake or pond in the isle of Anglesea, in Wales, the water holds blue vitriol, or copperas in solution, which is a salt composed of copper and the sulphuric acid. When iron hoops are thrown into the pond or lake, they become covered with copper scales, which is scraped off, and found to be the purest copper in nature. This decomposition of the blue vitriol takes place because the particles of iron have a greater affinity or elective attraction for the sulphuric acid than the copper has.

The load-stone is well known to attract iron, even in a cold state. Pieces of iron rubbed with the load-stone become also magnetic; two pieces of wood, or cordage and wood, and probably many other substances, by friction to a great degree, take fire; that is to say: they become raised to that degree of temperature by that friction, that their particles attract the oxygen from the azotic gas, and from the light and heat with which they are combined in our atmosphere. Certain stones also, as flints, being struck against iron or steel, heat the particles of the steel so as to calcine them; that is, they bring these particles to the temperature at which they *also* decompose the oxygen gas of the atmosphere, and disengage its latent light and heat. Thus the attraction of matter is certainly proved by chemistry.

But how is the attraction of large and solid bodies proved in the usual temperature of the atmosphere, as in the case of the block of granite mentioned by Paley? One rock of granite placed alongside another will evince no attraction. It is said, indeed, that some islands, having much iron ore, have attracted a vessel from her course, which, if it be the fact, may perhaps also prove the attraction of matter of a certain description; but I know no other way by which the attraction or density of the rock of granite could be proved, but by breaking it by some other body, and ascertaining the weight of the stroke; thus, if a hundred-weight of granite required a stroke of a certain number of pounds to break it, and a rock of some other species required only a force of half that number, its attraction or density might be said to be half that of the granite. Thus far, then, attraction would be proved by chemistry and geology also. But, that the Creator originally fixed some such law as attraction, for the cohesion of the particles of matter, appears highly reasonable; else, how should the earth and planets, travelling at such an immense rate in their orbits, be retained in their present forms, notwithstanding the power of such velocity of motion?—A ball of snow, when impelled by the force of the arm, if it be not rendered sufficiently dense by compressure, separates into innumerable parts; and it must have been the same with the earth and the planets but for some law of attraction or cohesion, to resist the attrition of their rapid motion through the heavens.

This attraction, then, of the particles of matter, seems to be indispensable to their existence as spheres; but the attraction of these for each other, though generally agreed to by the philosophers, appears more dubious and uncertain. This doubt is supported by their immense distances, which may, indeed, be founded on a crude idea, and the doubt may perhaps be dissipated on further consideration.

The moon is observed, in its approach, to occasion high risings or tides of the waters of the earth, which recede on its retiring. This, it seems to me, is an al-

most incontrovertible proof that the atmosphere (for storms are often generated at the same approach of the moon) and waters of the earth and seas are attracted by the moon. If the moon has this power, we may reasonably conclude that other planets have this power also, governed by certain laws of distance and dimension.

Now, as to the manner in which the sun exerts his attractive influence on the earth and the other planets. His attraction is said, by philosophers, to be the cause why the earth and planets, having been originally projected in a right line, do not move in that right line, but in their respective orbits round the sun. As to the opinions of these philosophers, of the nature of the sun's substance, I am not aware, except as above stated by Paley, that Buffon supposes it to consist of molten glass. I trust to have shewn, in the foregoing pages, the improbability of this, and that it is more probable to be a body of light and heat. His density, in that case, cannot be equal, bulk for bulk, to the density of the planets, which are, with reason, considered to be inhabited, and must probably be formed of solid matter. But, as to the nature of the sun's substance, I confess I cannot conceive it possible that a body of such inconceivable heat, should consist of any thing else than gaseous substance. We know of nothing here below that can produce light and heat with more intensity than the decomposition of oxygen gas. Why should we not reason by analogy, that the light and heat of the sun are produced by the same means? All the other means we have of producing heat by burning-glasses, or by friction, are derived from the sun; and nothing is more remarkable in nature, in her general principles, than uniformity of means. The principle of gravity is said to be the same in an apple falling to the ground, as in the motions of the heavenly bodies. Is it not, then, impossible to conceive that, in the sun's heat, solid or liquid substances could exist? The diamond is volatilized into vapours, and, if I recollect right, the perfect metals also, by the galvanic power. It has indeed been supposed by some, that the



sun may be habitable ; that the heat of the particles of light is owing to their friction or attrition, in their passage to the planets. This idea, of no heat in the sun, arose in part from the existence of ice and snow on high mountains in the torrid zone, which is now thoroughly explained from terrestrial causes, by Lamin, De Luc, Bougan and De Saussure. By such a supposition, we should be forced to conclude that the planets farthest off from the sun were the most warm, which I imagine is totally contrary to probability, to the opinions of the greatest philosophers, and to the evidence of our own senses in the planet which we inhabit.

“ A fact well known,” says De Saussure, “ and which proves strongly to my mind that the action of the solar rays (considered in themselves, and independent of all exterior causes of cold,) is as great on the tops of mountains as in the level country, is, that the force of a lens is the same at all heights. I am therefore convinced with Bougan,” continues he, “that the principal reason of the cold which reigns on the tops of mountains is, that they are always surrounded and covered by an air that is invariably cold, and that that air is cold because it cannot be greatly heated, neither by the rays of the sun, in consequence of the transparency of this air, nor by the surface of the earth, on account of its distance from that surface.”

“ That the temperature,” says Sir John Herschell, “at the visible surface of the sun, cannot be otherwise than very elevated, much more so than any artificial heat produced in any of our furnaces, or by chemical or galvanic processes, we have indications of several kinds ; first, from the law of decrease of radiant heat and light, which being inversely, as the squares of the distance, it follows that the heat received on a given area exposed at the distance of the earth, and on an equal area at the visible surface of the sun, must be in proportion to the area of the sky occupied by the sun’s disk to the whole hemisphere, or as one to about 300,000.\*

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\* Thus, by Sir John’s estimate, the heat of the sun must be 300,000 times greater than that received from it by the earth.

According to our theory of the sun, as above stated, we say that the sun is a mass of burning æriform substance, such as hydrogen gas, or some mixture thereof, which has the power of decomposing oxygen gas, and of throwing off its light and heat. The union of the basis of these gases, oxygen and hydrogen, would form water in the state of vapour, which would either be driven off into the heavens, and be in future decomposed, as happens in our atmosphere, by the electric fluid, or be otherwise condensed into aqueous globes, for the future formation of other heavenly bodies.†

I shall now offer some observations on the idea of the philosophers, on the existence of a vacuum in the spaces through which the planets move.

If we consider the projectile force to have been *ab origine* given to the planets by the Creator, we may suppose that this force was greater than what would have been required to produce their motions round the sun, if a vacuum had existed; as thus, allowing the spaces between the planets and the sun to be filled with an æriform substance of vast tenuity, (and, indeed, that such immense spaces should consist of vacuum is nearly incredible), yet it would still be possible that this æriform substance *should not impede* the motions of the planets, because, on the above supposition, the projectile force would have been made so much *greater* than would have been required for moving these planets through a *vacuum only*, as the resistance of this æriform substance should render necessary to overcome that resistance by the projectile force.

If, then we should adopt the idea that the heavenly bodies *do not* float in a vacuum, but should accede to the probability that the intervening spaces are filled up with an æriform fluid, I humbly conceive we shall have found a satisfactory way of accounting for the influence of the moon on our seas and atmosphere. If the fact be certain, that the waters rise as the moon approaches the earth, and recede as she retires [from it, may not this phenomenon arise from the pressure ex-

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† See Appendix No. II., page 28.

erted on the æriform matter above mentioned by the moon, on its approach to the earth, which pressure, at length reaching our atmosphere, presses on *it* also, and thereby on the waters of the ocean, causing them to rise and fall proportionably, and to occasion the spring, neap and daily tides? Should we not also have, by the same theory, a plain and simple way of accounting for the great principle of attraction in the heavenly bodies? That, by a power similar to that which propels bodies forward on the earth, seas and atmosphere, namely, the wind, so the heavenly bodies are propelled from their right line, and driven round their central sun by the repulsion of this mighty current of æriform gases in the regions of space.—(See *Note 6th to the Second Edition, at the end of the book.*)

Allowing the projectile force (by which I understand Sir Isaac Newton to have meant the primary projectile force directly given to the heavenly bodies by their Creator) and the attractive force of the sun, to be the causes of the, nearly circular motions of the planets, still it appears to me clear, that this projectile force must be something very different from the species of impelling force which Paley, in his "Natural Theology," speaks of in page 390 of that work. "If it were possible," he says, "to fire off a cannon-ball with the velocity of five miles a second, and the resistance of the air could be taken away, the cannon-ball would for ever wheel round the earth, instead of falling down to it." Now, if the ball were fired off in a direction due north, it is evident that, in the course of the circle it would form, it must return by the south pole to the place it was fired from, to north; and therefore, in every revolution, it would return in an exactly opposite direction to where it was fired off from; the force, therefore, by which it returns could not be the force of firing off, because it returns in a line directly opposite to that force.—(See *Note 4.*) I therefore conceive the projectile force, impressed by the First Cause on the heavenly bodies, is of an entirely different nature from the projectile force of a cannon-ball. May not the projectile force partake of the nature of electricity?

Having, in the sixth edition, formed our theory for supplying the waste of the sun's fire by the means of the comets, we beg leave to refer the reader to the Appendix No. II, where, under the head of "Extra Matter for the Sixth Edition," commencing at page 23, he will find the said theory, shewing how we conceive the waste of the fires of the suns of the universe are supplied with gaseous fuel by means of laboratories established for that purpose by the Creator in the regions of space, and how these combustible gases are conveyed from those laboratories to the suns by the comets of the systems. In the same Appendix, pages 21 and 22, the reader will find our theory, (based on that of Sir Isaac Newton's, as stated in Note 6 to second edition), in which we shew how, by the agency of the electric fluid acting on an elastic medium, the heavenly bodies are carried round the sun.

I have here to observe, the opinion formed and stated, in this our Theory of the Sun's Formation, of an æriform fluid or medium existing in the regions of space, has now been confirmed by the discovery of Encke's Comet.

It appears the Newtonians had asserted that "either there was no such fluid, or that it was so thin, and rarefied, that no phenomenon yet examined by philosophers was capable of betraying its effects." *Vide page 151, Whewell's Bridgewater Treatise, 1838,* and same page it is said, "But the facts which have led astronomers to the conviction that such a resisting medium really exists, are certain circumstances occurring in the motion of a body revolving round the Sun, which is now usually called Encke's Comet."

It appears this body was first seen in 1786, and that the effect of the resistance of the ethereal medium from its first discovery, (in that year to the present time say 1833,) has been to diminish the time of revolution, by about two days; and the comet is ten days in advance of the place which it would have reached, if there had been no resistance. (*See page 154 of Whewell's Bridgewater Treatise.*)

The Nebular hypothesis also appears to me to confirm or support both the theory of the combustion of the gases which I have ventured to produce as the origin of the Earth and Planets, and also the cause and formation of new heavenly bodies by the products of the combustion of the gases for the replenishment of the Sun's waste of light and heat, as stated in a subsequent part of this work.

This Nebular hypothesis is thus introduced by Mr. Whewell in his *Bridgewater Treatise* of 1833, *page* 143.

“La Place conjectures, that in the original condition of the solar system, the Sun revolved upon his axis surrounded by an atmosphere, which, in virtue of an excessive heat, extended far beyond the orbits of all the Planets, the Planets as yet having no existence. The heat gradually diminished, and as the solar atmosphere contracted by cooling, the rapidity of its rotation increased by the laws of rotary motion, and an exterior zone of vapour was detached from the rest, the central attraction being no longer able to overcome the increased centrifugal force. This zone of vapour might in some cases retain its form as we see it in Saturn's ring, but more usually the ring of vapour would break into several masses, and then would generally coalesce into one mass, which would revolve about the sun. Such portions of the solar atmosphere abandoned, successively at different periods would form ‘planets in the state of vapour.’”

Now it does not appear that La Place has given any clue to find how or of what this solar atmosphere and vapours were formed. He does, indeed, support our idea, that planets may be formed by vapours and subsequent condensation, which is precisely the way the oceanic globe of our theory is conceived to have been produced; and without infringing on the humility we wish to preserve, we may say we have presented to his consideration, in our theory of the combustion of the gases, a real and competent cause for the production of the atmosphere and vapours of his ingenious hypothesis. But we have to observe on this theory of La

Place's that we have more cause now to uphold our own theory of the formation of the Planets in the ocean of Genesis, as his nebular theory has now been disproved by the discoveries made by Lord Rosse's Telescope.—*(See extra matter for 6th Edition at the end of the work.)*

Will not the combustion of the gases, of which we all now know water to be formed, as stated in the theory of the sun's formation, and the extrication of their heat and light, account not only for this solar atmosphere, but also for the means by which the Great First Cause produced the sun itself?

We now recur to Paley's observation in page 388 of his "Theology of nature," that "by a comparative calculation with the force of attraction of a rock of granite, the earth was said to have twice the density of that rock, or about five times that of water."

Has the mode of ascertaining the force of this attraction of the earth been grounded on the supposed force of the attraction of the sun on the earth and planets? Has the earth's attraction in the above experiment been come at by calculating its proportionate bulk to that of the sun, and assigning it therefrom its proportionate attraction? If so, and it should be conceded that the theory I have ventured to propose, of the sun's power of attraction being created or increased by means of the elastic gaseous medium existing in space as stated, in the Appendix—if this theory be correctly founded in nature, it is evident the above experiment in the attraction of the earth cannot be correct in its results.

The force of attraction of a body is composed of the united attraction of its parts; but if the sun's density, has hitherto been considered by philosophers to be according to his powers of attraction, and it should be agreed to, that the elastic gaseous medium has a great influence in producing that attraction, the density of the sun must, in this case, be much less than it has hitherto been estimated at, and of course the density of the earth also if it has been grounded on this supposed density of the sun.

I now conclude the theory of the sun's formation by some observations on the following extract from Paley's Work, page 380. Speaking of the intervening spaces between the planets, he says that "the intervals between them are made devoid of any inert matter, either fluid or solid, because such an intervening substance would, by its resistance, destroy those very motions which attraction is employed to preserve."

I have before endeavoured to shew that there may be such æriform substances existing in these spaces, which would indeed resist these motions of the planets, but that this resistance is sufficient only to diminish the velocity of these motions. To explain this more fully:—May not the moon have been originally projected by the Creating cause to move in its orbit or course at the rate of three thousand two hundred and seventy miles per hour? and, supposing the resistance of the *media* or æriform fluids of my theory to be equal to one thousand miles per hour, this resistance would only diminish the rate of the moon's motion to two thousand two hundred and seventy miles per hour, which is the actual rate she is said to travel in her course round the earth.

In fine, the theory of the sun's being replenished with fuel by means of æriform fluids, is supported by another observation of Paley's. In page 350 of the above work, he says—"The light and heat of the sun follow the same laws, and, to us, appear nowise different from the light of a candle, and the heat of a coal fire." Why, then, may not this heat and light of the sun be supplied in the same manner as that of the candle and coal of fire?

In our planet, this heat is now known to be produced by the decomposition of oxygen gas by those combustible bodies, and the consequent extrication of its latent light and heat; but if the light and heat of the sun be generated by the same laws, and, as there is probably some physical cause for the attraction of the planets by the sun—and as this physical cause of the motion of those planets round their central Sun, may throw additional light on the great principle of his attraction—

I therefore humbly submit the foregoing Theory of the Sun's Formation and the means of supplying the waste of his combustion, to the scrutiny of a candid and enlightened world: and being sensible of my incompetence in respect of that profound degree of scientific knowledge required in the attempt I have made to reconcile and explain the account of the Creation, handed down to us by our religion, with the great discoveries in the sciences of Geology, Chemistry and Pneumatics, I have only to hope I may, at all events, have exalted the *utility* of these sciences by shewing their tendency and power to diminish or quiet the doubts of scepticism, and to open greater sources of our admiration of the goodness, power, wisdom and glory of the Great First Cause.

Having now represented to the public the theory of the sun's formation, arising, as I conceive, naturally, from the stupendous quantity of light and heat which must have evolved from the combustion of the gases required for the formation of the ocean of Genesis, and having therein given my ideas on the manner in which the waste of the sun's light and heat may be replenished, I purpose now to make a few observations on the opinion stated by Dr. Herschell as to the opaqueness of the sun, and also of the spots which are found on, or adjacent to his surface.

Sharon Turner, in his Sacred History, page 46, vol. 1st, says—"Of the actual substance of the sun, so little satisfactory to our judgment has been discovered, that all which is mentioned concerning it, can rank no higher than conjectures more or less plausible. Dr. Herschell thought his body to be opaque, with an upper stratum of black luminous clouds. Black spots of varying magnitude and form are continually appearing upon it and receding;" and in a Note from La Place, page 20, it is said—"Dr. Herschell has inferred that what he deems the sun's luminous atmosphere, is 2,500 miles from its surface."

The preface to Sharon Turner's Work is dated 1832. The first edition of mine was published in 1836;—his observations as to the substance of the sun could not,



therefore, include it ; and I shall now make one final observation in support of the probability of my system, namely, that it is, I conceive, highly probable, the Deity would convert the stupendous quantity of heat and light which must have been extricated from the combustion of the gasses of which the oceanic waters are formed, to some great purpose. The fabric of the sun thereby, was it not the most prominent and necessary one he could have applied it to ?

Now, respecting Dr. Herschell's opinion as to the opaqueness of the sun, as I am well aware of the exalted talents of that philosopher ; and equally conscious of my own want of scientific knowledge to cope with them, I must leave the decision on the validity of my theory of the sun to men of scientific acquirements, should it meet their eye ; and in that case, I beg to submit to them, should they agree to that validity two questions :—

1st. The luminous atmosphere of Dr. Herschel being, as he says, 2,500 miles from the sun, will it not be accounted for by the vast bodies of hydrogen and oxygen gases which I have supposed, by their combustion, to serve as alimentary fuel for the sun ? Also—the spots on the sun's surface, or, as some say, adjacent thereto, may they not be accounted for by the above said cause, from the denser volume of aqueous vapour which must be produced by this vast combustion of hydrogen ? The combustible gases would probably be ignited at the distance mentioned, (2,500 miles from the sun) and no doubt they would prove luminous enough.

2d. If, as it has been lately suggested, our atmospheric heat is produced by the sun's rays operating on a calorific medium, can we allow this heat to be produced by any other means than by abstraction from that medium ?

Heat is undoubtedly a material substance, and from whencesoever it is abstracted by the sun's rays, and carried off, must not a corresponding degree of cold be produced ? and must not the whole extent of the space between the earth and sun become continually more and more refrigerated, unless some means are found for

replenishing this waste of heat ? and this we humbly conceive, our theory of the sun will do.

I now present to the reader a short outline of Sir Richard Philips' Theory of the cause of the motions of the heavenly bodies, taken from a work called "Wonders of the Heavens," Lecture 2d, page 30, printed for Richard Philips, London. I make this extract as presenting a singular sanction of our theory, of the existence of a gaseous medium in the regions of space ; but do not agree with him in rejecting the Newtonian principle of gravity and attraction, and refer our readers to our observations thereon in the preface to the third edition.

" About 100 years passed from the discovery of the theory of gravitation, without any remarkable addition to it, till the year 1813, when Sir Richard Philips, in some essays on the proximate causes of the phenomena of the universe, impeached the entire theory founded on the simultaneous existence of universal gravitation, projectile force, and an alleged *vacuum* in space."

This writer has shewn that Hook's Law of Gravity, which Newton so fortunately applied, is not a universal law, but a law created locally by the transfer of motion through any medium, such as the medium of space, and that the motions of nature, necessarily propagated according to that law, are, in truth, the cause of all the phenomena which heretofore had been ascribed to the occult and unintelligible principles of attraction and gravitation. Hence, as the law called the law of gravity, which Newton applied to the problems of his *Principia*, is proved not to be universal, and not an innate property, but an accident of matter, so there no longer exists any occasion for the projectile force with which Newton endowed the planets to prevent their falling into the sun ; nor was it any longer necessary to extinguish the medium, which it may be supposed is co-existent with space, for the purpose of conferring perpetuity on the projectile force.

He considered all matter as the possible parent of motion, and motion as power, and then proceeded to

show, that all bodies on the earth are the parents of its motions, and that its motions are competent to produce all the phenomena which we witness on earth; that weight or gravity is the mere effect of motion, or a tendency to move by the transferred impetus of the earth's motions; in fine, that two-fold motions are powers of aggregation in all planets; and that these motions, or that of the *sun*, propagated through the *medium of space*, diverge as the square of the distance, and act with the same precision through an elastic medium, as a *lever of iron*. He shewed also, that the fall of bodies to the earth, ascribed to terrestrial gravitation, is a necessary result of the twofold motions of the earth, and that all the phenomena heretofore explained, by a principle which, considered as universal, led to many false analogies, are mere results, of motions, or accidents of matter, altogether local and mechanical.

The philosophy of material phenomena, promulgated by Sir Richard Phillips, teaches that the universe consists of extension of matter under various expansive gaseous, fluid, and fixed forms of body, proceeding in relative density from the rarest and most extended fluid media, to the most condensed aggregate or fixed atoms.

"In fine," says Sir Richard Phillips, "motions of matter, subject to regular mechanical laws, acting absolutely or subordinately, generally or locally, on aggregates or atoms, and producing various densities, and different degrees of locomotion, and affinity, in atoms of matter, of different constituent forms, are the proximate causes of all phenomena; and as one series of phenomena depends on another, so all existing phenomena, are, in regard to others, physically fit, compatible, and harmonious; and as matter cannot originate its own motion, so in considering motion as the proximate cause of all phenomena, we arrive, through the ascending series, at the necessary and sublime First Cause of all motion and all phenomena."\* *Page 35.*

\* It being thought by some that Sir Richard Phillips' Theory was of Atheistical tendency, I have extracted the foregoing paragraph to shew the reverse.

The next sanction of our theory of the existence of gaseous matter in the Sun's atmosphere, we take from Sir John Herschell's *Astronomy* of last year, *page* 407, *chap.* 12.

"We shall conclude this chapter by the mention of a phenomenon which seems to indicate the existence of some slight degree of nebulosity about the Sun itself, and even to place it in the list of nebulous Stars. It is called the Zodiacal light; and may be seen any very clear evening soon after sunset, about the month of April or May, or, at the opposite season of the year, before sunrise, as a cone or lenticular shaped light, extending from the horizon, obliquely upwards, and following generally the course of the ecliptic, or rather that of the Sun's equator. The apparent angular distance of its orbit from the sun varies according to circumstances, from  $40^{\circ}$  to  $90^{\circ}$ , and the breadth of its base perpendicular to its axis, from  $8^{\circ}$  to  $30^{\circ}$ . It is extremely faint and ill defined, at least, in this climate, though better seen in tropical regions.

It cannot be mistaken for any atmospherical meteor or Aurora Borealis. It is manifestly in the nature of a thin lenticularly formed atmosphere, surrounding the Sun, and extending at least beyond the orbit of Mercury and even of Venus, and may be conjectured to be no other than the denser part of that medium, which, as we have reason to believe, resists the motion of comets, loaded perhaps with the actual materials of the tails of millions of them, of which they have been stripped in their successive perihelion passages, and which may be slowly subsiding into the Sun."

It appears, hereby that Sir John completely sanctions the existence of gaseous matter in the Sun's atmosphere. And for what other purpose could it be there, but for the supply of the waste of its light and heat by the combustion of this gaseous matter? And Sir John may well say, as he does in the above most admirable treatise on *Astronomy*, "that there is an enormous degree of heat in the Sun."

The last extract we shall here make, as sanctioning our theory of supply of waste of the Sun's heat and

light, is from a work published in 1841, called "Graham's Elements of Chemistry."

"It has always been observed that there is a black line or lines among the rays received from the Sun through the prism on a spectrum. These black lines Philosophers had never been able to account for. But the atmosphere of the Sun has now received an entirely chemical character from late experiments of the celebrated Sir David Brewster, who found that on passing a ray of light from a common lamp through a medium of *nitrous oxyd gas*, it immediately formed a thousand black lines on the spectrum. He, Sir David, thence infers, (in accounting for the black lines when rays are received from the Sun) that gaseous matter must exist in the sun's atmosphere, by which medium the black lines are produced on the spectrum." Doctor Graham adds, "that we may thus be able hereafter to explain how the light of the Suns of other systems is formed and maintained."

He thus evidently considers that the mode of supplying the waste of our own Sun's light and heat is explained by means of this gaseous atmosphere, and thereby supports our theory of the combustion of that matter for producing that supply.\*

On a review of these concurrent testimonies, we, with humility, conceive therefore that our theory of the original formation of our Sun, by the light and heat evolved by the combustion of the gases for the formation of the universal ocean of Genesis; and of the mode of supplying the waste of the Sun's light and heat may be considered as nearly established.

Having thus concluded my attempt on the system of the creation of our earth and planets, and of the formation of their central Sun, with the means which I conceive may have been adopted by the Creator to supply the vast waste of his combustion, we now proceed to the last part of our prospectus, namely, the dissolution of our globe, with the possible changes

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\* The above extract is taken from memory, but the substance will be found in Graham's Elements of Chemistry.

which the present state of our knowledge would lead us to presume would be the result of it.

#### DISSOLUTION OF OUR GLOBE.

By the authority of Scripture, we are informed, that the globe we inhabit is doomed to dissolution by the element of fire. We cannot, indeed, presume to say, that the nature of this conflagration shall be the same, and be governed by the same laws as those which take place at present, but judging from the hitherto immutable nature of those laws, we shall proceed to consider the principal changes which, according to them, would take place at this general conflagration. There are, indeed, many parts in the external and internal phenomena of the earth, which subject it continually to change and decomposition. The probable effects also, of its continual motion in the heavens, and the possible contact of other heavenly bodies, perhaps igneous, appear to confirm the destiny recorded in the Scriptures.

The late discoveries however, in pneumatic chemistry, have proved to us, that what had hitherto been considered as destruction by fire, is only a *change*, or decomposition of the various combustible bodies, into the elements of which they are composed. A great proportion of the vegetable world is found to be reduced by combustion, into elastic vapour called gasses; and it is not improbable, (at least if we assent to the facts stated by, and the opinion of, professor Chaptal, which I have before mentioned, on the productions of the vegetative process; and also, the still higher authority, of professor Linnæus, quoted above, whereby many of the primary earths and metals are proved to be the products of vegetation,) that the various earths and metals, and their combinations, may hereafter be found to consist of compounds of the bases of the gases of oxygen, hydrogen and azote, and of carbon.

In the foregoing system of creation, I have stated that lead is found to gain an accession of weight by oxydation of nearly ten pounds in one hundred pounds, by the absorption of oxygen from the atmosphere. This

oxygen must therefore exist in the oxyd, in a solid state. Pit-coal and pot-ash are found also to contain oxygen and hydrogen in the same state, and the Schisti or slate mountains are also said to have been composed by the decomposition of vegetables, which are primarily composed of these gases; and these schisti, therefore, in part, consist of solid oxygen, &c. In fine, from these facts, and many others stated in the foregoing pages, we have, in the theory of creation, come to the conclusion that the processes of vegetation and of animalisation were the machinery chosen by the First Cause for the gradual production of all the geological bodies of which our earth is composed.

Now, the marine vegetables of the waters or ocean of Genesis, can have imbibed their nourishment only from these waters and the air imbibed by them, and must have had the power conferred on their natures to decompose these waters, and to re-compose by the process of vegetation (as we find to be the case in terrestrial vegetables) a vast variety of new productions, all of which, however dense, must have possessed the constituent elements of water and air, oxygen, hydrogen, and azote, for their final elements.

The depositions then of the marine vegetable world, having formed a certain and a very great proportion of the geological bodies of the earth, the remainder of them we have conceived to have been formed by the depositions and labours of the marine animals. The habitations or shells of these, we have shewn in various parts of the foregoing theory, to compose a considerable portion of the earth's crust; and the vast generations of these animals, after their decay and decomposition, have, no doubt, according to their affinities and gravities by their deposition, formed or entered into the structure of the remaining geological products.

In the course of our theory, we have endeavoured to show, that the vast chalk and lime-stone formations of the earth, may also have been the result of the decomposition or disintegration of these marine shells. On this subject, we have to add one observation; bearing

considerably on our present subject, namely, the *final* elements of the geological bodies. It is, that chalk and lime-stone, being carbonates of lime, must also, therefore, consist of a great proportion of oxygen in a solid state, their carbonic acid being compounded of oxygen and carbon. Lime itself, also has afforded Sir H. Davy a metallic button; it is therefore an oxyd, and contains oxygen in the same solid state.

The marine animals, again, of the waters of Genesis whether they derived their nutrition directly from those waters, or from the plants contained in them, or from both, must finally have been composed of the constituent elements of water, the *only* mode of nutrition of these plants. But it is possible, and even probable, that the marine animals had the power of decomposing the imbibed air of the atmosphere, by which they would obtain another elementary principle, *Azote*.\* This is an æriform substance, which is always found to be produced by the remains of terrestrial, and, no doubt, marine animals also.

Thus we are led to conclude the final elements of all geological bodies, and of the marine plants and animals of the ocean, and of the vegetable and animal productions of the earth to have been *oborigine*, Oxygen, Hydrogen, Azote, Heat, and perhaps, Light and Electricity; and that the immense variety of proportions of these, blended together by the vital principle, constitutes the distinctive characters of those bodies.

Now, in the event of the dissolution of the Globe by fire, the consequence would be, (as combustion is known to be nothing but the extrication of light and caloric, by the decomposition of the oxygen gas of the atmosphere, and the consequent absorption of its oxygen by the combustible body,) that the elements of all combustible bodies would enter into new combinations. The waters of the oceans, if not directly decomposed by this vast combustion, but, merely evaporated, would probably collect together, be finally condensed into water, be attracted together into vast bodies, and form

\* Atmospheric air is always decomposed in the lungs of terrestrial animals.



a part of an *oceanic globe*, which must obey the laws of gravitation and motion, and might thus form a part of the matrix of a future planet.

On the contrary, should the watery vapours of our earth and ocean, be drawn into the conflagration at this dissolution, and be decomposed by the intensity of its heat and the contact of the combustible bodies,—which is indeed probable,—these vapours would thereby be resolved into their primary elements, oxygen and hydrogen, in the state of gases; and the vegetable and animal creation would, also, be decomposed into these gases and the azotic and carbonic gasses.

The earthy, mineral, and metallic substances of the globe, many of which we have shewn in the foregoing pages of our theory, to contain an abundant quantity of these gases in a solid state, would be partly decomposed into these primary elements, and the remaining more indestructible parts, if not decomposed by the heat of the conflagration, would be resolved by it into vapours; for we have found, as before stated, that even by the comparatively small degrees of heat which the art of man has discovered, the diamond, and some of the perfect metals, have been resolved into *such* vapours; and, allowing even that these metallic, earthy, or mineral vapours, should not be decomposed into their final elements, even by the heat of the conflagration they must, after the combustion, be collected into vast bodies, mix with the other gases resulting from the decompositions above stated, and probably, by the agency of chemical affinity, find their decomposition effected by these gases; or, otherwise, their decomposition into the primary elements of oxygen, hydrogen, and azote, may be finally effected by the *electric fluid*.

Thus, although it may be the design of Providence to put a final period to the present state of existence of our globe; yet, as the primary elements of which we have conceived it to be composed, are indestructible—at least in the present state of our knowledge, these elements must unite to form the materials of a new mode of existence, unless, indeed, counteracted by the

divine ordinances, by which these very elements themselves should be annihilated

Now, that this globe is destined to dissolution, as I have already mentioned, is probable, from many facts in its internal and external phenomena.

But its pit coal, sulphurous and nitrous combinations, the inflammable and other gases it produces, and the tendency of these to produce earthquakes and volcanoes, may not operate sufficiently deep in the earth to produce its total dissolution. This is, indeed, more likely to arise, from its various motions in the heavens, and the possible contact of igneous bodies, as comets, &c. We do not mean to imply by this that the earth, is in danger from comets in its annual course round its orbit, the chances of such dangers being very small. All we imply is, that the dissolution foretold in scripture will be more probably brought about by means of some inflamed gas in space than by any internal cause in the earth, and it may form a part of the design of the Creator, that the heavenly bodies should thus be subject to continued changes; yet, does it not appear consistent with the unceasing evidences we have of His benevolence, to suppose, these changes are *not to destroy* the final elements of His creation; but to *produce* higher and better states of existence by their instrumentality?

Assuming, therefore, that the conflagration we are considering, shall have finally decomposed and resolved by combustion, and the power of mutual affinity, or by the electric fluid, all parts of the earths and ocean, into the primary elements, oxygen, hydrogen and azote, or other elements, we have now to consider how these elements would re-combine to form other heavenly bodies. These primary elements, having been drawn together by the laws of affinity or attraction, would probably be soon ignited and brought into combustion by the electric fluid, or the light and heat of the general conflagration. The hydrogen gas would then unite with the oxygen of the oxygen gas, whose light and heat, or caloric, would be set free, and the formation of watery vapours would ensue. These condensing in the course of time (for it is probable the light and heat

of the conflagration would, by laws of its gravity, find its way to the higher regions of infinite space) would form an oceanic globe, which also, in obedience to the same laws of gravity and attraction, would be attracted or driven, according to our theory, round its central Sun; and being endowed by the powerful and benevolent ordination of the First Cause, with the most abundant, prolific and plastic powers for the generation of plants and animals, these would, exactly in the same way in which, (as we have stated in our theory of creation) the waters of Genesis produced our earth, be continually tending, in the course of sufficient ages, by their vast accumulation, their death, decomposition and depositions, according to their affinities and gravities, to form the solid parts of their globe, which, by the laws of gravity, would be attracted more or less near the centre, and these decompositions would thus accumulate, until the land should finally appear on the surface of these waters.\*

We must then suppose the same benevolence and power of the Creator would be exerted to bring plants and animals on this part of its creation, endowing them with life and enjoyments of such degrees of eminence in the scale of being, as His Providence might be pleased to direct.

Thus, we have cause to believe from our evidences of the benevolence of the Deity that the globe we inhabit, if destined to combustion, may be thereby changed into another and more perfect state of existence, and its inhabitants be gifted with greater blessings; and we shall now venture to draw a conclusion from the foregoing observations on the dissolution and reproduction of the globe, namely, that although we are told in Scripture that this dissolution will take place, and the inhabitants then on the earth will perish, yet as we

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\* It is possible, however, that the primary elements of our globe resulting from its conflagration, may be first attracted by the tails of comets and carried off into space, to be there collected with other masses of vapour for subsequent condensation into an ocean forming the matrix of a system of planetary bodies.—See Appendix No. II., page 28.

have stated, that " it will be more consistent with the unceasing evidences we have of the benevolence of the Creator, to suppose these changes are not to *destroy the final elements* of His creation ;" and, as we have accordingly supposed these elements will only assume a new state of being, we therefore now draw our conclusion, that, as the final elements of the corporeal substance of man could only then, in common with those of other elements, assume a new state of combination, so we conceive that the benevolent creator (having in the present life given to him these high powers of intellect, and those hopes of a better state of existence) has also arranged some plan by which the elements of these bodies, and by a parity of reasoning, the elements of those who shall have died previous to the conflagration ; shall be re-united to the souls of which they formed the matrices on earth, and that with them they shall be endowed with a better and more perfect state of existence, as foretold and promised in the Scriptures.

The elements of those human bodies must otherwise be left to the disposal of a chance combination, and might thereby enter into the reproduction of inanimate substance. We cannot conceive this to be part of the design of the source of truth and benevolence ; and we therefore believe, that this *very indestructibility of the law of nature*, and her eternal tendency to form (as we have attempted to shew above) new combinations of matter, offer a proof also of the distinct destined existence, and of the immortality of the soul of man.—(See Note 3.)

Having now finished these considerations on the creation, dissolution and reproduction of our globe in a new state, I shall only mention that, reasoning from analogy, we may conceive the other systems of the heavenly bodies to have been formed by the same laws of nature, instituted by the Omnipotent for that purpose. But we are told by a great poet, " Presume not God to scan," and as I agree with that idea, inasmuch as that we ought not to venture so to do, beyond the data and facts which he has placed in our view, so I have limited these observations to our system, humbly concei-

ving I have in some measure shewn, that the geology of our globe, and our latest discoveries in phneumatics, will warrant the conclusion I have drawn from the foregoing facts and experiments.

In the theory of the sun, I observed that the water formed by the combustion of the hydrogen gas, in supplying him with fuel, might, perhaps, be condensed into globes of water, destined hereafter to form new worlds or planets, like those of our own system, by the means we have detailed in the theory of creation.

I have now only to add, that we may well conceive this possible, from the incessant proofs of power, wisdom, and benevolence, we are permitted to discover in the operations of the Creator ; that, in fact, the recent discoveries of our astronomers, of planets never observed before by the vigilance of those of former ages,\* may be a proof that new formations of heavenly bodies are always taking place, and that as we cannot presume to limit the attributes and power of a First Cause, so the reproductive and plastic powers with which He has endowed the laws of nature may be found in continual operation, for the production of other systems of heavenly bodies, and that the Almighty attributes and energies may be thus continually giving life and enjoyment, in a scale probably infinite, and advancing, perhaps incessantly, in displays of His goodness, power, wisdom, and glory.

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\* It is stated by astronomers, that the tails of comets are stretched towards the sun, when they are approaching him ; but when they return, they are stretchd in the opposite direction. May not this singular fact be caused by the comet depositing its gaseous tail into the sun's atmosphere as a supply of fuel, and taking up by its attraction, the denser aqueous vapours formed by the combustion of the gases, thus carrying them off into the regions of space to be condensed into planetary bodies ? For, it is observed, the tails in the returning course of the comet are much longer than when it goes towards the sun. May not these facts indicate a change in the nature of the tails ? See Sir John Herschell's observation on the tails of comets, at page 122 of this work.

## TABLE OF GEOLOGICAL FORMATIONS.

In the order of their Super position. By M. AL DE HUMBOLDT.  
 This table is stated by Baron Cuvier to have been formed by his friend Humboldt, for his (the Baron's) late Geological works; and he adds, that the Table may be considered as containing a summary of the tables of the most modern Geologists.

|                                                                                                                            |                                                                  |                       |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------|
| Aluvial deposits.                                                                                                          |                                                                  | Tertiary formations   |
| Lime-stone formation, with mill-stone (meulieres.)                                                                         |                                                                  |                       |
| Sand-stone and sand of Fontainbleau.                                                                                       |                                                                  |                       |
| Gypsum with bones. Siliceous lime-stone.                                                                                   |                                                                  |                       |
| Coarse lime-stone.<br>(Clay of London)                                                                                     |                                                                  |                       |
| Tertiary sand-stone, with lignites (brown coal)                                                                            |                                                                  | Tertiary formations   |
| Plastic clay. Molasse. Nagelfluhe.                                                                                         |                                                                  |                       |
| Chalk.                                                                                                                     | { White.                                                         | ANANCHITES.           |
| 600 Feet.                                                                                                                  | { Soft, (tuffeau)<br>Chloritic.                                  |                       |
| 400 Feet.                                                                                                                  | { Green sand.                                                    | Secondary formations. |
| Weald Clay. Secondary lime-stone with LIGNITES.<br>Ferruginous sand.                                                       |                                                                  |                       |
| AMMONITES.                                                                                                                 | Lime-stone of Jura.                                              | Secondary formations. |
| PLANULITES.                                                                                                                | Slaty beds, with fish and crustacea.<br>Coral rag.<br>Dive clay. |                       |
| Quadersandstein, or white sand-stone sometimes above the lias.                                                             | Oolites and Caen lime-stone                                      | Secondary formations. |
| Muschelkalk.<br>AMMONITES NODOSUS                                                                                          | Marly or calcareous lias with GRYPHŒA ARCUATA.                   |                       |
| Marls with fibrous gypsum arenaceous layers.                                                                               | Saltiferous variegated sand-stone.                               | Secondary formations. |
| Product. aculeat.                                                                                                          | (Alpine lime-stone.)                                             |                       |
| Magnesian lime-stone.                                                                                                      | Zechstein.<br>Coppery slate.                                     | Secondary formations. |
| Quartziferous porphyry.                                                                                                    | Co-ordinate formations of porphyry, red sand-stone and coal.     |                       |
| TRANSITION FORMATIONS.                                                                                                     |                                                                  |                       |
| Slates with lydian stone, greywacke, diorites, euphotides, lime-stone, with ORTHOCERATITES, TRILOBITES, AND EVOMPHALITES.* |                                                                  |                       |
| PRIMITIVE FORMATIONS.                                                                                                      |                                                                  |                       |
| Clayey slates, (Thonschiefer)                                                                                              |                                                                  |                       |
| Mica slates.                                                                                                               |                                                                  |                       |
| Gneiss.                                                                                                                    |                                                                  |                       |
| Granites.                                                                                                                  |                                                                  |                       |

\* As far as this line, comprises 24,350 feet.

## APPENDIX.

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*The following Notes and Illustrations are recommended to the reader's attention, as illustrative of the THEORY OF CREATION, and particularly as containing observations on the late discoveries in Geology.*

NOTE 1.— It seems, indeed, almost impossible (supposing for a moment the idea of Buffon as to the origin of our earth was correct) to conjecture by what means its waters could have been subsequently obtained. A body of molten glass would, necessarily, assume a spherical form in the heavens; but it seems not probable, or possible, that such vast cavities, as the beds of the seas or oceans of the earth, could have been formed on it by its motions merely.

Again vitreous substances do not contain the elements that produce earthquakes and volcanoes. Hydrogen or inflammable gas is probably required for that effect, which is not contained in glass: therefore, the vast cavities of the ocean could not arise from internal commotions; but, even allowing them to have been produced by some unknown cause, how is the origin of the waters to be come at? Water is, I believe, sometimes generated in our atmosphere by the combustion of hydrogen; but this is a mere drop in the ocean, compared to the general cause that produces our rains. In fact, it could not, consistently with the safety of the productions of the earth, or even of their embryos at the time of their formation, have been made a general law for the purpose of producing the waters of the oceans. On the other hand, the system of the formation of the earth, from waters generated by combustion, appears to be a more natural and satisfactory solution of the phenomena of creation. These waters, formed and endowed, as we must conceive, according to the design of the Creator, with the most prolific powers of generating plants and animals, produced gradually sufficient deposits to form the earth.

I have stated, in the body of the work, that a single herring, unmolested for twenty years, would, as it has

been computed, produce *ten* of our globes ; and, allowing it to produce only one globe, what must the depositions of all the vegetables and animals of the waters of Genesis amount to ? In fact, on a consideration of the probable powers of deposition of these waters, and of the small proportion the known parts of the land bears to our oceans, we might be inclined to conjecture that there may be vast tracts of land on the globe yet undiscovered, and it is remarkable that this idea is now verified by the discovery of an antarctic continent.\*

NOTE 2.—It may be observed further, respecting this resistance of the æriform media of our theory, that, as our system itself and I believe also the fixed stars, are allowed by astronomers to have some progressive motion, and which must be owing to the principle of attraction towards some centre ; therefore, the resisting æriform media must move the same way also in their courses towards the sun, having thus two motions ; they must be thus attracted towards the same centre as our system is said to be ; the resistance they give to the earth and planets in their rectilinear motion, though it may thereby diminish the velocity of that motion, yet it cannot “ destroy it,” these æriform media being themselves under the influence of the same attraction towards an unknown centre.—(See *Note 4 in confirmation of this*.)

This idea of a general motion of our system, and of the fixed stars, will be found in the work I have so often quoted, “ Paley’s Natural Theology.” He states if I rightly remember, “ that the fixed stars have certainly small motions,” and considers them to be at-

\* Our readers are aware, that Capt. Ross, of the British Navy, lately made a voyage of discovery to the South Sea. From extracts from his journals, published in some english papers, it seems that he has reached lat.  $78^{\circ}$  south ; and that he has discovered what he has called South Victoria Land, extending from latitude  $70\frac{1}{2}^{\circ}$  to  $79^{\circ}$ , and how much further is unknown. Its eastern coast lies between the  $163^{\text{d}}$  and  $171^{\text{st}}$  degrees of long. It was girt with a barrier of ice many miles in breadth, which rendered it inaccessible, the ice being in some parts 150 feet high. He represents the land as rising in peaks from 9,000 to 12,000 feet high, perfectly covered with snow. He saw various volcanoes.—Translated. March 19, 1812.



tracted to a centre ; and if this be really founded in fact, it certainly offers one of the grandest ideas of the Deity the mind of man can conceive, namely, that if all the systems of the heavenly bodies thus move round one common unknown centre, may we not conceive *that* centre to be the *Empyreal Throne of God* mentioned in the 4th chapter of Revelations, from whence He beholds continually the immense operations of his hands, performing their revolutions round Him?

The above idea, of universal attraction, also offers another very important one, of the cause of the projectile force or rectilinear motion of the planets of our system, namely, that this universal attraction to a common centre IS that cause.

Since writing this Note I have seen the substance of the second paragraph confirmed by the eloquent discourses of Dr. Chalmers, lately published, on the Christian Revelation, in connection with the Modern Astronomy.

NOTE 3.—The reasoning in this work, in pages 131 and 132, is grounded on the idea that the entire substance of man, including the soul, is not destined to perish with the material substances of the globe. On that idea I have supposed that the corporeal parts of his frame may be, by some arrangement of the Deity, reunited with the soul or intelligent part ; but should the future state of existence be one altogether *spiritual*, the constituent elements of the body may then, perhaps, enter into indiscriminate combinations with other matter. All I wish to infer from the reasoning offered is, that the intelligent spirit or soul of man is *indestructible*.

NOTE 4.—It is said, indeed, by philosophers, that a body once put in motion, if all the resistance to it were taken away, would continue to move in its course for ever ; that is a case, however, which never can be proved by actual experiment, and it must rest solely on the opinion or arguments of those philosophers. If, however, the above supposition of perpetual motion of bodies moving in a vacuum be founded in nature, and that the heavenly bodies are made to move in a

vacuum, to obtain the object of perpetual motion, we may, in addition to what we have observed in Note 2, on the subject of universal attraction to an unknown centre, remark, that this universal attraction (supposing our theory of the regions of space being filled with æriform media to be correct) may be the cause which prevents the diminution of the projectile force in the courses of those heavenly bodies through those æriform media.

NOTE 5.—Having just now obtained a sight of the late publication of Lord Brougham of last year, 1835, I here subjoin an extract from it, describing the late discoveries of fossil remains by Cuvier, Buckland, and other geologists, to which I add some observations bearing on the relation of these facts to our theory of creation. In page 33 of his work, Lord Brougham observes, “the discoveries already made in this branch of science (geology) are truly wonderful, and they proceed on the strictest rules of induction. It is shewn that animals formerly existed on the globe, being unknown varieties of species still known; but it also appears that species existed, and even genera wholly unknown, for the last five thousand years. These peopled the earth as it was, not only before the general deluge, but before some convulsion, long prior to that event, had overwhelmed the countries then dry, and raised others from the bottom of the sea. In these curious enquiries, we are conversant, not merely with the world before the Flood, but with a world which, before the Flood, was covered with water; and which, in far earlier ages, had been the habitation of birds, and beasts, and reptiles. We are carried, as it were, several worlds back, and we reach a period when all was water, and slime, and mud, and the waste, without either *man or plants*, gave resting place to enormous beasts like lions, and elephants, and river-horses; while the water was tenanted by lizards, the size of a whale, sixty or seventy feet long; and by others, with huge eyes, having shields of solid bone to protect them, and glaring from a neck ten feet in length; and the air was darkened by flying reptiles, covered with scales,

opening like the jaws of the crocodile, and expanding wings, armed at the tips with the claws of the leopard. No less strange, and yet not less proceeding from induction, are the discoveries made respecting the former state of the earth; the manner in which these animals, whether of known or unknown tribes, occupied it; and the period when, or at least the way in which, they ceased to exist. Professor Buckland has demonstrated the identity with the hyenas, of the animal's habits that cracked the bones which fill some of the caves, in order to come at the marrow; and he has also satisfactorily shewn, that it inhabited the neighbourhood, and must have been suddenly exterminated by drowning. His researches have been conducted by experiments with living animals, as well as by observations on the fossil remains."

I have now to observe, that it is to be regretted the geographical position of these discoveries is not mentioned by his Lordship. If they had been found in the vicinity of the countries inhabited before the Flood, by Noah or his ancessors, it is singular that no oral or written tradition is given (at least that I am aware of) by Noah or his descendants, of this convulsion before the Flood. "We reach a period," says his Lordship, "when all was water, and slime, and mud, and the waste, without either man or plants, gave resting place to enormous beasts," &c. If this period of time, therefore, is to be supposed as having been between the Creation and the Flood, it must probably have taken place in a part of the world very remote from the country inhabited by Adam or his descendants, before the Flood; and if there were, as is stated, "no plants" growing in these resting places for these "enormous beasts like lions, and elephants, and river-horses," whence did they get their subsistence? If no subsistence were prepared for them in these resting places in the land, is it not probable these "enormous beasts" may have been marine or amphibious? I must therefore say, that the circumstance of there being no tradition handed down to us by Noah or his descendants, of so great an event at this convulsion, coupled

with the fact, admitted by the geologists who have narrated these discoveries, that "no plants" are found to have existed in these "resting places" for the nutriment of these enormous beasts, (for allowing them to be animals of prey, the animals they devoured must have had means of sustenance from the productions of the earth;) therefore, these two circumstances would seem to warrant the opinion, that these skeletons, or organic remains, are those of marine animals, which had been deposited at their death more or less below the present surface of the earth from the waters of Genesis, (according to our theory of Creation,) before the time of the separation of the waters, as recorded in the first chapter and ninth verse of Genesis, when God said, "let the waters under the heavens be gathered together into one place, and let the dry land appear; and it was so."

As to the flying serpents, by the account itself, they appear to have been marine inhabitants of the waters; and for the same reason that applies to the "enormous beasts," that "no plants" have been found in those resting places, so the "birds," mentioned in the above account, must probably have been marine or aquatic also, and have existed as above stated, before the separation of the waters at the six days of the creation.

Now the effects of the Deluge, in the time of Noah, are, I believe, generally allowed to have made great changes on the face of the earth. The effects even of common inundations which have taken place and been recorded in history, have also had the same visible effects. Is it not, therefore, probable that the effects of the mighty rush of waters from, over, and all round the earth at the time of the separation, must have had a corresponding greater effect, and produced the convulsion described by the geologists as having taken place 5 or 6000 years ago; and is not this effect the more likely, from the circumstance that the land must, at that period, have been in a soft and humid state, probably for a considerable depth below its surface?

As respects the circumstance of no organic remains of the human species being discovered among the

other fossil remains, that will be completely accounted for by supposing, as above stated, that the "convulsion took place at the time of the separation of the waters of Genesis," since man was not then created.

To conclude, whether this great convulsion of nature were really one that took place since the Creation, and produced the overflow of an extent of country formerly inhabited by the animals above described, and which has, since then, become dry land again; whether, I say, such a convulsion has taken place since the Creation or before it, does not affect the validity of the theory of Creation which is now offered to the world, for this theory embraces the *primeval formation of the entire circumference and diameter of the earth*, and is, therefore, *antecedent to any partial convulsion* that may have, since that formation, taken place.

I now conclude this Note with a few observations in support of the formation of the geological bodies in the primeval oceans, drawn from the depositions of matter, and consequent formation, of land, which must be continually taking place in our present seas.

In the space of two or three miles, in the harbour of Halifax, N. S., I have seen thousands of cart-loads of kelp, or seaweed, collected from the shore in a season, and it is probably thrown up in the same quantities all along the coast of America.

In Scotland, great quantities are burned, to extract its saline matter; as also in Spain and Portugal. What must be the quantity, therefore, that annually decays and is deposited at the bottom of the oceans! In addition to this are the immense formations of coral beds. In the Pacific Ocean the Coral Islands are 1500 miles long by 60 or 70 broad, formed by various species of insects called coral insects or madrepores.

To these coral formations may be added the still more immense depositions of shells and different animals of the seas. These depositions are probably conglomerated by the sand and earthy particles brought down by the rivers, and abraded from coasts by the tides and storms. These masses must be continually augmenting, and in due course of time will greatly

enlarge the proportion of land. The waters of our oceans and seas (for a vast quantity is constantly consumed in the nourishment of the marine plants) must, on the other hand, be continually diminishing; and although, if I recollect aright, Dr. Paley states, in his "Evidences of Natural Religion," that all the evaporations return by the rains, I think it is easy to prove that not to be the case; for an immense proportion of the rains is consumed in the nourishment of terrestrial vegetables and by animal life; a large proportion of vapour is also dissolved by the air and probably decomposed by the electric fluid into its gases. Must not this continual increase of land and diminution of the waters of the earth, in the course of sufficient ages, greatly alter its specific gravity? What effect this may have on the earth's relative attraction with the other heavenly bodies, I leave to astronomers to determine. But it is, I conceive, possible, that a change in the degree of its attraction may be the means by which the dissolution foretold in the scriptures may be ultimately brought to pass; and it may be also possible that the design of a benevolent Creator, in making the proportion of water so much greater than the land, has been, to retard this dissolution for numerous ages.

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#### CONCLUDING NOTE.

In the contemplation of the wonderful discoveries in pneumatic chemistry, of the gaseous bodies, and peculiarly so of the component principles of water, I have conceived the formation of the waters of Genesis to have been produced from these elementary principles, by the Creating Cause at "the beginning;" but have, in the foregoing treatise, abstained, for reasons stated in page 132, from carrying my speculations onwards to the other systems of the heavenly bodies, further than reasoning from analogy, that they may have been formed by the same laws. In this Note, however, in conclusion of this work, I propose to offer some observations on this subject, as a comment on the 6th and

7th verses of the first of Genesis: "And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters; and God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament; and it was so."

Sharon Turner, page 30, "Sacred History of the World," and other writers, consider the firmament to refer, and to mean solely, the atmosphere. But the 9th verse will make it clear that the word "firmament" cannot refer to our atmosphere. And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament, and it was so." Thus, it is, evident that, in either sense of the word, an ocean of waters is here stated to exist above the atmosphere.

This ninth verse, therefore, leads us to believe that a universal ocean of water exists over and under the heavens. If, therefore, our theory of the primary formation of our earth and planets in this globe of water be founded in the laws of nature, may we not conceive, that the planets of the other systems of the universe have also been, or will be, formed in this universal ocean by the same laws? If the appearance of the geology of the earth have led us to believe that at the time of the separation, when the solid parts of it had been duly formed, they were, in obedience to the Divine command, (probably by the instrumentality of the law of their superior gravity,) then separated from this universal ocean, attracting such parts of it as were within the sphere of attraction of these solid parts, for the formation of its seas and oceans; that the other planets of our system have been formed and evolved in the same manner; and, that these planets, then receiving from the Creator their projectile force, became immediately subject to their motions round their central sun, may we not, by analogy, also conceive, that the planets of the other systems have been, or will be, formed by the same laws?

## NOTES TO SECOND EDITION.

NOTE 1st.—Since publishing the first edition of this work, I have found that Dr. Thompson, in his Chemistry, says, “We are certain that no particle of light weighs more than the million millionth part of a grain,”—Chemistry, vol. i. p. 300.

NOTE 6.—In Good’s Book of Nature, page 61, it is said, “To shew,” says Sir Isaac Newton, on gravity, “that I do not take gravity to be an essential property of matter, I have added one question concerning its cause, choosing to propose it by way of question, because I am not yet satisfied about it, for want of experiments.” In this question he suggests “the existence of an ethereal and elastic medium pervading all space, and supports his supposition by strong argument, and, consequently, much apparant confidence, deduced from the mediums or gases as they are now called, of light, and heat, and magnetism, respecting all which, from their extreme subtilty, we can only reason concerning their properties,—This elastic medium he conceives to be much rarer within the dense bodies of the sun, the stars, the planets and comets, than in the more empty celestial spaces between them, and to grow more and more dense as it recedes from the celestial bodies to still greater distance, by which means all of them, in his opinion, are forced towards each other by the excess of an elastic pressure. It is possible, undoubtedly, to account for the effects of gravitation by an ethereal medium thus constituted, provided (as it is also necessary to suppose) that the corpuscles of such a medium are repelled by bodies of common matter, with a force decreasing like other repulsive forces, simply, as the distances increase. Its density, under these circumstances, would be every where such as to produce the semblance of attraction. The hypothesis, in connection with the existence of a repulsive force in common matter, has a great advantage in point of simplicity, and may perhaps hereafter be capable of proof;



but at present it can only be regarded, and was at first only offered, as an hypothesis.\*

NOTE 7.—The Right Hon. and Rev. Francis Henry, Earl of Bridgewater, died in the month of February, 1829, and by his last will and testament he directed certain trustees to invest in the Public Funds the sum of £8000 sterling, to be held at the disposal of the President of the Royal Society of London, to be paid to the person or persons nominated by him. The testator further directed, that the persons selected by the said President, should be appointed to write, print, and publish one thousand copies of a work on the Wisdom and Goodness of God, as manifested in the Creation. There were eight treatises on various subjects.—The Rev. Doctor Buckland was appointed to write the Bridgewater Treatise on Geology.

#### NOTE TO THIRD EDITION.

NOTE.—I have perceived in Doctor Thompson's Organic Chemistry, some account of the experiment, of Von Helmont, (see page 52), wherein it is said, that a certain author has stated an opinion that the distilled water used in it contained sufficient earthy matter to account for the increase of the willow. This, I venture to say, is incorrect; for, in the first place, there is no earthy matter that is volatile at the heat of the boiling point of water; neither, if the earth were reduced to a saline form by acids, would they be volatile or evaporable at that heat; moreover, the quantity of water

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\* There must certainly be some mode existing to restore the vast waste of heat and light emitted continually by the sun, and perhaps the theory of an ethereal medium, as shewn by Encke's comet, may furnish the proof above required of Sir Isaac Newton's hypothesis. Thus, the elastic medium adopted as above, by Newton, being "much rarer within the body of the sun," there must, therefore, be a continual motion of the distant and more dense parts of that medium towards the sun, which affords another powerful cause by which the planets are carried round him in their respective orbits; and, on this important subject, we have to refer the reader to our Appendix No. 11, pages 21, 22.—The theory, therein stated, is powerfully supported by the cause above, namely, the movement of the gaseous ethereal medium of Newton towards the sun.

used in the five years could not have been more than 456 gallons, that is one quart per day. Now it is not conceivable that distilled water could contain more than one-quarter of an ounce of earth per gallon, which makes seven pounds.—The willow, however, gained 110 pounds in the five years, making 103 pounds produced from the water and atmosphere by the process of vegetation in the five years.

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NOTES TO SIXTH EDITION.

I beg leave to call the readers's particular attention to the two following notes, being explanatory of the fixation of the sun:—

NOTE 1.—In order to shew how Mr. Arago was led to form the conclusion he did respecting the constitution of our sun, as stated in page 10 of the Appendix No. II. I extract the following from "Sketches of Conspicuous Living Characters of France," translated by R. M. Walsh, Philadelphia, 1846:—

It was while employed in his optical researches that Arago was led to observe the singular properties of the substance called *tourmalin*, which divides into two parts the luminous rays which traverse it. He perceived that when the light, passing through the *tourmalin*, emanated from an opaque body, it was identical in the double radiation produced by the *tourmalin*; if, on the contrary, the light was emitted by a gaseous body, it was reflected, in passing through the *tourmalin*, under two different colours."—(See Appendix No. II., page 10, for Arago's conclusive induction.)


It appears to me that Mr. Arago was further led to form this induction in the following manner:—As he had proved, to mathematical demonstration (vide page 4 of the Appendix), that the sun's *atmosphere* was an ocean of flame, and also, (vide page 1 of that Appendix), that the spots on the sun could be "incontestibly" accounted for by a gaseous medium, he no doubt concluded, that, surrounded by so immense an atmosphere of flame, no solid body could exist in

the sun ; and, moreover, that as the sun's spots were best accounted for by a gaseous medium, that, for these reasons, the sun " could be nothing but a grand mass of burning gas, agglomerated in infinite space."

NOTE 2.—In the course of my journeys to offer this work for sale, I occasionally meet with questions on the subject of my theory of the sun. Among these, I have been asked how, if the sun were a body of gas, it could remain so stationary in the heavens, as it seems to do? The great astronomer, Arago, (as I have shewn in the Extra Matter for the Fifth Edition of this work, page 10), states, that "The sun is nothing but a grand mass of gas, agglomerated in space ;" and the word agglomerated (*agglomeré*, French,) means " collected and fixed in a globe."

Now, the purport of this note is to shew how I have conceived that the vast body of gas (of which, by our theory, the sun consists) is fixed in the regions of space, so that it cannot alter its position, with respect to the planets of its system. As I have shewn, in the Appendix No. II., under the head of Extra Matter for the Sixth Edition, I have, in it, adopted the theory that the comets are employed to convey the gaseous combustible matter, to supply the waste of the light and heat of the suns of the universe ; and as it is a known chemical fact, that neither of the gases of oxygen or hydrogen are combustible by themselves alone, that is, unmixed, we have conceived, in our theory, that the safety of the planetary bodies would require those gases to be conveyed to the suns by separate comets. We may easily conceive, therefore, that those comets which convey the oxygen gas may discharge their gaseous tails on one side of the sun, either above or below him, at any period after those comets shall have passed through the nearest planetary orbit to the sun, which is that of Mercury, being above thirty-seven millions of miles from him. The comets, on the contrary, which convey the hydrogen gas to the sun, would arrive in its vicinity, and deposit their gaseous tails, in a direction directly opposite to those comets which convey the oxygen gas. By these means the two currents of the

separate gases could not meet nor ignite, until they enter the body of the sun, when they *would* ignite, and thus restore the waste of his light and heat. So likewise the two opposite and vastly extensive currents of these gases, being drawn into the suns of the universe *by the power of the vacuum and draft* which the sun's combustion must be continually forming; these opposite currents, I say, would have the undoubted effect of keeping the suns in their places, for the fires could not extend themselves beyond the circumference of the suns, either on the side of the hydrogen current or on that of the oxygen current, because neither of these gases is at all combustible of itself alone, that is, without being mixed together. By the power of these opposite currents, then, the suns would be fixed and kept in their present positions in space. This fixation, however, of the relative positions of the suns, as respects their system of planetary bodies, would not prevent the motions of those suns round the unknown centre, stated by modern astronomy to exist; for that central movement includes also the movement of all the planetary bodies and their gaseous atmospheres round the same unknown centre, therefore the relative positions of the suns to their planetary systems must always remain the same.



## GLOSSARY OF TERMS

## IN THIS WORK.

- Alumine*, pure earth of clay.
- Azote and Azotic Gas*, a constituent principle of our atmosphere, destructive to combustion and to animal life.
- Appetencies*, a supposed aptness of matter to assume certain forms.
- Affinity*, that particular attraction which Chemists observe different bodies have for each other.
- Æriform Fluids*, gases or fluids resembling common air.
- Caloric*, matter of heat pervading all bodies.
- Carbonic Acid*, the acid of charcoal formed by burning it in the open air. It escapes in an æriform state.
- Chaotic Mixture*, a solution of all the solid substances of the globe, supposed by the ancients to have existed.
- Fossil Remains*, of animals or vegetables, found in the earth.
- Galvanic Power*, a species of electricity.
- Geology*, the science of the various substances forming the interior and the crust of the earth.
- Gravity or Gravitations*, that power in matter by which it continually tends to gravitate towards other bodies, according to the laws of its density and distances, and the power of an elastic pressure.
- Hydrogen*, a constituent element of all water ; it is called also inflammable air or gas, and is the same that is now used for lighting cities and inflating balloons.
- Incondescence*, any body in a state of ignition.
- Lamine*, the appearance of many rocks in the earth resembling the leaves of a book.
- Marine Exuvie*, shells or remains of animals found in the earth.

- Matriz*, the womb of material or spiritual substance.
- Medium*, air, water, or any substance through which the rays of light are made to pass.
- Nucleus*, the central part of any globular body.
- Orbits*, the paths of the moons round their planets, and of the planets round their sun.
- Oxygen Gas*, a constituent element of our atmosphere, supporting combustion and life in the highest degree. It is also a constituent element of water.
- Planets*, the heavenly bodies composing our system and revolving round the sun.
- Pneumatic Chemistry*, the science of æriform bodies.
- Silex*, siliceous or sandy principle.
- Silicon*, the metallic basis of siliceous earth or sand.
- Sodium*, a metal lately discovered by Sir H. Davy to be the basis of soda, produced by marine plants.
- Sulphuric Acid*, common oil of vitriol.
- Tertiary Strata*, in geology the strata or rocky formations of the earth as far as man has penetrated, are divided into three, the primary being the lowest,—secondary being next,—tertiary being the uppermost.
- Vacuum*, a space void of matter of any kind, now known not to exist.



## APPENDIX.

No. II.

CONTAINING EXTRA MATTER

FOR THE

4<sup>TH</sup> 5<sup>TH</sup> 6<sup>TH</sup> 7<sup>TH</sup> 8<sup>TH</sup> & 9<sup>TH</sup> EDITIONS.

I am happy to be able to present the reader of the Fourth Edition of this work with two important extracts from late scientific publications. The one is from the celebrated Arago, the French Astronomer, and the other from Lardner's Popular Lectures in the American States.

I now present the following extract from Arago's Scientific Notices on Comets, in support of our theory of the sun, and of the spots on his surface:—

“ If the comet of Buffon, in striking the sun, had detached from it solid fragments, if the planets of our system had originally been such fragments, they would in a similar manner have grazed the surface of the sun at each revolution.—All the world knows how far that is from the truth. Did not our naturalist also believe the matter which composes the planets sprung from the solar globe, already formed into distinct masses? He imagined, as I have said, that the comet had spouted forth a real torrent of fluid matter, in which the impulses which the various parts received from each other, and their mutual attractions, rendered every assimilation with the movements of solid bodies impossible. The system of Buffon affords *explicitly* as a result, that the solar matter—at least, the exterior of it—is in a state of liquefaction; then, I should hasten to declare that the most scrupulous modern observations have not confirmed that idea.

“ The rapid changes of form which the obscure and luminous solar spots incessantly experience, the immense spaces that those changes spread over in very short times, have already led to the very probable *supposition*, for some years, that similar phenomena

would occur in a gaseous medium. At present experiments quite of another nature, experiments on luminous polarization made at Paris observatory, incontrovertibly establish this result; and if the exterior and incandescent part of the sun is a gas, the system of Buffon is erroneous in its most essential outset, and is no longer tenable."

#### OBSERVATIONS ON THE ABOVE EXTRACT.

I have shewn, in the body of the work, that the theory of Buffon is not tenable. Mr. Arago now confirms the fact.—In another part of this edition, I have proposed a query on the subject of the spots on the sun, namely, whether they might not be accounted for by the combustion of the oxygen and hydrogen, gases serving (according to our theory) as fuel for the sun's fire; and it is with great satisfaction I am now enabled to add to this fourth edition of my work, the sanction given to this idea and to our theory of the sun, by the above extracts from the work above named of the celebrated Astronomer, Arago. He states that phenomena, similar to the spots on the sun, might arise in a gaseous medium, and allows the possibility that the exterior and incandescent parts of the sun may be a gas, which is precisely consistent with our theory of the sun's formation, and the means employed by nature to supply the waste of his heat and light. In fine, it would appear, by the experiment on the polarization of light stated above, that the original idea of the great Newton, that the sun is a body of fire or flame, will still hold good; and that although he had not the advantage of the modern discoveries in pneumatic science to direct him, it shews that on this occasion, as on that of the combustibility of the diamond, the genius of the immortal philosopher had formed a just idea of the nature of the sun. I am happy to be able to add a further explanation of this discovery of Arago's from Dr. Lardner's very popular lectures in New-York. In page 17, he says, on the subject of the Light of the Sun:

"In optics, a beam of light is proved to be susceptible of a peculiar modification, called *Polarization*. Light may undergo certain changes, which shall pola-



size it, imparting to two of the sides of the ray opposite to each other a certain property which the other two do not possess. The question arises what are these properties?

“ They are various; one, however, is so simple and so nearly connected with the demonstration to which I call your attention, that I shall mention it. If a ray of light fall upon a reflecting surface with either of these two sides which are represented by the two red sides of this wand, it will be reflected at an angle equal to that by which it approached the surface; but if it strike the surface upon the other opposite side—the blue—it will not be reflected at all; so that two of its faces are capable of reflection, while the other two are not. This is one of the qualities by which polarized light is characterized. In a ray which is not polarized, reflection takes place under all circumstances, but with polarized light only under certain conditions. Thus, we see that light may exist in two distinct states. Now this is the truth which has been contributed to this demonstration by the discoveries of modern optics. Let us turn to another branch of physics.

“ The science of heat has received more attention within a few years past than any other branch of physics. Fourier, a French philosopher, has done much in this department of knowledge. One of the conclusions he establishes in this: ‘There are three states in which material bodies exist; the solid, liquid, and gaseous? Fourier proved that when a solid body became incandescent, the light which it emits is *polarized*; that the light emitted by an incandescent liquid (as molten iron) is likewise *polarized*; and that the light of incandescent gases is *unpolarized*. These facts are true, whatever, may be the nature of the materials. Here is a distinction established by this great natural philosopher between the light emitted by incandescent solids and liquids, and that emitted by *gases*. This is the contribution from the science of heat.

“ Now, Mr. Arago has, with most beautiful sagacity, availed himself of these two facts constituted by the sciences of light and heat, to determine the nature of

the sun's atmosphere. This may easily be done ; for since it is established that the light from incandescent solids and liquids *is* polarized, while the light from gaseous bodies is *not polarized*, all that need be done, to determine this point, is to try the experiment, whether the sun's light be *polarized or not*. Arago, by applying the usual tests, *found that it is not polarized*.

“ The conclusion, as inevitable as it is important, is, that the surface of the sun is covered, not by a solid or liquid, but by an *atmosphere of flame*. Here is one of the most beautiful inferences ever drawn from the whole range of physics, and it is established by the aid of science, with all the CERTITUDE OF A MATHEMATICAL DEMONSTRATION.

“ Arago has proved, therefore that the sun's atmosphere is an OCEAN OF FLAME.”

Thus, by the above extract from Arago's Treatise on Comets, and from Dr. Lardner's Lectures, it appears that our theory of the sun's formation is powerfully sanctioned and confirmed ; and, I conceive, I have great cause to congratulate myself on this circumstance. This theory of the sun is based on the undoubted fact that the gases of oxygen and hydrogen, of which the Ocean of Genesis was formed, must have been brought into a state of combustion before they could produce the Ocean of Genesis, and on the no less indubitable fact that a most stupendous quantity of heat and light must have been evolved from that combustion ; and I then reasoned, that a sun being indispensably required to warm and light the planets of the systems, the Deity could not have applied this heat and light to a more needful purpose.

Many of my subscribers to the several editions of my theory, and also many men of science, have done me the honour to approve of the same ; but I have reason to believe that a few other persons, considering themselves, no doubt, of too superior acquirements to approve of any thing that had not been previously taught in the schools of science, have rather sneered at what I, with humility, had presented to the world. However, as the justly celebrated Franklin's suggestions

of the identity of lightning and electricity were at first laughed at by the Royal Society of London, I need not be surprised that the same may have happened to my suggestions on the nature of the sun and his combustion. But now that the gaseous theory is verified by so great authorities as Mr. Arago and the Paris Observatory, as shewn by Dr. Lardner, I cannot but feel content and gratified. By the extract from Arago, it appears that the spots on the sun might exist, and be accounted for and explained by a *gaseous medium*;\* this being the case, there is no longer any necessity for receiving that every improbable idea, that the sun's body is cold and opaque, and I therefore trust our theory will be found by scientific men to be more satisfactory and correctly founded in nature. In fact, it appears by Dr. Lardner's observations on this discovery of Arago, of the *non-polarization* of the light of the sun, that it is mathematically proved by him that the sun's surface is an "OCEAN OF FLAME;" and, I conceive, we are hereby justified in reasoning, by analogy, that the case is the same with the suns or stars of all the systems.

Conceiving, then, that part of our theory relating to the sun's substance and nature, has been thus (to me indeed unexpectedly) demonstrated by that very high branch of science, the polarization of light, and conceiving, also, that it is unquestionable, that great as the sun's bulk is, the unceasing emanation of his heat and light would, in time, exhaust his substance, and therefore the waste must necessarily be supplied with extraneous combustible matter: so I trust *that* part of our theory which relates to the supply of that waste, will be rendered more highly probable by the above discovery.

One would, indeed, have imagined that, by a *priori* reasoning on this waste of the sun's light and heat, philosophers might of old have inferred that it must be supported *ab extra*; but now that the gaseous nature of the sun's incandescence is verified, as shewn above, and as Sir John Herschell has shewn in his late admired work on Astronomy, that the gaseous tails of numerous

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\* Verifying our theory of those spots in the "Theory of the Sun's Formation."

comets are deposited in the sun's vicinity, there can hardly be a doubt that the gaseous fuel for the sun's fire must either be produced thereby, or, as by the theory of my work, from currents of the gases rushing through the regions of space for that purpose. It is indeed, probable that both these sources of gaseous supply may be employed by nature; but the latter theory will also account for the tides by physical pressure, and for the great principle of attraction of the heavenly bodies, namely, the impetus of motion generated by a gaseous medium rushing through the regions of space; and I have accordingly adopted that theory in my System of the Creation\*

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#### NOTE TO FOURTH EDITION.

In further corroboration of the formation of coal from marine plants and trees grown in the ocean, we observe that, in contemplating these immense masses of marine vegetable matter, we have a right to ask of those who argue terrestrial formation, what has become of those masses of marine vegetation after the termination of their vegetable life? Undoubtedly there can be no other satisfactory account given of this than that they have, like all other dead vegetable matter, suffered decomposition, and by means of the superincumbent pressure of other deposits of the oceans and volcanic heats, have been changed and converted into seams of coal, as we now find them.

There they lay, containing a considerable quantity of ammonia, received from their contact with the animal deposits of the oceans, and which ammonia cannot be accounted for by the theory of formation from terrestrial vegetables, for these yield very little or no ammonia.

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\* Having, in this sixth edition of this work, formed our theory of supplying the waste of the sun's light and heat by means of the comets, in place of our former theory of currents of gases, the reader will observe, that we now refer the attraction of the earth and planets round the sun to the gaseous medium now proved to exist in infinite space.—Vide Note 6th to Second Edition.

In proof of the diversity of marine production, I extract the following account of that immense sea plant, the "Fucus Giganticus," from the celebrated Professor Liebig's familiar Letters on Chemistry.—*Letter 11, page 34:—*

"We well know that marine plants cannot derive a supply of *humus* for their nourishment through their roots. Look at the great sea-tang, the *Fucus Giganticus*: this plant, according to Cook, reaches a height of 360 feet, and a single specimen, with its immense ramifications, nourishes thousands of marine animals; yet its root is a small body, no larger than the fist. What nourishment can this draw from a naked rock, upon the surface of which there is no perceptible change?—It is quite obvious that these plants require only a hold,—a fastening, to prevent a change of place,—as a counterpoise to their specific gravity, which is less than that of the medium in which they float. That medium provides the necessary nourishment, and presents it to the surface of every part of the plant. Sea-water contains not only carbonic acid and ammonia, but the alkaline and earthy phosphates and carbonates required by these plants for their growth, and which we always find as constant constituents of their ashes."

As some supposed astronomical causes are being produced in support of an idea that the dry land has existed several hundred thousand years, which is contrary to the interpretation of the Mosaic account, as explained in our system, and founded on the idea that the coal seams have each taken thousands of years for formation from terrestrial vegetables, which idea is purely gratuitous, and incapable of any proof; we have to call the attention of the reader to this note confirming our arguments for the marine formation of coal, and also to the same in a former page of this edition.

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## EXTRA MATTER FOR THE FIFTH EDITION.

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In this Fifth Edition of our work we are happy to be able to give two very important scientific extracts, the one from Mr. Lyal's sixth edition of his "Principles of Geology," vol. 2, page 431, whereby he confirms our theory of the earth's formation, as relates to there being no central fire therein.—The other important extract is from a work lately published in Philadelphia, called "Sketches of Conspicuous Living Characters in France," translated from the French.

Extract from "Lyal's Principles of Geology," vol. 2, sixth edition:—

"It may assist us, in forming a clearer view of the doctrine now controverted, of Central Heat, if we consider what would happen were a globe of homogenous composition placed under circumstances analagous, in regard to the distribution of heat, to those above stated. If the whole planet, for instance, were composed of water, covered with a spheroidal crust of *ice*, fifty miles thick, and with an interior ocean having a central heat about 200 times that of the melting point of ice, or 6,400 of Fahrenheit, and if, between the surface and the centre there were even every intermediate degree of temperature between that of melting ice and that of the central nucleus, would such a state of things last for a moment? If it must be conceded, in this case, that the whole spheroid would instantly be in a state of the most violent ebullition; that the ice, instead of being strengthened annually by new internal layers, would soon melt, and form parts of an atmosphere of steam, on what principle can it be maintained that analagous effects *would not follow in regard to the earth, under the conditions assumed in the theory of Central Heat?*"—*Vide Lyal's Principles of Geology, vol. 2.*

### OBSERVATIONS ON THE ABOVE EXTRACT.

It is with great satisfaction I find, by the above extract, that Mr. Lyal agrees in the results of our

theory of the Earth's formation, namely, that no central fire exists; which is stated at full in our elucidation of that theory in this Edition.

It is perfectly evident, that if the heat of the earth did increase down to its centre, in the same ratio as it is stated to do in the Artesian wells and in other experiments on the subject, that an ocean of liquid fire must be produced, of near 8,000 miles in depth; it is equally evident that heat or caloric incessantly tends to diffuse itself into all surrounding bodies; therefore, the enormous heat of this internal ocean of fire would be sufficient to melt down the hardest rocks composing the crust of the earth, with nearly equal ease and certainty as the ice would be melted, in the above statement of Mr. Lyal's. The idea, then, of this central ocean of fire is preposterous, as, in that case, the crust of the earth would long ago have ceased to exist.

As to the cause of the existing internal heats and fires of the crust of the Earth, we have explained our ideas thereon in this edition, conceiving these causes to be, the last decompositions of combustible matter from the oceanic waters of Genesis, and that this combustible matter being still in ignition, thereby produces the earthquakes and volcanic action of the present times.

In our fourth edition, I gave extracts from M. Arago, on Comets, and from Lardner's Lectures, showing that experiments on Light, made at the Paris Observatory, had proved that the atmosphere of the sun was an "ocean of flame." I have, since that edition was published, met with a "Life of Arago," and find that this great astronomer, after making subsequent experiments on light, has been led to announce his entire concurrence in our theory of the *gaseous nature of the sun through its entire diameter*; and this opinion is of the more importance from the consideration, that he probably would not venture to propound it, had he not full and sufficient scientific grounds for so doing.

I now beg leave to congratulate many of my readers who have, since the publication of the first edition, in

36, given me their approbation of the same: I congratulate them, that their judgement has been sanctioned by the high authorities stated in the third and fourth editions, and in the present, as will appear by the following extract from a work called "A Sketch of Conscious Characters living in France," published in Philadelphia, and translated from the French:

"LIFE OF M. ARAGO.—Subjecting thus to the action of the Tourmaline (a precious stone) the rays from the Heavenly bodies, M. Arago was led, by induction, to conclude, 'That the SUN IS NOTHING BUT A GRAND MASS OF GAS AGGLOMERATED IN SPACE.'"

I now humbly beg leave to make a few concluding observations on the very important confirmation which my theory of the Sun's formation, as first stated in the first edition of this work, printed at Toronto in 1836, has received from these late discoveries on light.

I founded that theory on the indisputable chemical fact of the elementary composition of water by the combustion of its constituent gases; and I was led to apply the evolution of the stupendous quantity of Light and Heat which must have ensued from the combustion of the oxygen and hydrogen gases (required for the formation of the ocean of Genesis) to the formation of our Sun; and the supply of the waste of its light and heat by currents of these gases drawn to the Sun from the regions of infinite space.

Nine years have now elapsed since the first publication of this theory. The sale of near 3,000 copies of the work proves that it has been approved of in Canada; but it was, during a great part of that time, uncertain whether it would receive the concurrence of men of acknowledged science in Europe; and I am, therefore, the more satisfied now, that it has done so.

When we reflect on the immense distance from the centre of some of the Planets of our system (Herschell being 1,800 millions of miles off) we cannot suppose at a body in a state of combustion of less dimensions than our Sun, nearly 800,000 miles in diameter, would be sufficient to light and heat them.



With respect to the mode by which the light and heat of the Sun is conveyed to the Planets, there appears to be two theories; the one is that of Sir Isaac Newton, that they come in right lines from the Sun; the other that they act, by means of undulations, on an ethereal fluid. I embrace the Newtonian theory decidedly, and for this plain and simple reason, that we have the direct evidence of our sight that it is the true one. A person observing the rays when the Sun is setting behind trees, will see those rays reaching from the Sun all the way to the Earth in direct right lines.

When we consider the vast distance of the Sun from our Earth—95,000,000 of miles, and the incessant tendency of all caloric to find an equilibrium, by diffusing itself into surrounding space, we may conceive that a certain portion of the caloric of the Sun's rays may be thus lost in its passage to the Planets; I therefore have, on reflection, been led to conceive that the particles of heat and light in the rays are, somehow, *chemically combined*, in their passage from the Sun to our atmosphere, to prevent this dispersion of their heat, and that, particularly in the lower parts thereof, where aqueous vapour most prevails, a decomposition of the light and heat takes place, and they are then set free to act, by which the cause of great degrees of cold in the higher regions will be accounted for, the decomposition and action of the rays not fully taking place until they have passed through those regions, and reached the more dense and aqueous parts below them.

I now conclude with one observation on that part of our theory of the Sun relating to the supply of the waste of his heat and light. As the entire body of the Sun is, by the above authorities, considered gaseous, it follows indispensably, that some mode of supplying its waste of combustion must be resorted to by nature; and we therefore conceive our theory of the mode of supply receives greater confirmation.\*

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\* For this mode of supply, vide "Theory of the Sun's Formation."

## EXTRA MATTER FOR THE SIXTH EDITION.

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Since the publication of the fifth edition of this work, it appears that Lord Rosse, by the high magnifying power of his six foot in diameter telescope, (being the largest ever constructed,) has made a most important discovery concerning the nebular hypothesis of the Astronomer, Laplace.—Before stating this discovery, I here give an account of these nebulae from Arago and Lardner's Astronomy, in 1845, page 24, under the head of "Fixed Stars":—

"One of these nebular beds is so rich, that in passing through a section of it, only in the time of thirty-six minutes, I detected no less than thirty-one nebulae, all distinctly visible upon a fine blue sky. Their situation and shape, as well as condition, seems to denote the greatest variety imaginable. In another stratum, or perhaps a different branch of the former, I have seen double and treble nebulae variously arranged; large ones with small, seeming attendants; narrow, but much extended; lucid nebulae, or bright dashes; some of the shape of a fan, resembling an electric brush, issuing from a lucid point; others of the cometic shape, with a seeming nucleus in the centre; or like cloudy stars surrounded with an atmosphere; a different sort again contain a nebulosity of the milky kind, like that wonderful inexplicable phenomenon about  $\theta$  Orionis; while others shine with a fainter mottled kind of light, which denotes their being resolvable into stars."

Mr. Mullinger Higgins also gives an account of the nebulae, in his treatise on the "Physical Condition, &c. of the Earth," 1840:—

"Nebulae exhibit a variety of appearances, sometimes presenting themselves as globular clusters of stars, and sometimes as diffused nebulosity. Many are, no doubt, stars at so enormous a distance from us that they can only be distinguished by the doubtful light they throw around them.—Others have been supposed to consist of phosphorescent matter, which either extends itself over the heavens, or is condensed around some star or dense matter. Sir William Herschell has

delineated a very beautiful nebulous appearance in Orion, which he observed with his large telescope.— Huygens, speaking of the same nebulosity, says, ‘that its appearance had the same effect upon an observer as that which might be supposed to proceed from raising a curtain that hid from the observer an ocean of light, the waves of which were irregularly illuminated.’”

“To the question, what is the ultimate designation of these nebulae, we can only answer by conjectures. Sir William Herschell thought he could trace a regular series of changes from a simple distribution of nebulous matter to that of a nebulous star, and some astronomers believe that a condensation of this matter is constantly going on, and that new worlds are daily in the process of formation. This is a splendid idea, and if the mind could at all adequately grasp it, would give an overwhelming conception of omnipotent skill; but there are some who have no higher ambition than to exclude God from His works, and to invest with His dignity and sovereignty that indefinable thing they are pleased to designate chance. It is not to be doubted that the great mind of Laplace was tainted with this unaccountable and unphilosophical desire; but, however this might be, he has availed himself of the discoveries that were made by Sir William Herschell for the invention of an hypothesis by which to account for the formation of the planets, and the sun itself, from a nebulous luminosity, which he is pleased to designate the primitive cause.”

In the London *Globe* the following article appeared:—

“Dr. Nichol, who has been lecturing in Edinburgh, under the auspices of the Philosophical Association of that city, stated to the audience the result of Rosse’s recent observations on the nebula of Orion. ‘He had,’ he said, ‘received a letter from Lord Rosse, dated so lately as the 19th of March, 1846, in which he said he had obtained so favourable a view as to be enabled to resolve the whole of one part of Orion into separate stars; and that he had no doubt, from there being only one-third of the magnifying power of the telescope

employed, that in favourable states of the atmosphere the whole would be resolvable. This, then, completely cuts away the ground from under the nebular hypothesis, and leaves Laplace's very ingenious deductions among the many cosmogonies with which the world has been amused. There was a new subject of wonder, however, opened on the human mind, overwhelming it with the boundless riches of the beneficent Creator. Orion, from its immense bulk and the immeasurable distance it is thrown back into the regions of space, must be composed of a greater number of stars than those of our visible firmament, so that here was another universe, as it were, discovered to the human race. What had formerly the appearance of gold dust sprinkled in the sky was now distinctly seen to be separate stars, but firmly compressed together, giving out a great effulgence of light, and not in the spare manner they appear in our system."

Dr. Nichol is Professor of Astronomy in Glasgow, of high character, and though he had published a work on the nebulæ, it appears he has now abandoned the nebular hypothesis.

The next extract is from another paper:—

"We gather a few interesting particulars, concerning the power of this great telescope, from a lecture recently delivered in Dublin, by Dr. Scoresby. By means of this instrument, Lord Rosse has discovered that the four stars, called the trapezium in Orion, are six stars. But the extraordinary powers of the instrument were best exhibited when turned upon the nebulæ, of which Sir John Herschell and his father examined and catalogued about two thousand. Of these a great many have been found resolvable into stars; but there were still a great many of these nebulæ that no telescope could resolve into any thing except misty specks; whence astronomers, anxious to find support for the nebular hypothesis, had hastily concluded that they were absolute nebulæ as yet uncondensed into stars. About the close of last year, the Earl of Rosse succeeded in getting his great telescope into complete operation, and, during the first month of his obser-

vations, on *fifty* of these unresolvable nebulae he succeeded in ascertaining that *forty-three* of them were already resolvable into masses of stars. Thus is confirmed the opinion, that we have only to increase the power of the instrument, to resolve all the nebulae hypothesis of Laplace into a splendid astronomical dream. The telescope of the Earl of Rosse has also enabled him to make some discoveries in the moon, which we may notice hereafter."

Thus it appears that this nebulae hypothesis, by which it has been attempted to shew the world how the earth and planets had been formed, is now disproved; and I cannot but consider that a great obstacle to the more general reception of my system of the Creation is removed. Its theory is founded on the Scriptural history of the formation of our earth in the waters of Genesis, and on the idea that the Deity has established laws in our system, which, when investigated by due scientific research, are competent to account for all the phenomena of our earth's formation; and as our attempt to give the time required by Geology for the formation of the crust of our earth and our theory of the sun, have been sanctioned by the high authorities stated in the work, we consider it will not be presumptuous to carry out the system to a greater extent, more especially as we trust, by natural results from this system, to be enabled to shew, (that as what has been called nebulous matter yet exists in very distant regions of infinite space): we trust to be able to shew what the design of those nebulae is, and also what are the real purposes of the comets in the vast scale of Creation.—And I consider it will be fortunate if, starting from known and established facts in Scripture and in the sciences, and advancing into the yet unknown and profound regions of the formation of the systems, we may, by a just combination of these facts and data, be enabled to establish a theory which will receive the assent of science, in opposition to the absurd doctrines of chance formation. We now proceed to shew why we consider that nebulae may yet exist in distant regions of space, and what the pur-

poses of these nebulæ are, as indicated by natural results of our theory of supplying the sun's waste in combustion.

If the sanction given to our theory of the sun by the great Astronomer, Arago, be sustained, it will of necessity result, that immense quantities of the combustible gases must be supplied to restore his waste. And here may, perhaps, be the proper place to notice a few theories of the sun which have been presented to the world. The great Newton always maintained that the sun was a body of *fire*; but the science of gaseous bodies being then unknown, he did not, nor could not, explain of what that fire consisted; but it is very remarkable; that this opinion of the immortal philosopher now bids fair to be confirmed by the recent discoveries of the French Astronomers on the polarisation of light.

The next noticeable theory of the sun is that of the late Sir Wm. Herschell, who conceived that "the appearance of the spots in the sun was explained by ruptures occurring in the sun's atmosphere, and exposing the solid globe of the sun to view." Now the reader, on referring to what Mr. Arago says, in page 1 of the Appendix, No. II, to this work, will find that of these spots on the sun it has been proved that they might occur in a gaseous medium; this result, he says, has been established incontestibly; and this agrees exactly with our theory, that the spots are occasioned by the dense volumes of aqueous vapour which must be produced by the vast combustion of the oxygen and hydrogen gases for the supply of the sun's waste. Sir John Herschell states, in his late treatise on Astronomy, that by the law by which heat is governed, namely, that it diminishes according to the square of the distance, "that there must be an enormous degree of heat in the sun." Sir Isaac Newton states, that this heat must be "many thousand times greater than red hot iron." How, then is it possible to suppose that any solid or liquid body could exist with this enormous degree of heat on its surface? Dense clouds and winds, in our own atmosphere, do certainly in-

tercept some degree of heat from the sun, it being ninety-five millions of miles away; but what would be the effect if the sun were close upon us? I do not believe that any power of either reflection or refraction could then save the earth from instant combustion; and the same must be the case with any solid matter in the sun.

Again, I have lately learnt that a theory of the sun has been proposed, on the idea that his heat and light are produced by electricity. It is thus supposed that all difficulties as to the great cause of the light and heat of the sun will be at once removed by the single term "electricity," and that the inquiring mind of man may now rest quiet on the subject; much in the same way that Atheistical writers formerly supposed they had cleared away all their difficulties, by referring them to chance formation. Electricity has, till very lately, been looked upon as so mysterious and occult a science, that the cause of it had almost been thought unfathomable, and those who have now sported the idea, that the sun is merely a great galvanic machine, probably believe they have found the "*ne plus ultra*" of causation. That profoundly ingenious Chemist, Liebig, has now, however, pretty clearly shewn that electricity is equally subject to, if not produced by, chemical action, as any other body. Without the previous action of aqueous, acid, or saline substance, on the metals employed, no electricity is evolved by galvanism. Before, therefore, we can refer to electricity as the cause of the light and heat of the sun, we have first to find whence is produced the indispensable "materiel" of this electricity.

By the idea of the above writers, of the Sun's being a galvanic machine, we should have to imagine that plates of solid zinc and copper exist in it. Now as we have shewn in the fourth and fifth editions of our System of Creation, that first-rate Astronomer, Arago, has proved to "mathematical demonstration," that the Sun's atmosphere is an "ocean of flame"; and by subsequent induction from later experiments on light, he has concluded that the entire mass of the Sun is a body

of gas in a state of combustion. In this stupendous heat, then, no solid body could exist. But what appears to me almost an unanswerable refutation of the above idea is, that the light and heat as it comes to us from the Sun, is of a totally different nature from the electric fluid. The rays of light and heat from the Sun produce the most genial and vivifying effects on all nature. It has been proved by experiment that a ray of light has no impulsive power whatever.

“It has been asked, whether the rays of light—whose velocity is enormous, since, as we shall show, it exceeds 70,000 leagues in a second—have any appreciable impulsive force: but the most delicate experiments have detected nothing of the kind.”—*Arago and Lardner's Astronomy.*

On the contrary, electric shocks, even from our atmosphere, generally prove destructive where the fluid strikes.—Would not therefore electric shocks from so vast a galvanic machine as must be supposed by the above idea to exist in the Sun, possibly have the effect of rending the Earth and Planets in sunder? Our distance from the Sun can be no argument against this, for distance appears to have no effect whatever on electricity. In short, the actual effects of the light and heat of the Sun, on coming to our earth, are so opposite to those of the electric fluid, that I cannot but consider the above idea as totally untenable.

Now our theory of the mode by which the waste of the Sun's light and heat is restored, gives the source from which the “materiel” of the Sun's combustion is supplied, namely, (according to the theory we have preferred in the present edition), by means of the comets.\*

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\* I have to state, that having reconsidered that part of our theory relating to the means of supplying the waste of the sun's fire, (as in the former editions), by currents of the combustible gases rushing through the regions of space, I have come to the conclusion that as these gases must then probably pass through the atmospheres of the planets by which they might chance to be inflamed, I have, therefore, in the present edition, corrected that part of our theory, and adopted, instead, that of the gases being supplied by means of the comets, whereby, as comets have never been known



The idea I have formed of electricity is, that it consists of heat and light combined together in some unknown and unique manner, and that the energy and violence of its effects is occasioned by the mutual expansive efforts of the light and heat to disengage themselves, and I am therefore inclined to believe that in the portion of electric fluid existing in the combustible body, these efforts are assisted by the decomposition of the oxygen gas; that the fluid is decomposed, and the light and heat of this electric matter is evolved, and then forms a part of the combustion. So far only, I believe that electricity may be concerned in the Sun's combustion.\*

The other theory I notice is one called "Vestiges of the Creation," very lately published in England. The original source of the production of the heavenly bodies, of this work, appears to be much of the same description as that of the Primitive World, by the Abbe de Sales, except that the author of the "Vestiges of Creation" calls his origin "a fire mist," instead of central fire. But from what cause or source he gets this *fire-mist* from which the Sun and Planets, as he says, originated, he does not inform us. Neither does he nor the former writer explain how the solid bodies of the earth and planets could be produced from fire *alone*, although this would be a very puzzling discovery for his readers to make.

Having now finished our observations on these various theories, we return to our previous proposal of shewing what we conceive the purposes of the nebulae may be, as indicated by the natural results of our theory, for

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to come near those atmospheres, no danger is to be apprehended, and I have the more willingly adopted this alteration, that I am therein sanctioned by the authority of the great Sir Isaac Newton.

\* I have to add, that by the present theory of combustion, even if the sun were a solid body, producing heat and light by volcanic action, still that heat and light must be ultimately derived from gaseous matter. The wood and coal of our terrestrial fires produce their heat and light by absorbing oxygen from the atmosphere, and thus setting free the heat and light that retained that oxygen in the gaseous state, and thereby we learn that gaseous matter is actually the great source of combustion even in our planet.

supplying the waste of the sun's fire. In the third edition of this work, on the subject of Sir David Brewster's discovery of the existence of gaseous matter in the sun's atmosphere, as related in Dr. Graham's Elements of Chemistry, the Doctor adds, "We may thus, hereafter, be enabled to explain how the light and heat of the suns of other systems have been formed and maintained." Sir Isaac Newton considered that there must be an enormous waste in the sun, from his unceasing emanations of light and heat, and he conjectured that this waste was restored by the means of the comets. "By far the greater number of comets," says Dr. Lardner, "appear to be mere masses of vapour, totally divested of all concrete or solid matter." About seven millions of comets are computed by Lardner and Arago to be contained in our solar system.\* What, then, can be the purpose of such a vast number of cometary bodies? *They*, at least, cannot be habitable; they are æriform,—stars have been seen through their central neuclei,—and we can conceive no idea more probable than that they are designed to distribute their æriform matter into the atmospheres of the sun's, for the purpose of restoring the waste of their combustion; and on this we shall shortly state our theory.

But having had the question-put to me, how the attraction of the planets by the sun could be accounted for, if he were only a body of gas in combustion; I here reply to this important question as follows:—In note 6, second edition, I have shewn, from Good's Book of Nature, that Sir Isaac Newton himself did not consider gravity to be an essential property of matter; but that he considered it might be explained by means of "an elastic gaseous medium, by which means the celestial bodies are forced towards each other by the excess of an elastic pressure." Mr. Good also agrees that it is

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\* Sir John Herschell, in treating on the Zodiacal Light, (See Index for Sixth Edition of System of Creation), says, the actual materials of the tails of millions of comets, of which they have been stripped in their successive perihelion passages, may be slowly subsiding into the sun.

possible to account for the effects of gravitation by an ethereal medium thus constituted. So does Sir Richard Philips in his theory of the Heavenly Bodies.

That there is such a gaseous medium existing in space, is proved to the satisfaction of most Astronomers. In note 17, first edition, from Whewell's Bridgewater Treatise, it is said, "But the facts that have led Astronomers to the conviction that such a resisting medium really exists, are certain circumstances occurring in the motion of a body revolving round the sun, which is now usually called Encke's Comet." All the operations of nature we know of are produced by physical laws. Gravitation is the most energetic and universal of all the operations of nature, therefore there is the more reason for believing that it is brought about by the same mode which we find employed by the Creator in all the operations that are going on under our eyes, namely, by those physical laws. And in addition to the strong arguments employed by Newton himself, (which will be seen in note 6, second edition, containing his explanation of gravitation by means of the elastic gaseous medium), I have to state, that it is known that electricity pervades almost all nature. Our atmosphere, our earth, and all water, especially when in a vaporized state, are charged with the electric fluid. Our earth is pervaded by magnetic and electric currents; and what I wish now to state, therefore, in addition to Sir Isaac Newton's arguments on the ethereal gaseous medium, is, that I conceive that medium is also pervaded and excited to motion by the electric fluid. I believe that this electric fluid is a most potent agent of nature, by which she keeps the ethereal gaseous medium in a constant state of motion and activity, for producing the force which carries the planetary bodies in their courses round the sun; and I believe this is the very purpose for which this ethereal electric medium exists in space. As above shewn, it appears that the great Sir Isaac himself thought this ethereal gaseous medium was sufficient to account for gravitation, and I now humbly beg leave to add my belief, that, with the aid of the vast powers known to be pos-

sessed by the electric fluid, there can be no doubt of these united forces being competent to produce the effect of the gravitation of the heavenly bodies round the sun. In corroboration of this physical cause of gravitation, I am happy to be enabled to give the following short extract from the celebrated author of "Cosmos" Baron Von Humboldt. In Vol. 1, page 137, he says, on the subject of the revolutions of the double stars, "But whether the attracting forces depend *solely on the quantity of matter* in these systems as in ours, or whether there may not co-exist with gravitation *other specific forces*, which do not act according to mass, is, as Bessel has been the first to shew, a question of which the solution is reserved for later ages."

Now I have shewn above, that Sir Isaac Newton did not leave the world without giving it his opinion how the great principle of gravity, discovered by him, was produced and carried on, and as the electric fluid is found to pervade all nature, we cannot suppose that the ethereal gaseous medium is void of it; repulsion and attraction are the great attributes of electricity. I, therefore, humbly offer these considerations to men of science, on the forces by whose influence the planets are carried round the sun, considering it, as Arago says, to be a vast mass of gaseous matter in a state of combustion.

If, therefore, our theory of the sun be substantiated, (as indeed it has already in part, by the induction formed by Mr. Arago, that the sun is nothing but a grand mass of gas agglomerated in space), it necessarily follows that the waste of this combustion must be supplied by currents of gaseous matter, and the peculiar attraction of the sun will have to be reduced to the degree of that power which his weight, as a body of gas, will give him. The remaining quantity of attraction or pressure required to carry the earth and planets round the sun, will arise from the elastic gaseous medium existing in space and acted upon by electric forces. Proceed we now in support of our theory. By it we conceive that the waste of the sun's fire must be replaced by gaseous combustible matter.

The vast quantity of this matter for the continual supply of our sun, whose diameter is nigh 800,000 miles, may indeed be conceived, and perhaps calculated; but though, as Dr. Graham says above, "we may henceforth be enabled to explain how the light and heat of the suns or stars of the other systems is formed and maintained," and which, reasoning by analogy with our own sun, we certainly may do, yet how are we to contemplate the stupendous and incalculable quantity of gaseous matter which would be required for the due supply of the millions of suns which the astronomers state to exist in the universe?

I have therefore conceived and adopted the idea that there may be *laboratories of these gasses* appointed by the Creator in the distant regions of space; for, believing that nothing short of a direct act of creation would be adequate for restoring the stupendous quantities of gaseous matter wanted for the supply of all the suns of the universe, I have therefore conceived that, although Lord Rosse has resolved the nebulae in the constellation Orion into stars, still some or many of the nebulae discovered in other regions of space may actually be *laboratories* established by the Deity for the *formation of this gaseous matter*.

The positive fact of the tails of comets being gaseous, their uniform courses round the sun, the changes which take place when they leave him, all appear to me a great confirmation of the sun's gaseous nature, and if this be ultimately conceded, we have every right to conclude that the other stars or suns of the universe are gaseous also, and though it might be conceived that a sufficient quantity of gaseous matter might be found in a space that is infinite, still the safety of the earth and planets precludes that idea. I have therefore come to the conclusion, as is stated above, that there must be *laboratories* for the formation of the gases required, in which *laboratories* a constant act of creation of the elementary matter of those gases would be indispensable, to supply the unceasing and stupendous waste. If, therefore, our theory of the sun continues to be substantiated, (and, as will be shortly

shewn, the planet lately discovered offers a strong confirmation of it), and as nothing short of a direct act of creation could produce a supply of gaseous matter for all the suns of the universe, we must refer to such an act of creation for that supply, and we trust we shall indeed thereby lead our readers "through Nature's works up to Nature's God." We believe we shall have found a more clear and positive proof of the reality of an existing and actually present creation of matter, than has yet been offered to mankind.

Another reason why I am led to believe that there are various laboratories established by the Creator for the formation of the gases is, that it is indispensable to suppose, that as there may be various gases required, both for replenishing the waste of the atmospheres of the planets and also oxygen and hydrogen for the waste of the suns of the various systems, these gases must therefore be formed and collected in separate repositories, to be afterwards taken up by various comets, and carried by them to their intended destination, by laws established by the Creator for their direction in their courses, consistent with the safety of the planetary bodies, as we shall shew shortly. Having now stated our conception how alone an inexhaustible source of supply of the combustible gases can be obtained, we shall extract from Arago and Lardner's Astronomy, and from Higgins on the Earth, some account of the Comets, as far as they relate to their physical constitution and laws of their motion.

Mullinger Higgins says, in page 54 of his Physical Condition of the Earth, that "Newton discovered that comets are bodies moving in fixed orbits round the sun. As soon as this philosopher had discovered the laws of universal gravitation, he applied them to the determination of the motion of comets; for having proved that, according to the conditions of that force, a body might describe any conic section about the sun, he conceived that comets, in their apparently irregular motions, might be governed by that principle. The comet of 1680, which approached the sun to within one-sixth of its diameter, enabled him to test the truth of his con-

jecture ; and he proved that it moved in an elliptical orbit of so great eccentricity that it could not be distinguished from a parabola having the sun as one of its foci ; and that, as in the case of the planets, the areas described about the sun were proportional to the times ; a law discovered by the illustrious Kepler. From this calculation it became evident that the comets were governed by the same laws as the planetary bodies, and that the orbits of the former differed from those of the latter in the great elongation of their elliptical paths." And in page 56, he says, "The calculations that have been made to determine the dimensions of comets prove that they are by far the largest bodies in our system. The greatest length of that which appeared in 1759 was sixteen million leagues ; that of 1811, thirty-six million ; while that of 1680 was not less than forty-one million leagues."

In Arago and Lardner's Astronomy, it is said, "These bodies usually are observed to rush into our systems suddenly and unexpectedly from some particular quarter of the universe. They first follow in a straight line, or nearly so, the course by which they entered, and this course is commonly directed to some point not far removed from the sun." In the same work it is also said, "The planets move round the sun all in one direction. Comets, on the other hand, rebel against this law, and move, some in one direction and some in another." Again, it is said, in page 66, same work, "One of Newton's conjectures respecting comets was, that they are the aliment by which suns are sustained ; and he therefore concluded, that these bodies were in a state of progressive decline upon the suns, round which they respectively swept ; and that into these suns they from time to time fell. This opinion appears to have been cherished by Newton to the latest hours of his life." And in page 67 it is said, "By far the greater number of comets appear to be mere masses of vapour, totally divested of all concrete or solid matter. So prevalent is this character, that some observers hold it to be universal. Seneca mentions the fact of stars having been distinctly seen through comets. A star of the

sixth magnitude was seen through the centre of the head of the comet of 1795, by Sir William Herschell."

It is seen, then, by these extracts, that comets move under fixed laws; that their course is towards and round the sun; that in general they consist merely of gaseous matter; that the opinion of that first of Astronomers, Sir Isaac Newton, was, that "they are the aliment by which suns are sustained." Comets have been a fertile source of amazement and terror to mankind for numerous ages previous to our times. No longer ago, indeed, than the year 1832, an Astronomer having calculated that the comet of that year would strike the earth somewhere, many of the people of Paris became so alarmed, that the French Government directed Mr. Arago to investigate the circumstance.

It is remarkable that, except Sir Isaac Newton's opinion, that the comets were employed in supporting the waste of the sun's fire, Astronomers have not, that I have learnt, made any further researches on this point. Now, as we consider by our theory, that the sun is a body of gaseous matter in combustion, for the purpose of heating and lighting the earth and planets, and as it is indispensable that the waste of this combustion must be restored, we therefore conceive this to be the very purpose of the numerous comets of our system, and of those of others. We conceive that the various combustible and other gases required to restore the waste of the atmospheres of the planets, and also the waste of the suns of the universe,—we conceive, I say, that these various gases are taken up by the power of attraction by the comets, from the laboratories of these gases in the nebulae, (as we have stated in our theory of these laboratories), and that these comets then, directed by the unerring laws of their courses, distribute these gases to our sun and to the various suns of other systems, thereby restoring the waste of their heat and light. Now, it is a known fact in Pneumatic Chemistry, that neither the oxygen nor hydrogen gases are combustible, *per se*, that is, by themselves alone: before combustion can ensue, these gases must be mixed in certain proportions. In order, therefore, to ensure the



safety of the planetary bodies, we must conceive these two combustible gases to be taken up from separate nebulae, some comets being charged with oxygen and others with hydrogen gas, the only two primary combustible gases we know of. By this separation neither of them can be ignited, as they may pass the orbits of the planets at the nearest approach comets have been known to make to those orbits. The comets having then arrived near enough to our sun and to the suns of other systems, their gaseous tails are then attracted by the draft of the fire of the suns and deposited in them, thereby restoring the waste of their combustion.

The following extract from Arago and Lardner's *Astronomy*, having been unavoidably omitted in this work, and containing a great proof of that part of our theory (the purposes of the comets,) which relates to their taking up by attraction the masses of aqueous vapour formed by the combustion of the gasses, for the restoring the waste of the sun; (vide page 27, of Appendix, No. II,) we now make the present Addendum. In A. and L.'s *Astronomy*, it is said:

“ It will doubtless excite surprise, that the dimensions of a comet should be enlarged as it recedes from the source of heat. It has often been observed in Astronomical inquiries, that the effects, which at first view seemed improbable, are nevertheless those which frequently prove to be true; and so it is in this case. It was long believed that comets enlarged as they approached the sun; and this supposed effect was naturally and properly ascribed to the heat of the sun expanding their dimensions. But more recent and exact observations have shewn the very reverse to be the fact. Comets increase their volume as they recede from the sun; and this is a law to which there appears to be no well ascertained exception.”

Now as it is evident that our theory of the mass of aqueous vapour being attracted by the comets, will perfectly well account for their increase of volume on receding from the sun, we therefore consider the above extract as a great sanction of that part of our theory.

We consider the extracts above given to be a powerful support of this theory of the comets, in which we trust to have shewn how they perform the vast purpose of restoring the waste of the suns; and when we reflect on the stupendous quantities of the combustible gases required for it, we need no longer be surprised at the millions of comets said by the Astronomers to be contained in the universe; neither, for the same reason, need we doubt that the Creator may have established laboratories in some part of the regions of space, for the replacing the enormous waste of the suns, either by certain laws, or by His own immediate agency.

The above important purpose is not, however, the only one which we humbly conceive the comets are intended to perform. By the combustion of the oxygen and hydrogen gases for the supply of the suns of the universe, stupendous quantities of aqueous vapor must be generated. Without the removal of these masses of vapor, the light and heat of the sun might be in part obstructed. We have therefore conceived that another great purpose of the comets is, to take up (by their power of attraction) and to transport these vast masses of vapor into various regions of infinite space, for their future condensation into oceanic waters, and in which, by the same processes by which our earth was formed, in the ocean of Genesis, as shewn in this work, so in future ages new systems of planets may be generated. And to place the probability of these operations in a more prominent point of view, I here subjoin a recapitulation of our theory of the probable design of some of the nebulæ, and of the real purpose of that vast number of comets said by the astronomers to occupy the regions of space.

In this theory it is conceived that, by the supply of the gases to the suns of the systems, nature effects a twofold object, namely, the supply of the waste of the sun's fire and the reproduction of other planetary bodies by means of the masses of aqueous vapour produced by that combustion. "Nature," says the immortal Newton, "could not exist without motion," (action) And the eminent Gœthë has in his works the same

idea. We may therefore conclude that the reproductive powers of nature are ever in action. We have also reason to believe that the heavenly bodies now existing are not to last for ever. "The great globe itself," says our immortal Bard, "shall dissolve, and, like the baseless fabric of a vision, leave not a wreck behind." And, in fact, stars that have been formerly well known in the heavens have now disappeared. The heavenly spaces, we are told by all astronomers, are infinite, therefore we have a right to suppose that the laws first established by the Deity are in continual operation, both for replacing exhausted systems and augmenting His bounty and His glory. Thus we have conceived, as stated in our theory, that the stupendous masses of aqueous vapours, formed by the combustion of the gases for the supply of the waste of the suns, are carried off by the comets from those suns into the regions of space, for the purpose of being condensed into *oceanic waters*, which, by the deposits of their vegetable and animal kingdoms, will form the solid parts of new planetary globes. Hence would arise the conversion of these gasses into the liquid and solid matter of those globes enduring many ages, and hence the necessary conclusion we have drawn in the theory that a present and constant act of creation is required to supply the unceasing and enormous waste of those gases, and hence we have conceived the existence of elaboratories for this purpose in some of the nebulae of the distant regions of space. Now, as all gaseous matter is indispensably associated with caloric and light, which probably form part of their constitution, so it is highly probable these elaboratories would have the exact appearance in the regions of space which the nebulae are said to present to the telescope.

As to the other purpose of the comets, namely, the supplying the waste of the sun's combustion, I have explained that at large in the theory thereof, and, as a confirmation of its necessity, I conclude with an extract from the celebrated Baron Von Humboldt's work, called "Cosmos," confirming Arago's discovery, of the constitution of the sun, and to which discovery, as a

Canadian born and zealous for the honour of Canada, I now lay claim. It was published in the first edition of my System of the Creation, in 1836, Toronto, C. W.

In vol. 1, p. 37, above work, it is said—“When Huyghens first applied himself in 1678, to the enigma of the phenomena of the polarization of light, exhibited in doubly refracting spar, and observed the difference between the two portions into which a beam of light divides itself in passing through such a crystal, it was not foreseen that through the admirable sagacity of a physical philosopher of the present day, the phenomena of chromatic polarization would lead us to discern, by means of a minute fragment of Iceland spar, *whether the light of the sun proceeds from a solid nucleus, or from a gaseous covering.*”

The new planet just discovered affords a strong corroboration also of our theory of the sun. This planet is found to be 3,695 millions of miles from the sun.\* Its diameter is nigh six times greater than our earth; and on reflection on the highest degree of heat we receive from the sun, it seems impossible that a planet at such an enormous distance could be warmed and lighted unless the sun were in a state of combustion through its entire diameter.

In corroboration of our theory, of the purpose of the comets, I here extract some account from Arago and Lardner's Astronomy, of changes in the appearance and bulk of the tails of certain comets on their receding from our sun.

It is said, in the above work, “The comet of 1759 was now observed in various places. It continued to be seen at Dresden, also at Leipzig, Boulogne, Brussels, Lisbon, Cadiz, &c. Its course being observed, it was found that it arrived at its perihelion, or at its nearest point to the sun, on the 13th of March, between three and four o'clock in the morning; exactly thirty-seven days before the epoch first assigned by Clairaut, but only twenty-three day previous to his

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\* Professor Olmstead says this planet is 3,600 millions of miles from our earth, which would give 3,695,000,000 of miles from the sun.

corrected prediction. The comet on this occasion appeared very round, with a brilliant nucleus, well distinguished from the surrounding nebulosity. It had, however, no appearance of a tail. About the middle of the latter month, it became lost in the rays of the sun while approaching its perihelion; it afterwards emerged from them on its departure from the sun, and was visible before sunrise in the morning on the 1st of April. On this day it was observed by Messier, who states that he was able to distinguish the tail by his telescope. It was again observed by him on the 3rd, 15th, and 17th of May. Lalande, however, who observed it on the same occasions, was not able to discover any trace of the tail."

I have here to observe, that in the first account of this comet given in the above work, before it had arrived at its perihelion, or nearest distance from the sun, it is not said it had no tail, therefore we conclude it had one; but, as appears by the above extract, when it had arrived, on the 13th March, at its nearest distance, it had no tail. Now, it appears to me, our theory of the intended offices of comets will account for these facts. The comet, on arriving at the sun, deposited its gaseous matter or tail, therefore, as Lalande says, "he could not discover any trace of a tail."

In page 64, of Arago and Lardner's Astronomy, it is said, "It had been observed, however, in the southern hemisphere at Pondicherry by Pere Cœur-Doux, and at the isle of Bourbon by La Caille, under more favourable circumstances; and both of these astronomers agree in stating that the tail was distinctly visible by the naked eye, and varied in length at different periods from ten degrees to forty-seven degrees. These circumstances are obviously in perfect accordance with the former appearances of the same body."

Thus, at this time, it had again acquired a long tail, which, I conceive, can be well accounted for, by its having, between the two observations, attracted the mass of aqueous vapour in the vicinity of the sun, which then formed its new appendage.

Now it is plainly visible that our theory of this part of the purposes of comets will account naturally and with perfect ease for the increase of their tails, by the absorption by attraction of the aqueous vapours it found near the sun's atmosphere, after having deposited therein the combustible gases they were previously charged with.

We now conclude our extracts with one from Mr. Higgins's work to shew the vast length of the tails of comets:—"The nature of comets, and the purposes they serve in the system to which they belong, are almost entirely unknown. No probable explanation has yet been given of the character of that train of luminous matter frequently appended to them, and very inappropriately termed the tail, since it frequently precedes the body itself. The tail is sometimes of very considerable length. Aristotle states that the tail of the comet that appeared in 371 A. C., occupied a third of the hemisphere, or  $60^{\circ}$ : that of 1580 is said to have covered an extent of more than  $70^{\circ}$ ; and that of 1618,  $104^{\circ}$ . But a tail is not a necessary appendage to a comet, for some have been quite destitute, as were those of 1585 and 1763; but there are also some that have several tails; that of 1744 had no less than six, which, spreading out in the form of a fan, extended over a space of nearly  $30^{\circ}$ . A very small condensed spot has been observed in the heads of some comets, but the fixed stars may be seen through the densest parts of many; and from the circumstance that none of them have exhibited phases, though they undoubtedly shine by reflected light, we may gather that they have no claim to be considered as solid bodies, but have in all probability the condition of the lightest vapour."

Now I am in a great hopes that should my theory of the purposes of the comets reach Mr. Arago's eye, he will agree, that as vast masses of vapour must be formed by the combustion of the gases, that these masses must be attracted by the comets, and the formation of their tails be the natural consequence,

The great author of the "Cosmos" says, in page 106, 1st vol. "The little knowledge which we yet

possess of the physical qualities of the comets, renders it difficult to separate the essential from the accidental in phenomena recurring at intervals, and which have been observed with more or less accuracy," And happy I should be, if our present theory of these bodies should, in the opinion of that profound philosopher, throw a new light on this important subject.

We have now to conclude this Sixth, and probably the last, Edition of our work. We humbly conceive we have, from natural results of our System of the Creation, shewn, a high degree of probability of what may be the purpose of the nebulæ and cometary bodies, to produce in the stupendous scale of the universe of the Almighty, either by laws established by Him, or by His immediate and unceasing agency; and we have now only to present these efforts to the calm consideration of a candid and intelligent public, and more especially to the enlightened minds of scientific men, being well convinced that the greater their zeal for the advancement of science, and the greater their powers therein, the more favourably they will receive our humble attempts to advance the study and the knowledge of it.

SUPPLEMENT  
TO THE SEVENTH EDITION  
OF THE  
SYSTEM  
OF THE  
CREATION OF THE GLOBE, PLANETS,  
AND SUN,  
CONTAINING THE EXTRA MATTER OF THE SEVENTH EDITION.

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IN the sixth edition of this work, in page 21 of the Appendix No. 2, I shewed how the planets were attracted round the sun, supposing it, according to our theory (as sanctioned by the great astronomer Arago,) to be a body of gas in a state of combustion. I there shewed how the immortal Sir Isaac Newton considered this attraction was effected, as narrated in note 6th to the second edition from Good's Book of Nature. In the same part of the work, I stated my belief that electricity had a great share in the rotation of the planets, by "keeping the ethereal gaseous medium of Newton in a constant state of motion and activity, for producing the force which carries the planetary bodies in their courses round the sun." I therefore beg to refer the reader to those pages 20, 21, and 22 of that appendix, No. 2, by which he will be made more clearly to comprehend the purpose of my inserting the following extract from the recent lecture of the celebrated chemical philosopher Faraday, given in London, (England.) In "Chambers' Edinburgh Journal" of April 18, 1846, is the following article—Professor Faraday's Further Reserches in Magnetism:—"In No. 114 of the present series of the Journal, we give a brief report of Mr. Faraday's lecture on the relations of light and magnetism. Since its delivery, he has explained away a misapprehension existing in the



minds of many persons as to his experiments, which it was imagined were meant to prove that the luminousness of a ray of light is due to magnetism. The truth, however, resolves itself simply into this; that, regardless of any of the existing theories on the nature of light, whatever is magnetic in a ray only has been effected; the line of magnetic force was illuminated by the ray of light used in the experiment, as the earth is illuminated by the sun: *there was no creation of light*; the ray was required to shew that light in common with ponderable matter, is acted on by magnetism.\*

"A second lecture was delivered by Mr. Faraday, at the beginning of March, 'On the new magnetic actions and on the magnetic condition of all matter.'—So great was the interest excited by the announcement of the subject, that the entrance-hall of the institution was thronged, long before the hour of admission, by a dense body of individuals from among the most scientific classes, who afterwards filled the theatre to overflowing, many being unable to obtain seats. It was impossible to look round on the intellectual-looking assembly, without being struck with the reflection that they had met to do homage to some of the highest truths of science.

"Punctual to the hour, the lecturer made his appearance, and observing that he would not waste time in idle regrets that a portion of the audience was unable to find accommodation, proceeded to the discussion of the subject. The apparatus used on this occasion was the same as at the former lecture, with a little difference of arrangement. The helix stood perpendicularly on the floor, connected as before by wires with the electro-galvanic battery; and the large horse-shoe magnet was placed so that the two poles only were seen rising through openings to a level with the surface of the table in front of the operator, who by this arrangement, had the great power of the apparatus completely under command, while it afforded the best means of exhibi-

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\* This shows that Faraday does not consider light and magnetism as the same thing.

ting the effects. A few experiments were made to display the energy of the magnetic force, with less than which, the lecturer observed, it would be in vain to look for the phenomena. He succeeded in shewing, with a quantity of iron nails, the line of force passing from one pole of the magnet to the other; along this curve they were seen clinging to each other, and describing a regular arch several inches in length and height; which position they retained until, on breaking communication with the battery, they instantly fell in a confused heap to the table.

“ Mr. Faraday next adverted to the popular ideas of magnetism with regard to iron and some other metals, which point freely north and south, and explained the importance of showing the relation of the power he employed to common magnetism. A small bar of iron was suspended by a thread to move freely in the line of force between the poles, and, on charging the magnet, the bar was seen to obey the natural law by pointing north and south, in a line from one pole to the other, or what the lecturer terms the *axial* line. This simple experiment was necessary to enable the audience to understand the allusions to the axial line in the subsequent portion of the lecture. Among the metals, nickel, cobalt, platinum, palladium, titanium, and a few others possessed of the same property, are classed as magnetics.

“ The power here afforded for testing the magnetism of all substances, was noticed and exemplified by suspending, in the place of the iron, a small bar of copper, which was found to be neither attracted or repelled, remaining, with the exception of some very feeble manifestations, indifferent to either position.—A piece of paper was also tried, and, after some vibrations, proved to be magnetic, by remaining stationary in the axial line.

“ Mr. Faraday then recalled to the memory of his hearers the experiment of his former lecture, shewing the peculiar action of glass on light. On that occasion the piece of glass, through which the magnetism found its way as readily as though no substance intervened,

was named a diamagnetic; and it was to the testing of this peculiar property that the subsequent experiments were directed. To insure a satisfactory result, more than ordinary care and delicacy were required in the manipulation. Threads of cocoon silk, free from torsion, were used as the suspending medium, bearing at their extremity a small stirrup of non-magnetic paper, in which was laid the substance forming the subject of the experiment, and the whole was hung inside a glass chamber, to protect it from currents of air. On placing a small bar of the heavy glass in the stirrup, instead of pointing north and south, it took up a directly contrary direction EAST AND WEST, or what the lecturer termed the equatorial, in contradistinction to the axial line; describing it, further as 'a tendency of the particles to move outwards, or into the position of weakest magnetic action,' the whole of the particles being jointly exercised in producing the effect.

"Of all the metals, bismuth is found to be the most energetic diamagnetic; and to show that such substances are repelled by either pole of the magnet, a long glass tube, balanced horizontally, was charged with a piece of the metal, at the end within the line of force; at the other end a piece of coloured paper was fixed, which, by the sweeping arcs it described, demonstrated the repelling power of the two poles as the piece of bismuth was alternately brought within their influence. Sufficient care was taken to shew that this is not an accidental, but a constant result in the numerous substances which have been put to the test of experiment, among which were phosphorus and water; the latter constituting nine-tenths of nature, may play a most important part as a diamagnetic. All natural substances are affected one way or the other, either magnetically or diamagnetically. A slice of apple cut with a silver knife, a piece of wood, beef, bread, and a thousand other objects—a man, even could he be suspended with the requisite delicacy—all would point east and west, or in the equatorial line. They are all acted on by magnetism, though not magnetic, as iron.

“Some curious facts came out with regard to gases, which appear to fill a place, as yet unoccupied by any other substance, between the magnetics and the diamagnetics. Whether dense or rare, the phenomena produced are the same; from which it has been inferred ‘that air must have a great and perhaps an active part to play in the physical and terrestrial arrangement of magnetic forces.’”

“The general sum of the experiments may be best given in a quotation from Mr. Faraday’s published observations on the subject:—

“Having arrived at this point, I may observe that we can now have no difficulty in admitting that the phenomena abundantly establish the existence of a magnetic property in matter, new to our knowledge. . . . All the phenomena resolve themselves into this, that a portion of such matter, when under magnetic action, tends to move from stronger to weaker places or points of force. . . . This condition and effect is new, not *only* as it respects the exertion of power by a magnet over bodies previously supposed to be indifferent to its influence, but is *new* as a magnetic action, presenting us with a second mode in which the magnetic power can exert its influence. . . . All matter appears to be subject to the magnetic force as universally as it is to the gravitating, ‘arranging itself’ into two great divisions—the magnetic, and that which I have called the diamagnetic class; and between these classes the contrast is so great and direct though varying in degree, that where a substance from the one class will be attracted, a body from the other will be repelled.

“Mr. Faraday considers that the use of this power will eventually be developed. ‘It cannot for a moment be supposed that being given to natural bodies, it is either superfluous, or insufficient, or unnecessary. . . . It doubtless has its appointed office, and that, one which relates to the whole mass of the globe; and it is probably because of its relation to the whole earth, that its amount is necessarily so small, so to speak, in the portions of matter which we handle and subject to experiment. . . . Matter cannot thus be affected by the mag-

netic forces, without being itself concerned in the phenomenon, and exerting in turn a due amount of influence upon the magnetic force. . . . When we consider the magnetic condition of the earth as a whole, without reference to its possible relation to the sun, and reflect upon the enormous amount of diamagnetic matters which, to our knowledge, forms its crust; and when we remember that magnetic curves of a certain amount of force, and universal in their presence, are passing through these matters, and keep them constantly in a state of tension, and therefore of action, which I hope successfully to have developed, we cannot doubt but that some great purpose of utility to the system, and to us its inhabitants, is thereby fulfilled, which now we shall have the pleasure of searching out. . . . If one might speculate upon the effect of the whole system of curves upon very large masses and these masses were in plates or rings, then they would, according to analogy with the magnetic field, place themselves equatorially. If Saturn were a magnet, as the earth is, and his ring composed of diamagnetic substances, the tendency of the magnetic forces would be to place it in the position which it actually has.

“It is a curious sight to see a piece of wood, or of beef, or an apple, or a bottle of water, repelled by a magnet; or taking the leaf of a tree, and hanging it up between the poles, to observe it take an equatorial position. Whether any similar effects occur in nature among the myriads of forms which, upon all parts of its surface, are surrounded by air, and are subject to the action of lines of magnetic force, is a question which can only be answered by future observation.

“The lecture which occupied nearly two hours in the delivery, was listened to throughout with undivided attention by the auditory, who at the close, manifested their pleasure in loud and enthusiastic plaudits. We cannot conclude our notice better than in professor Faraday's own words:—It will be better to occupy both time and thought, aided by experiment, in the investigation and development of real truth, than to use them

in the invention of suppositions which may or may not be founded on, or consistent with, fact."

Having referred the reader to the Appendix No. 2, he will now understand the purport of the foregoing extract, which we consider as a strong support and sanction of the idea stated in that Appendix, namely, "that electricity has a great share in effecting the rotation of the planets round the sun."

"If Saturn," says the Professor, "were a magnet, as the earth is, and his ring composed of diamagnetic matter, the tendency of the magnetic forces would be to place it in the position which it actually has."

The immortal Newton made the discovery of the great principle of the attraction of the heavenly bodies, which has so excited the admiration of mankind. He was at that time of opinion, that our sun was a body of fire, but it was only in his later writings that he gave his opinion by what physical forces this attraction was effected, which we have shewn in note 2, to our second edition, from "Good's Book of Nature," and our idea of electricity being employed for that effect, is now strongly corroborated by the above extract from Faraday's lecture. By that lecture it appears, that all the bodies of matter on our earth, except a few of the metals, &c., are diamagnetics, that is, are attracted *east and west*. That being the case we have the strongest analogy for believing that it is the same with the other planets. Now, east and west is the very course which the planets take in their orbital rotation round the sun; and knowing that electro-magnetic currents are flowing continually over our earth, oceans, and atmosphere, we have every reason from analogy to believe, that electricity is the grand agent of nature, acting upon the gaseous elastic medium of space, to produce this rotation of the earth and planets. I therefore feel happy in being able, in this edition of my work, to present the reader with so important a corroboration of the above idea of the rotation of the earth and planets, as is shewn in this lecture of the eminent Professor Faraday.

Since the publication of the sixth edition of my System of the Creation, I have fallen in with a work, entitled "A New Philosophy of Matter," published by Crocker and Brewster, Boston, and George Brewster, Adrian, 1843. In my sixth edition pages 16 and 18, of the Appendix No. 2, I noticed "a few theories of the sun, which have been presented to the world:" amongst these, there was one theory founded "on the idea that our sun's heat and light are produced by electricity." To this notice (writing of course before I knew of Mr. Brewster's work,) I beg leave to refer the reader, for as the "New Philosophy of Matter," is also founded on the idea that our sun's heat and light are owing to its electricity, but without shewing what this electricity is generated from, I now propose to make some observations on that and other parts of the work.

I must commence with paying a well-merited compliment to the style, energetic boldness of thought, and talent, of this author. His idea that "each ultimate particle of the electricity that makes a bar of steel magnetic and keeps it magnetic, has opposite polarities, as well as the whole current," appears to me very ingenious and well supported. But, in his endeavours to solve the difficulties which perplexed Dr. Franklin,— "the repulsion of two negatives," the author makes an assertion which much surprised me, namely,— "that motion is never produced in ponderable matter, by the mere force of moving currents of electricity." How then is it, that the terrific effects of those currents (which he has so well described in another part of his work,) are produced? I have witnessed these effects myself. I have seen a pine tree rent asunder and shattered into fragments by lightning; and the direful effects of those currents on ponderable matter is universally known. The cause of lightning in its descent to the earth, may depend on polarity; but that it has no effect on the ponderable matter which *obstructs* that descent, appears to me an unaccountable assertion. Again, this author adds:—"If this were the case, (if motion in ponderable matter were produced by elec-

fricity,) our earth would have been instantaneously battered into atoms by the light which first struck it from the sun. It is plain that the author here considers light and electricity as one and the same body, according to the theory of his work, but the fact which he states, that light from the sun does not "batter the earth to atoms," is a clear proof that light is not electricity, nor electricity light; for we all know that the electric fluid produces the most destructive effects wherever it impinges; while light, as is proved in Arago and Lardner's Astronomy, has no impulsive power whatever; and we shall have more to say on this subject as we examine other parts of the work.

In page 67 and 70, the author gives an ingenious theory of the formation of acid and alkaline tastes on the tongue, which he believes are produced by electricity.

It is possible, indeed, that this theory *may* be founded in nature; but it must be observed, that the saliva contains various salts in solution. May not the positive current decompose most or all of these salts, and thus produce an acid taste; and may not the negative current be able to decompose *only* a certain number of these salts, and so produce an alkaline taste? for it is well known that electricity will decompose saline substances. In his endeavours to account for oxygen gas going to the positive pole, supposing it to be itself positive, as he does, I think this author has totally failed. He considers oxygen gas to be *electricity itself* formed, as he says, by the positive electricity taking up a certain "incasement of watery particles," which gives it the appearance of gas; but he must have forgotten that positive electricity decomposes water, therefore, such incasement could not exist. His error probably lies in not believing oxygen gas can be negative, and at the same time support combustion; but according to the hitherto received theory of Lavoisier, combustion is nothing but an affinity of the combustible body for the oxygen of the oxygen gas with which it combines; and the heat and light that kept it in a gaseous state is evolved. Now, this heat and light would be evolved, whether the oxygen gas were posi-



tive or negative; it is merely a consequence of this gas being in a highly rarified state, and of course evolving much heat and light, while the base of the gas is combining with the combustible body.

This author has fallen into the same error with respect to hydrogen gas. He states, "that it is not inflammable at all, and goes on to shew, that "if a lighted candle be inserted in a jar of hydrogen, it will be extinguished," which is true enough; but no *body* in nature will burn or be inflammable, without the access to it of air or oxygen, to set free their heat and light; for oxygen itself will not burn by *itself*—it is not inflammable, it is merely the supporter of the combustion of combustible bodies, by the mode above shewn, when in contact with them. The author subsequently attempts to account for the combustion of hydrogen in air, or oxygen gas, by opposite electricities; but as I conceive I have shewn that his theory of the nature of oxygen gas is untenable, and as oxygen gas goes constantly to the positive pole, I cannot concede to his explanation of this cause of the combustion.

In page 162 of his work, Mr. Brewster very candidly states, that if any person is prepared in any other plausible or rational way than that of his theory, to account for the otherwise unavoidable waste of the sun, he will willingly become a learner, &c. I am now preparing for the press this seventh edition of my work, called a "System of the Creation of our Glode, Planets, and Sun;" and I, with humility, shall be happy to present Mr. Brewster with a copy, should an opportunity offer. In this work I trust to have shewn the great probability that our sun was originally formed by the combustion of the gases of oxygen and hydrogen, which must have taken place at the formation of the waters or ocean of Genesis. I have presumed that the Deity could not have applied to a more needful purpose a part of the stupendous quantity of heat and light which must have been evolved by that combustion, than the concentration of that heat and light to form a sun for our system. In page 10 of the Appendix No. 2 to the work, it will be seen that the great astronomer

Arago has sanctioned this theory of the sun. After having proved to mathematical demonstration, as Dr. Lardner says (as shewn in page 129 of this Appendix,) "that the atmosphere of the sun is an ocean of flame," Arago, from subsequent experiments concludes, "that the sun is nothing but a grand mass of gas agglomerated in space." Now, with respect to "accounting for the unavoidable waste of the sun," I have to say, that Sir Isaac Newton, with the same wonderful sagacity with which he foretold the combustibility of the diamond, suggested that comets were employed in restoring the waste of the light and heat of the sun. It was known probably in his time, that the courses of the comets generally were towards the sun; and since the discovery by Professor Black and others, of the gaseous sciences, it has been shewn that the enormous tails of the comets, some of them near fifty millions of miles long, are gaseous; I have therefore adopted this idea of Newton in my theory of the sun, and believe that it will naturally "account for the supply of the unavoidable waste of the sun's material."

Mr. Brewster's idea that the light returns to the sun, reminds me of Buffon's theory, that the earth and planets were struck off from the sun by the stroke of a comet, which theory has been long disproved by the astronomical fact, "that if that were the case, they must return to the sun in every revolution; so this idea of light returning to the sun after leaving its heat with the earth and planets, which it must do, forms a very insufficient cause for restoring the waste of heat in the sun. Besides this, must not two counter currents of light mutually oppose and retard each other? I submit, therefore, to the candid sagacity of the author of the "New Philosophy of Matter," whether there be any necessity to refer to that theory, when the known fact of the gaseous tails of the comets rushing continually to the sun, and as Sir John Herchell says, "millions of them depositing their tails there," is not ample evidence of their purpose being to restore the waste of his heat and light. With respect to this author's question, "What becomes of the light, if it does not return

to the sun?" I answer, light is known to enter into combination with almost all bodies on the earth, and by analogy, on the planets also. It changes the colours of all bodies, and probably by some unknown process of nature, assumes in them a liquid or a solid state. The lately discovered Daguerreotype is a proof of this; the rays of light from the countenance fall on a plate coated with iodine, or other chemical mixture, and the impression of the countenance is embodied and solidified in it: now, light is supposed to be imponderable, but I believe that is only *supposed*, because we have no means of weighing it; for a grain of light may perhaps be enough to fill a house. What an immensely small space, then, light must require when entering into combination with, and becoming absorbed by the liquid and solid bodies on the earth, planets and their satellites, their oceans and atmospheres, and assuming the liquid or solid state. To shew the immense tenuity of light, I will state, that Sir Isaac Newton calculated that even the tail of a comet, forty or fifty millions of miles long, might, if, *solidified*, be almost comprised in a *nutshell*.

In page 71, the author says, "Heat is only light in a state of diffusion. This is proved by the fact, that if you condense it sufficiently, you make it light." But the effect of heating anything is not to condense it, but to *rarify* it. The author falls into the same error here as in the case of hydrogen and oxygen above stated. He supposes the light to come from the heated iron, whereas it is produced by heating it to that degree at which the iron absorbs the oxygen from the atmosphere, and sets free its light and heat. To prove this, if the author analyzes the external scales of the heated iron, he will find them to contain a calx or oxyde of iron, by the absorption of the oxygen from the atmosphere. Moreover, if light were only heat condensed, how is it that the light of the moon gives no heat at all to the most delicate thermometer \* So also when the current is stopped in the telegraph offices, the current probably absorbs oxygen from the air, and a spark is produced by the decomposition of that oxygen.

\* See page 143, Extract from Arago and Lardner's Astronomy.

In page 194, the author, although he has all along contended that heat, or caloric, and light are identical with electricity here avows that "the *essence of electricity* he never attempted nor proposed to explain." There is, then, something more in electricity than either heat or light, by his own account of it.

In the sixth edition of my work, in page 44 of this Appendix No. 2, I have given my idea of electricity, namely, "that it consists of heat and light combined together in some unknown and unique manner; and that the energy and violence of its effects are occasioned by the mutual expansive efforts of the heat and light to disengage themselves." In fact, I conceived that latent electricity exists in bodies in a condensed state; for we now know, that some of the gases (the carbonic acid, for instance,) can be condensed by pressure to a solid state, but its energy and power to recover the gaseous state are so great, that when the pressure was removed, as shewn by Professor Leibig, in his "Familiar Letters,"—"it burst the condensing apparatus, and killed the operator:" so I conceived it might be the case with condensed heat and light in electricity. I must acknowledge, however, that on contemplating the action of electricity in the telegraph wires, I am much inclined to believe, that there is some much more energetically powerful ingredient in electricity, than either heat or light; some gaseous power of such vehement action, that it has eluded as yet our discovery, forming perhaps, what Mr. Brewster calls its "essence;" and I conceive there is no greater proof that electricity is not heat and light alone than its amazing velocity on these wires. What progress, in fact, would heat and light alone applied in any degree to these wires, be able to make, perhaps not ten miles in an hour, while electricity goes, perhaps, five hundred miles in a minute or much more.

In page 150 of the "New Philosophy," the author states that, from certain analogies he has brought forward, he infers, "that no creation of materials is progressing to supply the waste of the sun." In page

146 of the Appendix No. 2 to the seventh edition of our System of the Creation, I have said :

"I have therefore come to the conclusion, as is stated above, that there must be elaboratories for the formation of the gases required, in which elaboratories a constant act of creation of the elementary matter of those gases would be indispensable, to supply the unceasing and stupendous waste. If, therefore, our theory of the sun continue to be substantiated (and, as will be shortly shewn, the planet lately discovered offers a strong confirmation of it,) and as nothing short of a direct act of creation could produce a supply of gaseous matter for all the suns of the universe, we must refer to such an act of creation for that supply, and we trust we shall indeed thereby lead our readers " through Nature's works, up to Nature's God." We believe we shall have found a more clear and positive proof of the reality of an existing and actually present creation of matter, than has yet been offered to mankind."

In the same page, I have stated my reasons for coming to this conclusion ; and in page 151 of said Appendix, the reader will see a recapitulation of our theory of the probable design of some of the nebulae in these distant regions of space, and of the real purposes of the vast number of comets said by the astronomers to occupy these regions of space. It will be then seen, that the oxygen and hydrogen gases thus conveyed to the sun to restore its waste are by this combustion transformed into aqueous vapour, and we conceive it to be a two-fold purpose of the comets on their return, to carry off by their power of attraction this aqueous vapor into distant regions of space, to be afterwards condensed into oceans, for the purpose of forming new planetary bodies, just as our earth was formed in the ocean of Genesis. Hence the gaseous matter conveyed by these comets would be ultimately changed into the liquid and solid bodies of these new planets ; hence the original stock of gaseous matter, however immense, would be in time consumed ; and hence we concluded

that a constant new creation of the elementary matter of these gases must be continually going on.

The author of the "New Philosophy," considers "that the supposition of a new creation to supply any deficiency would be derogatory to the skill of the great architect." I, on the contrary, conceive it would be greatly adding to our conceptions of his omnipotence and glory. "Nature" say Shakespeare and Goethe, "could not exist without action." The astronomers tell us that old stars have disappeared from the heavens, and new ones have been discovered. He who created one world, can, without doubt, create millions; and we have reason to believe the benevolence, wisdom and power of the Deity is not circumscribed, while there is infinite space for their exertion, thereby to be replenished with life and animation, enjoyment and happiness. Now, the gaseous matter supplied, being converted into the liquid and solid matter of the new planetary bodies created, we therefore humbly conceive that the creation of elementary matter, for the supply of the waste of the stars or suns (as they are allowed to be by all astronomers,) of the universe, is proceeding at this moment as it was at the time of the creation of our system.

In page 204, Mr. Brewster states a theory, by which the earth and planets are carried round the sun. This movement he considers is done by the power of electricity. In the Appendix No. 2, to our sixth edition of the System of the Creation, I stated that— "In addition to the strong arguments employed by Newton himself, (which will be seen in note 6, second edition, containing his explanation of gravitation by means of the elastic gaseous medium), I have to state that it is known that electricity pervades almost all nature. Our atmosphere, our earth, and all water, especially when in a vaporized state, are charged with the electric fluid. Our earth is pervaded by magnetic and electric currents; and what I wish now to state, therefore, in addition to Sir Isaac Newton's argument, on the ethereal gaseous medium, is, that I conceive that medium, is also excited to motion by the electric fluid.

I believe that this electric fluid is a most potent agent of nature, by which she keeps the ethereal gaseous medium in a constant state of motion and activity, for producing the force which carries the planetary bodies in their courses round the sun; and I believe this is the very purpose for which this ethereal electric medium exists in space.'

In this very important part of his work, I have then the pleasure of partly agreeing with him; for although our theory of the sun goes to shew that the enormous waste of his light and heat is restored by the oxygen and hydrogen gases brought to his vicinity by the comets; still, we are well aware, that both positive and negative electricity are evolved in the combustion of those gases, and, most probably, that is the mode by which a sufficient quantity of electric fluid is furnished to the system, which electricity, acting upon the gaseous medium of Sir Isaac Newton, produces sufficient force to carry the earth and planets in their revolutions round the sun; and I should conceive that to effect this purpose, there are two currents of electricity employed by nature, one forcing the earth and planets in a right line, corresponding with the projectile force, and the other operating upon the planets in a sidelong direction ninety degrees to the northward of the right line current, both which currents, operating upon the surrounding gaseous medium, would, I humbly conceive, produce ample force to carry the planets in their present orbits round the sun.

While we agree, then, that electricity is a very powerful agent of nature in carrying the earth and planets in their orbits round the sun, we have, in conclusion to observe, on the "New Philosophy of Matter," that although the author of that work derives his electricity from the sun, his theory does not show how that electricity is formed there, whereas, our theory shows it to, be produced from the combustion of the gases that are supplied by the comets to restore the sun's waste.

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EXTRA MATTER FOR THE EIGHTH  
EDITION OF THIS WORK.

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Since the publication of the seventh edition no new discoveries that I know of have yet been published relating to the theory of the work, except in an article from the *London Athenæum* which we give below.

In the fourth edition in pages 2 and 3, of the Appendix No. 2, is stated, Dr. Lardner's account of the confirmation of our theory of the sun, wherein he says "The conclusion," &c. (*Vide* Appendix No. 2,) down to "ocean of flame." In a work called "A Sketch of Conspicuous Characters living in France," it is stated, under the article, "Life of Arago," "Subjecting thus," see Appendix No. 2, down to end of paragraph.

Now it is certainly matter of surprise to me, that when such an important change in the theory of the sun is made by such an astronomer as M. Arago, and when, more particularly in his "Scientific Notices on Comets," he gives an entirely new account of the cause of the *spots on the sun*, corroborating our theory of these spots. See Appendix No. 2, page 126, from "The rapid changes, &c., down to end of paragraph. I say therefore, that as these opinions of so eminent an astronomer have not yet produced any observations on the subject by astronomers, it would then seem that they have agreed to their results. The same may be said respecting any later publication of what Lord Ross has been doing for many months with that wonderful telescope, which has so much excited the admiration and expectation of mankind. To account however for this delay, I have been informed that that telescope cannot be employed with effect except in very bright states of the atmosphere, which seldom occur, and also that his Lordship is employed in extending his discoveries on the resolving of the nebulae into stars, or rather suns, as all astronomers now allow them to be.

In the absence then, of any late discoveries bearing particularly on our theory of the Earth, Planets and Sun of our System, we have however in this eighth



edition, to state, from Professor Lounis's work on "The Recent Astronomy," an extract which is sufficient to astonish even the modern astronomer, and to predict the astounding discoveries which are perhaps yet reserved for that science, viz :

"Alcyone is the most prominent of the pleiades, as the centre around which our sun is revolving, and he calls it the *central sun* of the great system.

"This is partially corroborated by the fact that the most palpable and greatest of the real motions of the fixed stars, are found in a "great circle described about the pleiades as a pole," the very place where such must occur.

"But the astounding wonders are now to come. Professor Madler computes the distance of Alcyone to be "thirty-four millions of times that of the sun (from the earth,) requiring 537 years for its light to come to us, at the rate of 200,000 miles a second, or of twelve millions of miles per minute. If this be so, the periodic time of the sun, and of our system, about Alcyone is estimated at *eighteen* millions of years."

"For enlargement of human conceptions, this is magnificent enough. Should it not all prove to be an approximation to the truth, the world will see in it the heavings and aspirations of the astronomical spirit."

The distances and magnitudes of the remote heavenly bodies are indeed so immense, as stated in astronomy, and particularly modern astronomy, that the minds of many cannot overcome their doubts on the subject; and certainly if there were only a few astronomers who had come to these conclusions these doubts might be justifiable; but when we find such numbers of these astronomers recorded in the history of the science who have all been narrowly watching to detect the slightest errors in each others calculations and statements, and when we find all nearly agreeing in the same results, we can no longer doubt that the results themselves, and the basis on which they have been begun and finished, must be correctly founded in nature.

In our Appendix No. 2, we have stated our idea how the stupendous quantities of the gases required for the supply of the waste of the combustion of our sun and of the suns of the other systems of the universe may be replaced by elaboratories of these gases appointed by the Creator in the distant regions of space.

The immortal Sir Isaac Newton was of opinion that the comets were intended to supply the waste of the sun's combustion,—in Sir Isaac's time the knowledge of the existence of gaseous matter was hardly known, but it is *now* known that the tails of comets, some of which are 120 millions of miles long, are formed of gaseous matter; they all make for the sun, from whatever part of the heavens they come, and it appears by Lardner and Arago's astronomy, (*vide* our Addendum page 152 "that comets increase their volume as they recede from the sun, and this is a law to which there is no well-ascertained exception.")

By our theory of the combustion of the oxygen and hydrogen gases brought by the comets to the sun for the purpose of supplying his waste, the cause of these changes in the tails of the comets on receding from the sun, is accounted for, by the attraction and carrying off from the sun the aquegaseous vapors formed by the combustion of these gases for the above purposes.

Now it appears to me that the opinion of Newton, as to these purposes of the comets, will be found to be equally correct as was his surprising assertion that "the diamond was combustible" now fully proved by galvanic power. These immense volumes of gaseous matter carried through the heavens by the comets must be designed for some vast purpose. They all go to the sun, and for what more likely purpose could that be, than to supply the waste of combustion? Accordingly, Sir John Herschell states in his astronomy, in speaking of the zodiacal light "that the tails of millions of comets slowly subside into the sun." Taking then this theory to be sufficiently substantiated, the next question is, where do these immense bodies of the gases come from, where

If are they generated and taken up by the comets? they go to supply the waste of the suns of the universe they must of course be combustible, and they cannot be supposed to exist in the regions of infinite space in a mixed state, for in that case, the oxygen and hydrogen would be always liable to be ignited by the electric fluid. But we know that neither of these gases is combustible by itself; therefore we concluded in our theory that they must be generated or created in separate elaborations in some parts of that space and conveyed to the sun by separate comets. Now some of the 2000 nebulæ discovered and catalogued by the Herschells have been resolved into stars by themselves, and more lately by Lord Ross, in Orion, but the numbers of these nebulæ are so great, their shapes and appearances so gaseous, that therefore we concluded as shewn in Appendix No. 2 page 154. Again, where can we look more reasonably, for the sources of supply of these stupendous quantities of gaseous matter to be generated, than in these distant nebulosities which present to view such gaseous appearances under the telescope? The comets are known to enter our system from all parts of the heavens; and in passing by or through these nebulæ, it may well be conceived they would take up these gaseous tails by attractive influences. It is only necessary then to conceive, that oxygen may be generated in some of these nebulæ, and hydrogen in others, in order that *some* of the comets may take up by attraction the one of these gases, and *other* comets may take up the other Gas, and then proceed with them in their courses to the suns of the systems to supply their waste of combustion; since, as neither of the gases is combustible by itself, there can be no danger of their being ignited by the electric fluid till they arrive at those opposite points of the sun's vicinity; as we have shewn in page 122 of this work. Now as our theory of the sun has received the confirmation of some of the first rate astronomers, we think we are entitled to present with due humility, the above mentioned theory of the mode of generation

and supply of gaseous matter to replace the waste of the sun's to their notice also.

I shall now proceed to make some enquiry into what may be the effects of these discoveries of modern astronomy on the minds of men. It would appear that even that vast expanse of space occupied by the stars and sun of our firmament may be mere points compared with these discoveries. Sir John Herschell tells us in his late beautiful treatise on astronomy, that he uses "firmament upon firmament" totally independent of our own, and what numbers of them may not exist in a space that is considered infinite? Now it appears to me that the effect of even the small knowledge the more ancient nations had of astronomy, produced in their minds the origin of the heathen mythology. The psalms of David say "The heavens declare the Glory of God, and the firmament sheweth forth his handywork," the prophecy of the bible predicted a direct communication from the Deity to man. This has been verified by the Christian Religion, and indeed it has for many years seemed to me highly rational to suppose that the Creator, having exhibited such wonders of creation to a being whom he has endowed with sagacity and power to explore these wonders, it has, I say appeared to me highly rational to suppose, this benevolent creator would, by some direct communication to mankind disclose to them some parts of their destination in futurity, just as a sovereign of a great empire, which he has founded and established by his firmness and wisdom, would naturally inform the youthful mind of his son, of the advantages and enjoyments he would derive from it in his future life.

The Revelations of Deity by the Christian Religion have given this instruction to mankind, and I cannot but believe that the modern astronomy is giving a great confirmation of the truth of this religion. It has brought us immensely nigher to the precincts of the Deity. It has shewn us that our sun and system, and all the stars or suns of our firmament are wheel-

ing round some immense centre. This very centre is even pointed out to be in Alcyone one of the pleiades of most astonishing distance as is shewn in page 176, I have suggested the idea in the early editions of my work, that we might conceive that centre to be the very "Empyrean Throne of God, mentioned in the fourth chapter of Revelations." See page 137, of this work, on the subject of "Paley's Natural Theology." Again I have stated in my theory of the mode by which the combustibile gasses for the supply of the waste of the suns of the universe are produced, that there must be an act of creative agency continually going on for the vast purpose, in the distant nebulae. In short I am led to conclude, that the discoveries now made in modern astronomy, and those which may be thereby induced hereafter, may be considered as the handmaids of Christianity. I believe that the power of modern astronomical science which reveals to man, with so much certainly and grandeur the existence of an unseen first cause of almighty power wisdom and energy, will, when by the natural progress of society, this science shall be more generally diffused among the masses of mankind, produce a wonderful advance in the character and state of the Christian Religion. I have in my late work on the "present condition of United Canada," called on the various sects of the Protestant Religion, to promote a convocation thereof, for the purpose of ascending to the fountain head of that Religion, as given by the Saviour to mankind, to try if one national code could be formed by them entirely on this Saviour God's own principles, unity, peace and good-will to man. Yes, I do believe that as by the science of modern astronomy, the study of the vast works of God, will become more diffused among mankind they will see the folly of the alienation and animosity occasioned by the working of these various sectarian bodies, and that they will feel, on ascending together to the time when this religion was given to them, that nothing could be further from the Saviour's design in the government of his church, for that (having faith in his divine commission,) they

cannot but believe that he must have *known* that the language in which he gave this religion to mankind could be fully comprehended by them, and that therefore the design of his church is unity and peace. Such then do I believe will be the effects of the science of Modern Astronomy in its powerful tendency to enlarge and expand the mind of man, and thus unite the christian world in sound, reasonable and practical knowledge of the design of the Saviour, so that when his religion shall be divested of that complicated state into which it has been brought, by the folly and presumption of man in loading it with ceaseless discussion which only produces endless differences of opinion; and that when confined to the direct terms of the Saviour himself, it will produce the end designed by him, unity, peace and goodwill among men. In fine that when by the progress of astronomical science, the minds of the masses are enlightened with extended views of the Almighty power and benevolence, they will feel, *that true* devotion to him, that shall not be founded on their fears, but on that perfect love, which, as the scripture says, casteth out fear; it will be then founded on the contemplation of the divine energies and wisdom, and on gratitude, in fine, for the manifold blessings and comforts he has bestowed on his creation; and I further believe, that these comforts, being diffused through society by such improvements as its wisdom may in future suggest, will lead to the practice universally of those Christian virtues and graces which cannot fail to produce happiness here and hereafter.

THIS IS THE ADVANCED STATE OF SOCIETY WHICH I BELIEVE THE DIFFUSION OF THE STUDY OF MODERN ASTRONOMY WILL PRODUCE.

We have only now to make one observation on the recent publication of the third volume of the *cosmos* as far as relates to its author's idea of the suns being an electro magnetic storm, I therefore give the following extract from the *London Athenæum* of 12th April 1851, "Leading us again into cosmical space, the author lingers with feelings of evident pleasure among the fixed stars, he discusses the question of their movements, the

nature of the universe pervading ether, and the phenomena of stellar light. Adopting the views of Huygen's Hook and other physichists, he endeavours to explain luminous and thermic phenomena, by supposing them due to electro magnetic currents. Sir W. Herschell once speculated on the sun being in the condition of a perpetual aurora, Humboldt imagines that orb to be under the constant excitation of an electro magnetic storm, by which the propulsion of luminous waves through all space is effected; and the thermo electric influences of the stars and planets in a similar manner drive back from their shores the waves of light which beat upon them, and hence their lustre. There is more of poetry than philosophy in this theory modified from that of Ersted; and Humboldt has allowed his mind to be carried on in that stream of modern thought which is disposed to refer everything which is unknown to electricity. The weight of his name will strengthen this probable error, and men satisfying themselves that they have, by adopting a phrase, explained a fact, will rest in ignorance, because they are too idle to enquire. To suppose that man has discovered all the modes of force, or to adopt a more material view, has traced out all the imponderable agencies which are at work in the cosmos, is rash and unscientific: we believe that there are things between heaven and earth yet undreamt of in our philosophy, and we are not satisfied that magnetism is the *primum mobile*. It needs little reflection on what we now know to perceive that there must be physical powers beyond those the effects of which have been searchingly examined, and that even the all-pervading force of gravitation, must be the result of some such higher power which the eagle eye of the philosopher has not yet traced in its mysterious operation.

"Alexander Humboldt is a man to use Akensides phrase of "chosen mind," he has worked diligently in his high vocation, and lingers lovingly over it: when we remember the advanced age of this great traveller and philosopher, we cannot but admire the zeal which like a pure flame expiring yet radiates light around,

and we can pardon the discursiveness of which twenty years since he would not have been guilty."

In the Appendix No. 2, in the sixth edition of this work we reviewed several theories of the sun, which had been presented to the world, and among them the electric theory, see page 142 appendix No. 2, shewing that "Before we can refer to electricity as the cause of the light and heat of the sun, we have first to find whence is produced the "indispensable matériel" of this electricity," without which no electricity can be formed. With respect to Humboldt's idea of a storm existing in the sun, I have often reflected on the vast noise that must ensue from the rushing of the immense volumes of the gases discharged into the body of the sun from the tails of the various comets designed to supply the waste of his combustion, according to the theory of the sun, stated in our system of Creation; and if we wish to form some remote idea of the thunder-like noise or storm in the sun, that must be engendered by the draft of the sun's fire, we have only to think of the noise formed by the air passing into a common furnace whose aperture is only a few inches, and then to consider, that the noise or storm occasioned by two comets discharging their gases, the breadth of whose volume is perhaps millions of miles, in opposite points of the sun's surface, must be in like proportion. Yes, the rushing of these stupendous volumes of gas into the sun must needs produce a sound or storm with which all the loud thunders of our earth could they be so concentrated, as to be heard by all its inhabitants, can bear no comparison, and well it is that the highest planet to the sun is above 37 millions of miles from it, for otherwise its inhabitants might not only be deafened, but their planet blown to atoms. In addition also to this cause of storm, we know that electricity, both positive and negative, is evolved by the combustion of the oxygen and hydrogen gases, and that such stupendous quantities of each electricity as must be evolved by that combustion may tend to increase the storm of the rushing gases, is highly probable. Now we have shewn in our review above mentioned in page 142 of



the Appendix, that the materiel of electricity cannot exist in the body of the sun, and as our theory of the gaseous supply by the comets, will give a palpable source of light, heat and also electricity, we certainly feel that theory is again confirmed by the opinion and observations of the Athenæum on the convenient practice of some writers of referring everything unknown to electricity; just as was formerly done to chance formation, or to the nerves, for the cause of unknown diseases.

Well then does the Athenæum observe, "that there is more of poetry than philosophy, in this idea of Humboldt, that electro magnetic electricity is the cause of the light and heat of the sun." The very fact that the immense number of the comets, (being according to Lardner and Arago's astronomy there upwards of seven millions existing in universal space,) all of which when visible to us make for and go round the sun, this very fact I say, would seem to account for the mode of supply of the sun's waste in the most natural manner; in fact precisely, as the lamps of our cities are supplied with fuel, with hydrogen from the gas house, and oxygen from the atmosphere. Accordingly, the light and Heat from the sun, comes, to us with the most genial and vivifying powers, bringing forth the buds and leaves and blossoms of the spring, the beautiful flowers of summer, the nutritious pulse and delightful fields of autumn, and cheering and reviving the vital powers of mankind, whereas when we know and often feel the deadly effects of electric storms in the heavens, what terrific effects would we be justified in expecting, if the vast body of the sun were an electric mass.

I cannot then but consider that our theory of the sun rests upon more tangible facts and bases, and I wait with anxious expectation to learn that future discoveries of Lord Rosse's telescope, when directed to the vast luminary, will give still more confirmation to our theory.\*

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\* In Tait's Magazine for March, 1848, under the head "Popular Lectures," page 147, "Nichol, on the contrary, seems to point to the

We shall now observe respecting the belief (expressed by the *Athenæum*) that there are things between heaven and earth yet undreamt of in our philosophy. In the sixth edition of our System of Creation we have expressed our belief that there must be elaboratories of gases in some part of the regions of space, to produce the tails of the comets for supplying the suns of the universe with heat and light. If therefore this part of our system shall be hereafter confirmed by the astronomers, we shall have at least a claim to the first suggestion; and we shall conclude the eighth edition of our work, with repeating our observation that the science of astronomy, by its modern advancement and its future progress, is powerfully calculated to bring the minds of men in closer contact with, and knowledge of their Creator; and that man having been permitted and endowed by him with the means of exploring those wonders of his creation, he will not disappoint him in the promises given in the holy writings, of a nearer and more complete inspection of them in a future state.

In conclusion, the vast discoveries of astronomy appear to me to be designed by nature to lead man to the contemplated expectation of a future state of existence. How is it possible to believe that Providence should present to his observation and study so vast a universe of worlds, and yet deny him the future contemplation of their glories. Yes, the soul of man in its perfection, is part of the vitality of God himself; it must therefore be immortal, and therefore it is in the wisdom of man by following the dictates of christianity, to endeavour to secure for himself the blessings of that immortality.

“All are but parts of one stupendous whole,

“Whose Body Nature is and God the soul,”

ALEXR. POPE.

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stars, not with a cold rod, but with a waving torch. He never doubts that the stars are fire’—no immeasurable icebergs they, floating in frozen air, but glowing, burning, almost living orbs; and his words glow, burn, and nearly start from the page in unison.” In this point then Nichol agrees with Newton and with our theory, that the stars, now called suns of other systems, are bodies of fire.

“ Be ye also perfect, as your Heavenly Father in Heaven is perfect.”

FROM SCRIPTURE.

If then a convocation, as we have suggested in our work on the Canadas, be formed by the christian sects, it is possible a great accession of strength may be given to man's steadiness in following these dictates of christianity. When the united voice of the nation shall have erected a church, founded alone on the Saviour's own words, then the conviction of every individual mind in it, will be sanctioned and confirmed, all its tendencies to waver will be removed, and it will proceed through life with the unshaken firmness of consistency.

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N. B.—A principal part of the Theory of Creation of this work being founded on the 1st and 2nd verses of the 1st chapter of Genesis, I wished much to add to it the *notes* of that part of Hayden's Creation, relating to those verses, but could not procure them. To any musical lady or gentleman possessing that sublime piece of music, it may perhaps afford additional satisfaction to find its idea carried out and embodied in this work.

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ADDITION  
TO THE  
EIGHTH EDITION  
OF  
SYSTEM OF THE CREATION.

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ON the occasion of binding the remaining copies of the eighth edition of this work, I take the opportunity of making this addition, first, to notice some confirmations of parts of our theory, by two authors of celebrity; and, secondly, to state a suggestion which I had intended to present at a Lecture on my work on the Creation, which suggestion, I conceive, may hereafter prove of service to those students in Astronomy, who possess a lively zeal for discovery in that magnificent science.

The first of these confirmations of our theory of the production of the Geological Bodies, in the ocean of genesis, is taken from *Harper's Magazine*, June, 1850, to wit:—

(*From Harper's Magazine, June, 1850.*)

“The French savans, MM. Malgale, Derocher and Suzeau, announce that they have detected in the waters of the ocean the presence of copper, lead and silver. The water examined appears to have been taken some leagues off the coast of St. Malo's in France, and the fucoidal plants of that district are also found to contain silver. The *F. Serratus* and the *F. Ceramoides* yielded ashes containing 1-1000,000 part, while the water of the sea contained but little more than 1-100,000,000 part. They state also that they find silver in sea salt and the ordinary muriatic acid, and in the soda of commerce, and that they have examined the rock-salt of Lorraine, in which they discovered this metal. Beyond these, pursuing their researches in terrestrial plants, they have obtained such indications as leave no doubt of the existence of silver in vegetable tissues. Lead is said to be always found in the ashes of marine

plants—usually about 18-100,000 parts—and invariably a trace of copper. Should these results be confirmed by further examination, we shall have advanced considerably towards a knowledge of the original formation of mineral veins in our earth.”

The second confirmation of this part of our theory, will be found, I believe, in *Harper's Magazine*, for May or June, 1852, wherein it is shewn, that Primary Earths and Metals have been found in the ashes of certain vegetables, which were raised in such manner as to preclude the possibility of these earths and metals to have derived their origin from any other source than the vital processes of these plants, acting on the air and water supplied them, which precisely agrees with our theory of the formation of these Primary Earths.

The above discoveries agree and confirm the statements of the great French chemists, Chaptal, Schrader and Braconnot, as given in the Eighth Edition of our System of the Creation, on which we based our theory of the formation of the metallic and geological bodies by the processes of vegetation and animalization.

I have also seen, in a late astronomical publication, that Professor Nicholl has now agreed to the opinion that the heat of the sun must be derived from some “external source.” Now, a most ample “external source” for this object is contained in our theory of the sun's formation, namely, the gasses conveyed to the sun by the tails of the comets, which is agreeable to Sir Isaac Newton's opinion, as shewn in page 150 of our appendix No. 2 to 8th edition.

The last confirmation we shall give is from a lecture said to have been given by Sir David Brewster, the distinguished Optician, of England, wherein I am informed, he has taken a very complimentary notice of our System of the Creation, especially that part of it which refers to the Formation of the Suns of the Universe, and the mode of restoring the waste of their Light and Heat.

We now give the suggestion intended to have been given in the lecture above mentioned.

With respect to the future possible discoveries of Modern Astronomy, I beg leave to say, that by the naked eye, (as we are told by Astronomers) only 2,000 stars can be seen : by the use of the telescope, I believe, hundreds of thousands can be seen. Sir John Herschell, by his largest telescope, resolved into Stars a great number of the 2,000 Nebulæ, which he and his father had catalogued ; but out of fifty of these Nebulæ, unresolvable by Herchell's telescope, Earl Rosse, by his six feet diameter telescope, succeeded in ascertaining that forty-three of them were resolvable into stars. Now Astronomers say, that the light of the most distant Stars, that can be seen by the eye, would take 120 years to reach the earth, and thus being at too great a distance to shine by a borrowed light, they agree that these Stars must, therefore, be Suns, and it is said by some that our Sun is one of the Stars of the Milky Way. If this view of the Stars of the Firmament be correct, we have a clear right, by induction, to conclude that these Suns are accompanied by families of Planets, as our own Sun is. Further, we know that the wonderful discovery of the daguerrotype shews us, that by a certain mixture of Iodine and other chemical ingredients, the rays of light from the human countenance can be embodied on a metallic plate, in perfect resemblance of the face itself. Now, it is not impossible, that some future wealthy and zealous Astronomer may arise, to construct a twelve-foot telescope, being double that of the Earl of Rosse ; so it is also possible that some chemical mixture may be found greatly to add to the powers of vision of such a telescope. May we not be hereafter enabled by such improvements, to discover the very Planets of those distant systems ?

I state this suggestion, merely to shew that the future powers of Astronomy cannot be limited ; and to what astonishing scenes of astronomical discoveries they may possibly lead.

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EXTRA MATTER  
FOR THE NINTH EDITION  
OF THE  
SYSTEM OF CREATION.

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In the Appendix No. 2, to this work it is shewn on the authority of a great philosophical writer, that the late M. Arago "a french astronomer of very great celebrity, has proved to mathematical demonstration, that the sun's atmosphere is an Ocean of Flame" and it is there also shewn, that by a work called "Sketches of conspicuous characters living in France, under "life of Arago" the following paragraph appears.

"Subjecting thus" (vide extra matter for 5th edition page 135 of this appendix) "down to space." Now M. Arago had shewn as above, that the sun's atmosphere was an ocean of Flame: and this atmosphere of the sun is said by astronomers to be 2500 miles from his surface, and there can be no doubt then, that Arago considered the body of the sun to be in a state of combustion for the purpose of heating and lighting the earth and planets.

In the extra matter for the 6th Edition of our work see page 137, I have given some account of the nebular hypothesis and of the *nebulæ*. This nebular hypothesis was of a very splendid nature, but supposed to be rather atheistical; however as we have shewn in page 139, Doctor Scoresby of Dublin says "the grand nebular hypothesis of La Place has been resolved into a splendid astronomical dream, by the discoveries made by Earl Rosse's new telescope of 6 feet diameter.

Our theory of the earth and sun is founded on the mosaic account of Creation, in the 1st. 2nd and subsequent verses of genesis chapter 1st; but there can be no doubt that the aqueous vapor formed by the combustion of the gasses of oxygen and hydrogen before they became condensed into what is called the waters, or

ocean of Genesis, may have existed for ages previously in a vaporous or nebulous state.

Having in the 8th edition of this work endeavoured to shew, that by the discoveries made, and likely to be made in future by modern astronomy, the Christian Religion would be greatly confirmed, and the best effects produced on society from the diffusion of those discoveries, I had conceived and intended that the 8th edition should be the final one of this work ; but I have found in the November number of 1852 of the Canadian journal, published by the Canadian Institute of the city of Toronto, an extract from the proceedings of the 22nd meeting of the British Association in England for the advancement of science, and in which extract is given the president of the associations address, in which a very surprizing discovery is stated to have been made, purporting that the magnetic variations of the marine compass are dependant on, and derived from the sun, as their *Primary source*. Now, as by the Theory of the Sun of this work on the Creation, the oxygen and hydrogen gasses are brought into a state of combustion for the restoration of the waste of his heat and light, and as by the combustion of these gasses both electricities must be produced, the oxygen gas evolving the positive electricity and the hydrogen evolving the negative, it follows that a stupendous quantity of electricity must be thereby produced in the sun, and therefore, as by the above stated discovery, the magnetic variations of the compass are derived from the sun we consider a powerful sanction of our theory has been thus given ; and the 8th edition of our work being soldoff, we have therefore concluded to produce before the Public this ninth edition of the work. And we therefore present the following extract (from the speech of the president of the British Association in England for the advancement of science) to the Canadian Public.

“ The periodical variations in the terrestrial magnetic force, which I have before adverted to as distinguished, from its secular change, are small in comparison with the force itself ; but they are highly deserving of attention on account of the probability that by suitable



methods of investigation they may be made to reveal the sources to which they owe their origin and the agency by which they are produced. They formed accordingly the subject of a distinct recommendation from the British Association, which met with an equally favourable reception. To investigate these variations by suitable instruments and methods, to separate each from the others, and to seek its period, its epochs of maximum and minimum, the laws of its progression, and its mean numerical value or amount, constituted the chief purposes for which magnetic observatories were established for limited periods at certain stations in Her Majesty's dominions, selected in a view that by a combination of the results obtained at them a general theory of each at least of the principal periodical variations might be derived, and tests be thus supplied whereby the truth of physical theories propounded for their explanation might be examined. We are just beginning to profit by the collocation and study of the great body of facts which has been collected. Variations corresponding in period to the earth's revolution around the sun, and to its rotation around its own axis, have been ascertained to exist, and their numerical values approximately determined in each of the three elements, the Declination, Inclination, and Magnetic Force. We unhesitatingly refer these variations to the sun as their *primary source*, since we find that in whatever part of the globe the phenomena are observed, the solstice and equinoxes are the critical epochs of the variations whose period is a year, whilst the diurnal variation follows in all meridians nearly the same law of local solar hours. To these unquestionable evidences of solar influence in the magnetic affections of the earth, we have now to add the recently ascertained fact, that the magnetic storms, or disturbances, which in the absence of more correct knowledge were supposed to be wholly irregular in their occurrence, are strictly periodical phenomena, conforming with systematic regularity to laws in which the influence of local solar hours is distinctly traced."

“ But whilst we recognize the sun as the primary cause of variations whose periods attest the source from whence they derive their origin, the mode or modes in which the effects are produced constitute a question which has been and may still be open to a variety of opinions ; the direct action of the sun as being itself a magnet—its calorific agency in occasioning thermo-electric and galvanic currents, or in alternately exalting and depressing the magnetic condition of substances near the surface of the earth or in one of the constituents of its atmosphere,—have been severally adduced as hypotheses affording plausible explanations. Of each and all such hypotheses the facts are the only true criteria ; but it is right that we should bear in mind that in the present state of our knowledge, the evidence which may give a decided countenance to one hypothesis in preference to others does not preclude their possible co-existence. The analysis of the collected materials and the disentanglement of the various effects which are comprehended in them, is far from being yet complete. The correspondence of the critical epochs of the annual variation with the solstices and equinoxes, rather than with the epochs of maximum and minimum temperature, which at the surface of the earth, in the subsoil beneath the surface, or in the atmosphere above the surface, are separated by a wide interval from the solstitial epochs, appears to favour the hypothesis of a direct action ; as does also the remarkable fact which has been established, that the magnetic force is greater in both the northern and southern hemispheres in the months of December, January, and February, when the sun is nearest to the earth, than in those of May, June and July, when he is most distant from it : whereas if the effect were *due to temperature*, the two hemispheres should be oppositely, instead of similarly affected in each of the two periods referred to ; Still, there are doubtless minor periodical irregular variations which have yet to be made out by suitable analytical processes, whose, possible accordance with the epochs of maximum and minimum temperature, may support in a more limited

sense, not as a sole but as a co-ordinate cause, the hypothesis of caloric agency so generally received, and so ably advocated of late in connexion with the discovery by our great chemist and philosopher of the magnetic properties of oxygen and of the manner in which they are modified and affected by differences of temperature. It may indeed be difficult to suppose that the magnetic phenomena which we measure at the surface of the globe should not be in any degree influenced by the variations in the magnetic conditions of the oxygen of the atmosphere in different seasons and at different hours of the day and night; but whether that influence be sensible or not, whether it be appreciable by our instruments or inappreciable by them, is a question which yet remains for solution by the more minute sifting of the accumulated facts which are now undergoing examination in so many quarters."

"To justify the anticipation that conclusions of the most striking character, and wholly unforeseen, may yet be derivable from the materials in our possession, we need only to recall the experience of the last few months, which have brought to our knowledge the existence of what may possibly prove the most instructive, as it is certainly at first sight the least explicable of all the periodical magnetic variations with which we have become acquainted. I refer to the concurrent testimony which observations at parts of the globe the most distant from each other, bear to the existence of a periodical variation or inequality, affecting alike the magnitude and frequency of the disturbance of storms. The cycle or period of this inequality appears to extend to about ten of our years; the maximum and minimum of the magnitudes affected by it being separated by an interval of about five years, and the differences being much too great, and resting on an induction far too extensive, to admit of uncertainty as to the facts themselves. The existence of a well-marked magnetic period which has certainly no counterpart in thermic conditions, appears to render still more doubtful the supposed connexion between the magnetic and calorific *influences of the sun*. It is not a little remarkable that

this periodical magnetic variation is found to be identical in period and in epochs of maxima and minima with the periodical variation in the frequency and magnitude of the *solar spots* which Mr. Schwabe has established by twenty-six years of unremitting labour. From a cosmical connexion of this nature, supposing it to be finally established, it would follow, that the decennial period which we measure by our magnetic instruments is, in fact, a *solar period*, manifested to us also by the alternately increasing and decreasing frequency and magnitude of obscurations on the surface of the solar disc. May we not have in these phenomena the indication of a cycle or period of *secular change in the magnetism of the sun*, affecting visibly his gaseous atmosphere or photosphere, and sensibly modifying the magnetic influence which he exercises on the surface of our earth?"

This great discovery then, we consider as highly sanctioning our theory of the Sun, but I have to make one observation on that part of the extract which states that the Sun, as a "magnet" has been by *some* offered as a suggestion to account for its influence on the magnetic variations on our earth.

If it be here intended to suggest by the word "magnet" that the sun is composed of electricity, I beg leave to refer the reader to page 142 of this appendix wherein I trust to have refuted and disproved that idea. If the sun (whose circumference is near two million four hundred thousand miles,) were intirely consisting of electricity, I should conceive, from the perilous effects of electric storms even in our own contracted atmosphere, that neither the earth nor the other planets could perform their periodical revolutions round the sun, in safety.

By our theory of the sun we conceive there may be sufficient electricity evolved by the combustion of the oxygen and hydrogen gasses to produce these magnetic variations on the earth's surface and which fact is proved by the above stated discovery of the British Association, and *that* without endangering the earth's safety as we happily find to be the case.

And when we reflect on the invariable constancy of the elective motions which seem to defy the opposition of all distance, and reflect also, on their invariable effects to produce an equilibrium; it appears to me, there can be no doubt that the electricity produced in the sun, by the combustion of the gasses as above shewn, must be the true cause of the magnetic variations on the earth's surface.

And it is remarkable that the great author of the cosmos in his first vol. page 180, has suggested the same idea, that is now verified by the above speech of the President of the British Association.

The cosmos says in page 180. "Are these currents electro currents on the surface of the earth, thermo-magnetic and excited directly from unequal distribution of Heat! or should we not rather regard them as *induced by the position of the sun, and by the solar Heat?*"

The phenomena of periodical variations depend manifestly on the action of solar Heat operating probably thro' the medium of thermo-electric currents induced on the earths surface (*from observations to be made in the Antarctic Expedition.*)

And in the annual of scientific discovery for 1854 edited by Doctor A. Wells, it is said.

"These Laws are coming out with beautiful precision from the reduction, which Col. Sabine is now making of the numerous observations taken at the different magnetic stations. In his address before the British Association in 1854 he stated, that the secular changes in the magnetical forces were confirmed in those recent observations and also that periodical variations depending on the solar day, and on the time of the year had been distinctly made out, indicating the *sun as the cause of these variations.*

During the past year the results of the observations made in Toronto, have brought out with equal perspicuity, a variety in the direction of the magnetic needle going thro' all its changes in each lunar day. These results with reference to the sun prove the immediate and direct exercise of a *magnetic influence emanating from that luminary.*

I have in this ninth edition of my work to make one observation on the great number of planets stated by some astronomers to be contained in our system.

According to the Abbé de Sales, there are not less than seven hundred thousand planets in this system; and the foundation of his estimate he states to be, that there is sufficient room in it for the orbits of this number of planets without interfering with each other, and, that nature could not have left such large spaces unoccupied.

Now if this were really the case, we might fairly ask how happens it that so very few of these planets are seen by the largest and best Telescopes, namely only 17, and therefore it appears to me, that altho' there may be room for that number of Planets, still they are not yet in existence, and we humbly conceive our theory of the comets will explain this.

By this theory, the formation of the planets is one part of the purposes of the comets, by the deposition of their aqueous vapors in their returning courses from the sun, and if our theory be founded in nature, it is probable therefore that these vacant spaces in the systems may be only gradually filling up with new formations of planetary bodies.

Of the number of comets also, (as it is stated in Arago and Lardner's Astronomy) that it is probable that seven millions of them are included within the limits of our system, and altho' the reasoning above, respecting the number of planets, stated to exist in our system, does not indeed apply to the number of comets, (since in our theory of creation, we have presented no ideas on the original formation of the nuclei of comets, but merely stated the changes which must by our theory, take place in the nature of their tails on receding from the sun,) yet should the number of these comets be correct as stated by Arago, and indeed, in corroboration of his estimate, it is certain that the famous astronomer Kepler stated his belief that there were more comets in the regions of space than there were fishes in the sea; and also the profound author of the cosmos says: there are myriads of them; If therefore these statements of

the astronomers as to this vast number of comets be well founded, it certainly appears to me a strong confirmation of our theory, that the comets are designed to restore the waste of the sun's light and heat, in as much as it would prove they are sufficiently numerous for that great purpose.

I shall now proceed to make some observations on the great discovery stated in the speech of the President of the British Association given above.

The eighth edition of our work on the creation was intended to shew the beneficial effects on society which an enlarged diffusion thro' the masses of mankind, of the recent discoveries in astronomy would produce.

And altho' I have good reason to be gratified that our theory of the sun is supported by the above named great discovery and that it is authenticated by so high an authority as the British Association for the diffusion of science ; yet, I feel equally pleased by the hopes that this discovery will awaken a great zeal for the study of modern astronomy in this Province.

I verily believe that the study and contemplation of the heavenly Bodies was designed by Nature to lead mankind to the contemplation and hopes of a future state. The very distances of some of these Bodies are sufficient of themselves to produce the most sublime conceptions of the great first cause. The highly talented author of the *Cosmos* states in Page 78, 1st volume "The cluster of Stars to which our cosmical Island belongs, forms; a lens shaped flattened stratum detached on every side, whose major axis is estimated at seven or eight Hundred and its minor one at a hundred and fifty times the distance of Sirius from the Earth. Now Sirius is 60 million of million of miles from the Earth according to Arago and Lardner's astronomy ; and 800 times that distance is forty-eight thousand million million of miles from the earth, and in the 1st volume of the *cosmos* page 154 it is said by its renowned author. "The elder Herschell was of opinion that light requires " almost two millions of years to pass to the earth from " the remotest luminous vapor reached by his 40 feet " reflector." And it is a great proof of the wonderful

power and goodness which the creator has shewn in his construction of the human mind, that it should arrive at such vast conclusions without being overwhelmed by them.

The British Government has it seems given up the astronomical observatory at Toronto with all the instruments pertaining thereto, to the Provincial Government of Canada. It therefore appears to me, that a great opportunity presents itself to our Government, (there being so many high Seminaries of learning in the Province) for awakening a zeal for the prosecution of the study of the modern astronomy. I consider that a new æra in the history of that magnificent science is about to appear, in consequence of the above stated great discovery of the relation of the magnetic variations of the compass to our Sun; and it appears also to me, it would be well worthy of our Provincial Government to facilitate the efforts of the scientific portion of the Province to take a share in discoveries which may in future be made in it. For this purpose I should conceive a large and powerful telescope should be furnished to the observatory of Toronto, whereby the solstices and equinoxes, or other changes in the sun's surface may be invariably, and closely examined, and their connection with the magnetic variations of the mariner's compass, be accurately noted and described.

By the industry, zeal and talent, of our provincial geologist and his assistants, Canada has acquired considerable praise in the sciences of mineralogy and geology, and there is no reason why she should not aspire to elevation and repute in the vast field of *astronomical discovery* which I trust is about to open.

Lord Rosse's Telescope is six feet diameter; and the Revd. M. Craigs of England is eight feet and a half in diameter. It could not be expected the Province could go to so high an expence, nor need it. But the ordering of one, much more large and powerful than commonly used, would possibly answer, so to excite the zeal of our students as to enable them to share in the honors of discovery in future; and I must observe that I know of no more powerful means of producing



good and true religious feelings, than the contemplation and study of the heavenly bodies; for altho it may be true, that the contemplation of bodies of such vast numbers, and distances, and of the forces which govern them, tend so to overwhelm the imagination of man, that we may not consider ourselves worthy to invoke the unfathomable creator of them, yet when we find he has condescended to grant us a saviour, by whom we are invited to come to pour out our adoration before *him*, and by doing which the human mind becomes susceptible of the most exalted sensations of which it is capable, we feel accordingly the utmost gratitude to the supreme donor. For myself at least I can say, that the first time I partook of the sacrament of the saviours supper at the communion table, I experienced a sensation of the heart, of the most over earthly and delightful nature, I had ever felt before.

I shall now give the opinions of some writers on the theory of the formation of the earth by the condensation of nebulous matter. The cosmos \* seems to adopt it, but his opinion of nebulous formation as well as that of La Place which is the same, were written before the Earl of Rosse had, by means of his telescope of 6 ft. diameter resolved forty three out of fifty three of these nebulae into real stars. Doctor Scoresby and professor Nicoll who were, I believe before this event, suppor-

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Extract from Cosmos, Vol., 1, page 285.

\* " In the first formation of the planets, as we stated in the astronomical portion of this work, it is probable that nebulous rings revolving round the sun were agglomerated into spheroids, and consolidated by a gradual condensation proceeding from the exterior toward the center. What we term the ancient silurian strata are thus only the upper portions of the solid crust of the earth."

" The erupted rocks which have broken through and upheaved these strata have been elevated from depths that are wholly inaccessible to our research; they must, therefore, have existed under the silurian strata, and been composed of the same association of minerals which we term granite, augite, and quartzose porphyry, when they are made known to us by eruption through the surface. Basing our inquiries on analogy, we may assume that the substances which fill up deep fissures and traverse the sedimentary strata are merely the ramification of a lower deposit. The fact of active volcanoes are situated at enormous depths, and, judging from the remarkable fragments which I

ters of the nebular hypothesis have now disclaimed it and, Doctor Scoresby says, that "this grand nebular hypothesis of La Place, is thus resolved into a splendid astronomical dream; and it certainly seems difficult even to imagine that the bases of two or three primary gasses should be able to form the immense variety of solid bodies of which our earth and probably all the planets are composed. This leads me therefore to a comparison of the theory of gaseous or nebulous formation with our own, as shewn in this system of creation, 9th edition.

The theory of the nebulous formation derives the composition of all the solid Bodies of the earth from the in animate combinations of condensed gaseous or nebulous matter; whilst our theory embraces the most energetic source of formation, namely the action of the vital powers of the vegetable and animal creation of the oceanic waters of Genesis, to embody these bases of the gasses imbibed from those waters and the air contained in them and which gasses (by the aid of the electric fluid and the powers of their vitality,) this animal and vegetable creation of the waters of Genesis have transformed into the solids composing their substances, which finally, by the deposition of their remains after their death, have produced all the solid bodies of our earth :

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" have found in various parts of the earth incrustated in lava currents, I should deem it more than probable that a primordial granite rock forms the substratum of the whole stratified edifice of fossil remains. Basalt containing olivine first shows itself in the period of the chalk, trachyte still later, while eruptions of granite belong, as we learn from the products of their metamorphic action, to the epoch of the oldest sedimentary strata of the transition formation. Where knowledge can not be attained from immediate perceptive evidence, we may be allowed from induction, no less than from a careful comparison of facts, to hazard a conjecture by which granite would be restored to a portion of its contested right and title to be considered as a primordial rock.

" The recent progress of geognosy, that is to say the more extended knowledge of the geognostic epochs characterized by difference of mineral formations, by the peculiarities and succession of the organism contained within them, and by the position of the strata, whether uplifted or inclined horizontally, leads us, by

We have shewn in the Preface to the 3rd edition of our work, that the celebrated geologist Hutton has sanctioned this theory of formation of which indeed I was not aware till some years after the publishing of my first edition in Toronto, 1836.

"If, with Elie de Beaumont, we term the waters (in which the Jura limestone and chalk formed a soft deposit) the *Jurassic oroolitic*, and the *cretaceous seas*, the outlines of these formations will indicate, for the two corresponding epochs, the boundaries between the already dried land and the ocean in which these rocks were forming. Extract from *Cosmos* Page 286.

Now this agrees with the theory of this work.

I have shewn in the work that the depositions of the ocean are amply competent to account for the formation of all the solid bodies of our earth, see page 51 of this work, I conclude therefore that the gaseous or nebulous matter supposed by some to have formed the solid bodies, have not been condensed into solid, but merely into a liquid form, and have thus produced the ocean of Genesis (as by 1st and 2nd verses, 1st chapter) which was designed by the creator to form the earth, and accordingly he replenished that ocean with animal and vegetable life, whose remains after death, and whose labours during their term of life, have formed all the solid bodies of the earth by deposition.

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"means of the causal connection existing among all natural phenomena, to the distribution of solids and fluids into the continents and seas which constitute the upper crust of our planet. We here touch upon a point of contact between geological and geographical geognosy which would constitute the complete history of the form and extent of continents. The limitation of the solid by the fluid parts of the earth's surface, and their mutual relations of area, have varied very considerably in the long series of geognostic epochs. They were very different, for instance, when carboniferous strata were horizontally deposited on the inclined beds of the mountain limestone and old red sandstone; when lias and oolite lay on a substratum of keuper and muschelkalk, and the chalk rested on the slopes of green sandstone and Jura limestone.

Here then it would appear by these two last paragraphs the author of the *cosmos* considers the rocky formations to have been produced, not by the condensation of a few gasses, but much more reason-ly by the depositions of the water of those seas.

Whilst therefore the processes of nature in our globe, appear, so fully competent for its formation, what need is there to resort to formation by the imaginary condensation of a few primary gasses in the nebulae? and which have indeed been nearly overthrown, by the recent discoveries of modern astronomy made by the six feet diameter telescope of Earl Rosse.

I now conclude this work, with some observations on the theory I have offered in the 6th edition pages 148-9 of elaboratories of the gasses to supply the waste of the sun's light and heat. The great Sir Isaac Newton was of opinion to the end of his days, that the waste by the incessant emanation of heat and light from the sun, was restored by means of the comets. His foundation for this opinion would appear to have arisen from his observations that the comets always went round the sun before they retired from it. In his days the gaseous sciences were unknown, but now we know the tails of the comets must be gaseous, for many of them are 50 to 100 millions of miles in length and of great tenuity, and we have shewn in our addendum page 152, that the appearance of these tails are quite changed as they recede from the sun, making it most probable that their former tails have been absorbed by the sun for the great purpose of restoring his waste of light and heat.

Being aware of these facts, the question upon reflection, naturally arose in my mind, whence could the comets obtain this supply of gaseous matter? that it must have been taken up by them in the course of the stupendous extent of some of their orbits, appeared to me self evident, and on the contemplation of the immense numbers and distances of these nebulous bodies, all of which are more or less luminous, and therefore contain light, it appeared to me I say, that this was that part of the distant regions of space which was most likely to furnish these gasses to the comets, whose powers of attraction acting on their nebulae, have drawn from them these gasses to form their tails.

It is impossible to suppose that this gaseous matter, could exist unconfined in space, because then the

oxygen and hydrogen gasses might intermix and would that moment be made subject to combustion by the electric fluid, and thus endanger the planetary bodies of the systems they might encounter.

I therefore formed my theory on the idea that some of these distant nebulae were constructed by the creator into vast laboratories, some for the formation of oxygen gas, and others for the formation of hydrogen, and that different comets were then charged with these separate gasses respectively.

Now as it is known that neither of these gasses when separate are at all combustible, no danger could then happen in the courses of these comets towards the suns to deposit their gasses there.

But if our sun be thus restored to its powers of emanation of heat and light, we may reason from the uniformity of nature's laws that all the stars (now allowed to be suns) are so supplied by the comets and so immensely vast must be the supply of the gasses required for this stupendous purpose, that I have concluded in my theory of the comets, that the hand of the creator alone can be resorted to for this supply; and therefore, that a present unceasing act of creation is carried on by him in these laboratories to maintain the existence of the heavens and the earth he created at the "beginning."

"Newton affirms (and who would doubt when Newton affirms) "that the same quantity of force could not be preserved in space; he even thinks that the universe would perish at length if the governor of the universe did not take care from time to time to renew its resources." *Monde Primitif Paris.*

Thus should our theory of the comets and nebulae be in future substantiated and confirmed, as I may I believe, be allowed to say my theory of the sun has been, by several eminent astronomers and now chiefly by the great discovery made by the British Association for the diffusion of science, as above narrated, we may then consider we have indeed arrived THRO' NATURE, UP TO NATURE'S GOD.

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- In title page, for "Discoveries" read Discoveries, and for "compasses" read compass.
- Page 60, line 15, from foot, for "basses" read bases.
- Page 91, line 6, for page 28 read page 148 and line 13, for 21 and 22, read page 151.
- Page 94, line 10 from foot, after fire read " that is by oxygen and hydrogen.
- Page 124, last line for "remanis" read remains.
- Page 128, line 15, from foot, for " in" read is.
- Page 130, line 12, for " every" read very.
- Page 168, line 9, from foot, for "cembustion" read combustion.
- Page 175, line 7, for 2 and 3, read page 129.
- Page 178, line 1st, " If " misplaced.
- Page 178, line 2, for " they go" read *if* they go.
- Page 179, line 10, for " uses" read sees.
- Page 196, line 2 for " elective" read electric.
- Page 204, line 3, for " endanrer" read endanger.